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Pro-birth policies, missions, and fertility: historical evidence from the Congo

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Abstract

We investigate the impacts of pro-birth policies implemented in the Congo during the colonial era on women who grew up in the colony. The Belgian state relied heavily on Catholic nuns to implement these policies (and not on Catholic male missionaries or Protestant missionaries). Using an urban demographic survey conducted in the 1970s, we recover the individual birth calendars of about 30,000 women born between 1900 and 1948. We rely on unique historical material to reconstruct temporal and geographic heterogeneity in exposure to different types of missions. In the spirit a difference in differences, we exploit this heterogeneity and find that Catholic nuns succeeded in stimulating fertility, while Protestant missionaries had a negative impact on fertility. We verify that endogenous mission locations and/or openings and selective migration are not driving the results. In terms of mechanisms, we argue that Catholic education for girls appears to have had a decisive impact on their fertility behavior. We find a strong correlation between the presence of Catholic housekeeping schools and the rise in fertility. This confirms historians' analyses on the success of nuns in promoting an ideal of domesticity where women are confined to their roles of mothers and wives. Finally, using *Demographic and Health Survey* data, we find traces of the influence of colonial missions on fertility patterns today.

Keywords: Colonial demographic policies, fertility, missions, Congo.
JEL codes: D31, D15, O15, O17, N35.
Acknowledgments: See Section A1 in the Appendix.

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1 Introduction

Starting in the 1920s, several colonial powers feared depopulation of their African colonies and wanted to increase birth rates. To this end, they designed policies targeted at maternity and infant care practices and deployed efforts to encourage women to focus more on their reproductive roles and to bear more children (Coghe, 2020). From historians, we learn that these colonial pro-birth policies were carefully implemented and transformed the lives of mothers and wives (Cornet, 2014; Hunt, 1988; Likaka, 2006). Yet their overall success and quantitative impacts remain largely unknown.

Surprisingly, these pro-birth policies – and their potential long-term consequences – have received little attention in the social sciences. In fact, the conventional wisdom is that sub-Saharan African populations experienced high fertility rates before the onset of (timid) demographic transitions and that a high demand for children is an inherent and entrenched aspect of "African cultures" (Cordell and Gregory, 1994). This belief has policy implications, as it contributes to skepticism toward the potential effectiveness of family planning programs in the sub-continent and raises questions about whether fertility preferences can be expected to change (Bongaarts and Casterline, 2013).

In this paper, we seek to investigate the quantitative impacts of pro-birth policies in colonial Congo on women directly exposed to these policies. To implement these policies, the Belgian colonial state relied heavily on Catholic missionaries and Catholic nuns in particular (Catholic male missionaries were generally not involved in girls' education or women health interventions). In practice, the state subsidized Catholic missions to implement health and education programs targeted at women with the double objective of raising fertility and decreasing child mortality. Protestant missionaries, who were also very active in the colony, were more independent (financially and ideologically) from the Belgian state. Motivated by research in history arguing, on the one hand, that female missionaries had a deep transformative influence on girls "close to the mission", and, on the other hand, that Catholic nuns effectively implemented health and education programs designed by the colonial State, we hypothesize that the fertility of women exposed to Catholic nuns (but not those exposed exclusively to male missionaries) increased. We are more agnostic about the impact of Protestant missionaries. They also provided education and health care to girls and women, but the content of their programs and the personnel administering them were sensibly different from those of the Catholic missions.

To measure fertility behaviors, we recovered the individual birth calendars for a sample of about 30,000 women surveyed in the 1970s and representative of the population of 7 major cities of the newly independent country.[1] The survey is of exceptional quality and provides individual-level information for a time period for which reliable demographic information is sorely lacking. In addition, we digitized fertility data from the 1950s by age categories for 148 territories (this data is representative of 95% of the colony's population).[2] We also built a comprehensive data set on the universe of Catholic and Protestant missionary posts from the 1900 to 1948: we know when each post opened and the type of personnel present (in terms of congregation or societies). For Catholic missions we also know the activities missionaries engaged in and the gender of the personnel.

This data yields a source of temporal and geographical heterogeneity in pro-birth program intensity: in a given place in a given year, state-subsidized girls' education and women health interventions were implemented if Catholic female missionaries were sufficiently close by. Using the 1950s data, Figure 1 provides a first comparison of fertility levels across three categories of territories characterized by the predominance of different types of missions in 1920 (Catholic with nuns, Protestant, and Catholic without nuns – the omitted category, represented by the vertical line). It appears that, in territories where Catholic nuns were more numerous, women's fertility increased after the 1920s. Women born after 1920 already had more children at ages 30 to 35 than their "mothers" born before 1900 ever had, and also had significantly more children than women in territories dominated by male Catholic missionaries. This is not true of areas dominated by Protestants. This comparison is too coarse to infer about the impact of exposure to Catholic nuns. It is based on only a few territories and two age groups.[3] Yet the figure helps us highlight our overall strategy. When we turn to econometric analysis, we generalize this comparison by exploiting detailed information on the arrival of new missions of different types (Catholic, Catholic with nuns, and Protestants) at different dates in the 148 territories of the country. In the spirit of a difference-in-differences estimation, we

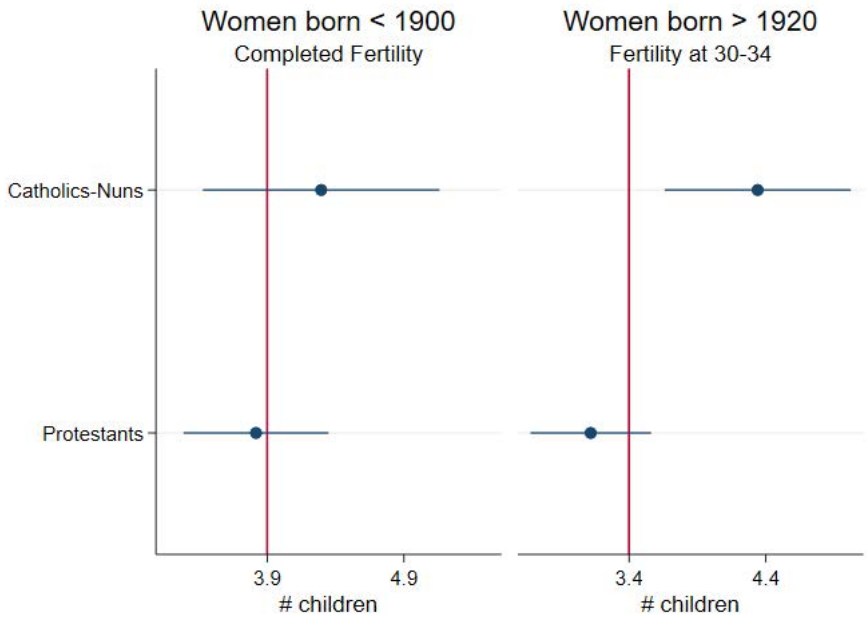
[1] At that time, about 20% of the population was urban (de Saint Moulin, 1974). More than 90% of sampled women were born in a rural area and migrated during the last years of the colonial era or after independence.

[2] The territory (*territoire* in French) is the lowest level of administrative division in the Belgian Congo.

[3] We include territories that we could classify as dominated by either type of missionaries based on missionary presence in 1920, when pro-birth policies started being implemented. Many territories had no missions at that point. Fertility cannot be computed at the same age across the two age groups because – in the 1950s data – fertility is available at the time of the survey only.

then analyze women's fertility outcomes (at a given age) by their degrees of exposure to new missions (with territory fixed effects).

Figure 1: Average territory fertility, territories dominated by Catholic nuns or Protestant missionaries, compared to territories dominated by Catholic male missionaries



Source: 1950s demographic survey, fertility at time of survey.
Note: Average fertility in territories dominated by Catholic nuns (11 territories) or Protestants (50), compared to territories dominated by Catholic male missionaries in 1920 (26, red axis). Omitted territories had no mission post in 1920. Fertility corresponds to completed fertility for women born before 1900 (left panel) and to fertility at ages 30-34 (i.e, at the time of the survey) for women born between 1921 and 1927 (right panel).

Our main empirical results reveal that Catholic missions stimulated fertility *only* when they hosted Catholic nuns. Halving the distance to such missions increases the number of children by about 0.16 (for women aged 35). The effect of Catholic nuns is particularly strong when they operated housekeeping schools. In stark contrast, Protestant missions have a negative and robust impact on fertility: exposed women have their first child later, larger birth intervals, and fewer children (halving the average distance to a Protestant mission decreases the number of children at 35 by about 0.16). To verify that mission location (or more precisely the endogenous timing of mission openings) is not driving the results, we perform two tests. First, using both the 1970s and 1950s data sets (parallel trend test), we verify that women's fertility is not correlated with the opening of posts

when they were too old to be affected. Second, we include time-variant district-level controls (using a new data set we built for this purpose) and check that our point estimates are not affected. Both analyses are reassuring. Selective urban migration does not seem to drive the results either : the results are similar when we use the nationally representative data from the 1950s. Furthermore, when we compare the same birth cohorts (from the same territory) in the representative sample of the 1950s and in the urban sample of migrants in the 1970s, we find similar fertility patterns.[4]

We conclude that, overall, the State was successful in its efforts to stimulate fertility by subsidizing health and education interventions by Catholic nuns. Our data also help uncover the mechanisms beyond this overall impact on fertility. Detailed analysis of the impacts of specific missionary works and information on health outcomes suggest that improvements in general health alone are unlikely to account for the increase in fertility in the vicinity of nuns. We argue that Catholic female missionaries were probably successful in changing behaviours and preferences related to maternity, especially when they invested heavily in girls' education. Education and evangelizing activities promoted the image of an ideal Christian wife entirely dedicated to the well-being of her children and husband, and the embedding of the discourse in religious prescriptions possibly facilitated persuasion (Bassi and Rasul, 2017). Protestant missionaries were excluded from state subsidies until the late colonial period and designed their education and health interventions independently from the State. Unlike Catholic schools, Protestant schools welcomed girls and boys in the same classes through the same program. Protestant missions also relied on local female labour to a greater extent, and their white female personnel were more qualified and stemmed from more progressive environments than that of the Catholic missions. All of these elements contribute to explaining their contrasted impact on fertility.

These findings raise the question of the long-lasting influence of these colonial policies on fertility. It is outside the scope of this paper to provide an answer to this question. Yet, as a first and crude step in this direction, we investigate the correlation between Christian missions locations in 1948 and the fertility behavior of women in the Democratic Republic of Congo in 2007 and 2013-14 (using the two available waves of the Demographic and Health Surveys (DHS)). We find that women in the vicinity of former Catholic missions with nuns do not have more children today, except if the former mission hosted a

[4]We can reconstruct the fertility in the 1950s of a woman surveyed in the 1970s using their birth calendar.

housekeeping school, which we interpret as some trace of colonial influence on fertility behavior.[5]

We contribute to several strands of the literature. First, we contribute to recent literature on the influences of colonial institutions on fertility patterns in sub-Saharan Africa. Canning et al. (2020) compare fertility patterns between the French and the British empires using a regression discontinuity design across the colonial borders that went through homogeneous ancestral ethnic homelands. They show that fertility is significantly higher in the former French colonies, where women rely less on modern contraceptives. They argue, with the help of an event study, that the gap in fertility is driven by the earlier introduction of family planning policies in the former British colonies (see also the similar study by Saxena (2022), which includes countries colonized by Portugal and Belgium). Similar to these studies, our analysis suggests a decisive influence of colonial policies on fertility. In contrast to them, we evaluate the impact of these policies on women who were exposed to them during colonial times and explore the mechanisms through which they influenced fertility behavior.

More generally, we contribute to a growing literature on the impacts of colonial policies and institutions on individual behaviours and attitudes (Acemoglu et al., 2001; Anderson, 2018; Banerjee and Iyer, 2005; Dell and Olken, 2020; Huillery, 2009; Lowes and Montero, 2021a,b). Our originality, with respect to this literature, is to measure the impacts of exposure to colonial policies on the individuals directly exposed to these policies.[6]

Finally, we contribute to a growing literature on the impact of missions on development outcomes. This literature insists on the long-lasting effects (mostly in education and health) of missionary presence during the colonial period (see, for example, Cagé and Rueda, 2016, 2020; Valencia Caicedo, 2019; Calvi et al., 2020; Nunn, 2014 and the extensive reviews by Becker et al., 2021and Jedwab et al., 2022). Several authors have also found a distinctive impact of Protestant missions, in particular on women's education in Prussia (Becker and Woessmann, 2008), India (Calvi et al., 2020), and Africa (Nunn, 2014). Particularly relevant is the recent paper by Okoye and Pongou (2021), who investigate the long-term impacts of missions on fertility (among other outcomes)

[5]One element that may help explain why the vicinity of former Catholic missions with nuns is not positively correlated with fertility overall is the persistence in the location of health facilities, which today follow official guidelines on promoting family planning, close to former missions.

[6]In this sense, we are close to the work of Meier zu Selhausen and Weisdorf (2016) and Meier zu Selhausen (2014) on the impact of missions on women's empowerment.

using a discontinuity design around the border of the Emirates of Northern Nigeria where missionary activities were restricted. They find that, in areas where missions were more active, fertility is lower today. Our specificity with respect to the existing literature on missions lies in our investigation of the early impacts of missions on local populations, which is an important step in understanding the long-term effects of missionary presence. Furthermore, by exploiting the *timing of opening* of posts, our identification strategy is less demanding than that of the existing literature : we need not assume that – once geographical and historical controls are introduced – missions settled in "random" places. As we combine time and geographic variations in exposure, we need to assume that the specific timing of (specific) post openings is uncorrelated with pre-existing fertility trends. We also go a step further in decomposing the influence by type of missionary work (in the same vein as Cagé and Rueda (2016)).

The rest of this paper is organized as follows. Section 2 provides background on pro-birth policies and the expansion of missions over the period of interest. Section 3 introduces the data and measures. Section 4 details our empirical strategies and presents the results. Section 5 discusses the mechanisms behind the results in light of historical evidence. Section 6 analyzes the correlation between former mission locations and fertility in the 2000s using DHS data, and Section 7 concludes.

2 Historical context

2.1 Fear of depopulation, pro-birth policies, and the role of Catholic missions

"For the future of the race and the prosperity of our colony, we must count on high childbirths." P.J. Bourgaux, Union Minière du Haut-Katanga, cited by Likaka (2006).

Between 1885 and 1930, the population of the Congo was decreasing. The lack of reliable data makes it hard to estimate the extent of the decline, but it was a major preoccupation for colonial authorities (Sanderson, 2000, 2020). The Belgian colony was not an exception, with similar trends observed in neighbouring countries. France and the United Kingdom shared Belgian concerns about the demographic situation (Feierman, 1985).[7] Colonial authorities feared a labour shortage – a colony would be worth little

[7]Reliable demographic information from the late 1950s confirms that, in some regions in particular, natality rates were very low and infertility rates were very high in the last decades of the nineteenth

without workers. The general governor of the Congo summarized the problem in the following terms in 1924: *"The exploitation of the resources we know about – and of those we guess exist – will require numerous hands. It will be delayed if the population does not grow as fast as our resource extraction, and many worry that natality is so low that a gradual decrease, slow but certain, of the population is inevitable."*[8] Low fertility rates became the main topic of colonial demographic literature, and several medical studies and expeditions were devoted to these questions (Hunt, 1988; Sanderson, 2010).

Both European occupation and indigenous practices were blamed for low natality. Colonization was said to have accelerated the spread of diseases and led to trauma, depression, and an apathy that inhibited reproductive functions (Romaniuk, 1967). Indigenous practices held responsible for low birth rates included polygamy, traditional practices of abortion, and abstinence during breastfeeding (Hunt, 1988).[9] Much attention was paid to the latter element, as breastfeeding periods were long (two to three years according to colonial literature), and led to "excessive" birth-spacing.[10] The historian Hunt (1988) cites the report to the Colonial National Congress of 1924 that makes the explicit link between breastfeeding and low fertility: *"The present situation is certainly irrational. Sometimes women breast feed during three years. In the course of the approximate thirty years during which women are susceptible of becoming mothers, [it is irrational] to place periods of three to four years during which they can have only a single child, while nature would certainly permit them to support more frequent pregnancies without harm".*

The colonial government started to implement policies to reduce infant mortality and promote birth rates in the 1920s. It subsidized health facilities and the development of programs that would teach Congolese women the "art" of child rearing. In addition, the government introduced a tax on polygamy and subsidies for large (monogamous) families.[11] To reduce birth spacing, breastfeeding periods were to be reduced and artificial

and the first decades of the twentieth centuries (Romaniuk, 1967). It is now commonly accepted that sexually transmitted diseases played a major role in this "natality crisis" (Retel-Laurentin, 1974) and that, while the problem predated Belgium colonization, the movements of population triggered by colonization aggravated the problem. Sterility sharply declined in the next several decades for reasons that remain debated. Anti-venereal disease campaigns in the late colonial period may have contributed to lessening the problem (Romaniuk, 2011).

[8] This declaration is cited in Congrès Colonial National (1924).

[9] Colonial literature explains abstinence during breastfeeding by superstition and reports that some groups believed that having sexual relations during this period would harm the child and bring bad luck to the family(Hunt, 1988).

[10] Even in the absence of sexual abstinence during breastfeeding, breastfeeding depresses fertility through changes in hormonal secretions.

[11] Polygamy was thought to depress birth rates for several reasons. By encouraging young women to

milk and alternative feeding practices were to be promoted (Hunt, 1988). Belgium was not the only country to implement pro-natalist policies in its colony. In the French Empire, laws prohibiting abortion and the use of contraceptives came into effect as early as the 1920s and continued until after the 1960s. Population policies in the British colonies were also pro-natalist until the 1940s, when policies began to focus on population control, for example by introducing modern contraceptive methods in the 1950s (Canning et al., 2020).

To put these pro-birth policies into action the Belgian government sought the support of missionaries. Female missionaries were put in charge of new maternal and infant health programs and would help change sexual practices through moral advice and incentives (Likaka, 2006). An annual subvention was allocated to "national missions" if they respected a strict program and worked under the control of the hygiene services to which they would regularly report (Cornet, 2014, pp. 155–6). These programs were ambitious and the regular maternal and infant consultations turned out to be successful at attracting women. It is estimated that, at the end of the 1950s, about a third of the colony's infant population (aged 0 to 2) had attended a consultation program, and half of women giving birth had attended prenatal consultations. During these consultations, mothers (or mothers-to-be) would be instructed about appropriate infant care and in particular feeding practices. As an illustration of colonial prescriptions on infant care, Figure A.1 shows a page from an official booklet informing women of all the steps to follow to feed their child correctly. It promotes the transition to solid food and to bottle feeding, and mothers of infante of 10 months are advised to stop breastfeeding.[12]

In addition to medical programs, girls' education programs intended to raise morality standards, promote "Christian marriage" and teach appropriate house-keeping practices. Girls who attended schools were to become Christian wives and mothers, focused on their households. Programs were set by the government, and virtually all education took place in missions.[13] When secondary schools opened for girls, they were almost exclusively dedicated to house-keeping. The *écoles ménagères* (housekeeping schools) taught, among

marry old men, some young men could remain without wives. In addition, polygamy was seen as an obstacle to a "higher conception of marriage" that would be centered on reproduction (Congrès Colonial National, 1924).

[12]This booklet, written by a doctor of the colony, was translated into the main local languages and was distributed in maternal health facilities and housekeeping schools.

[13]The same was true of the British colonies. In the French Empire, education was more often public, and teachers were secular state officials.

other things, infant care, hygiene, sewing, and ironing.

2.2 Mission expansion, Protestant versus Catholic missionaries, and the State

As illustrated by the implementation of pro-birth policies, missions were important intermediaries between the state and the population. In addition to relying on the logistical support of missions for medical assistance, the state saw missionaries as agents of social control that would ensure local peace and educate workers (Markowitz, 1973). It encouraged expansions of missions by granting them land concessions and providing subsidies for missionary schools and health facilities.[14]

Catholic and Protestant missions had a distinct status and relationship with the state. Catholic missions were typically "national" while Protestant missions were predominantly from Great Britain, the United States, or Sweden. While claiming to support religious freedom and the principles of international law, the state favored national Catholic congregations over Protestant societies. Protestant missions regularly complained to national authorities that they were receiving smaller land grants than Catholics and were excluded from receiving state subsidies. Indeed, until the end of the Second World War, education and medical subsidies were granted to national missions only. This did not prevent Protestant missions from continuing their expansion (see Figure 2, Panel A).

Catholics and Protestants had different views of their mandates. Most Catholic orders present in the Congo were reluctant at first to engage in medical relief work, fearing that healing the body would crowd-out important resources destined for saving the soul (Au, 2017). The development of medical activities in Catholic posts was stimulated by state subsidies and followed the arrival of nuns (despite their lack of formal qualifications in this area).[15] In contrast, Protestant missions tended to embrace medical work with enthusiasm and relied on highly qualified personnel. In the Congo, they had licensed medical doctors and hospitals long before the Catholics (Au, 2017; Markowitz, 1973).[16]

[14] In the French and British Empires missionary personnel were also the main providers of basic health care (Nkwam, 1988; Rouanet, 2015).

[15] The colonial government clearly saw the advantage of relying on missionaries. In Congrès Colonial National (1924), one reads: *"Give [missions] the resources needed, and they will, at a much lower cost than the state or the Red Cross, embark on a medical crusade [...]. If, much like Protestant foreign missions – who do not lack resources – Belgian religious missions could hire medical doctors, they could increase their social actions considerably and bring to the natives from the bush outstanding medical assistance."* (p. 132, own translation).

[16] Despite important efforts to recruit doctors for Catholic missions in the 1920s, by 1930 there were only 8 Catholic mission doctors, against 30 Protestant mission doctors (Au, 2017).

Protestant missions welcomed women from the start. Figures available in Irvine (1978) indicate that new posts were opened by missionary women (typically accompanied by male missionaries) in 88% of cases.[17] In contrast, the presence of Catholic nuns only became significant in the 1930s.

In the area of education, Protestants also had a head start, yet both Catholics and Protestants invested heavily(with the help of state subsidies in the case of the Catholics) in mass education and competed against each other. The primary goal of Catholic missionary schools was mass conversion, and the focus was on "socialization" and moral training rather than on "education". Historians report that Protestant education was of a higher quality and provided girls with opportunities for literacy before the Catholics, partly because they implemented coeducation instead of aiming for as much gender-specific education as possible (Depaepe and Lembagusala Kikumbi, 2018; Yates, 1982).[18] The development of girls' education in Catholic missions followed the arrival of nuns. Overall, investment in girls' education was substantially lower than investment in boys' education over the colonial period. Only one in five pupils was a girl at independence in 1960 (Yates, 1982).[19] We return to the differences between Catholic and Protestant activities in the discussion of the results in Section 5.

3 Data, samples, and measures

3.1 Demographic surveys and fertility measures

3.1.1 Demographic survey in urban Zaire in the 1970s : Data recorded at the individual level

The micro-data we use to construct our main outcomes are derived from a unique demographic and household budget survey that was carried out between 1975 and 1977

[17] In the remaining 12%, no women was present among the first missionaries at the post.

[18] The report from the 7th congress of Protestant missionaries in the Congo held in 1918 in Luebo, Congo, provides an account of what had been accomplished in terms of education and underlines the importance of girls' education – and the difference to the Catholics : *"Boys and girls have been gathered into village schools in large numbers. At almost every mission station boys have been taught, and on quite a large number girls also. And right where let it be said that it is most necessary to educate the girls of Congo as well as the boys [...] We are glad to record that much has been done in the training of women, and that the majority of our missionaries are awake to this great need. [...] What would have been the result if the Christian churches at home had neglected the education of women? We can have some idea of the result after viewing some of the Latin countries of Southern Europe and of South America dominated by a church that is afraid to educate its people, especially the women."* Congo Missionary Conference, 1918, p 69.

[19] Yates (1982) writes that the Belgian Congo "had one of the highest Third Word enrollment rates for males and one of the lowest for females".

on a representative sample of seven major cities in Zaire: Kinshasa, Matadi, Bandundu, Kikwit, Mbandaka, Kananga, and Bukavu.[20] For each of the 270,000 individuals belonging to the selected 46,000 households, enumerators carefully collected demographic information (age, gender, ethnic group, marital status, and place of birth), socio-economic characteristics (level of education, employment status, and occupation), and position in the household (relationship to the head of the household). Further details on the quality of the data are provided in the online appendix, Section A.1.1.

A major advantage of this survey is that each woman over 13 reported the birth schedule of all the children she ever had, including the month and year of birth, the child's gender, and, in case the child was no longer alive, the month and year of death. For one-sixth of the households surveyed, the weights (but unfortunately not the heights) of a woman and a man over the age of 25 living in the household (and randomly selected from the household) were also recorded. We use this variable as a (rough) indicator of health.[21] Finally, for all members of the household, the territory of birth and the date of arrival in the city were recorded. More than 90% of the sampled women were born in a rural area and migrated during the last years of the colonial era or after independence. We can thus measure each woman's exposure to missionary presence in childhood (as described in Section 3.2).

3.1.2 Demographic survey of the Congo, 1950s: Fertility by age and territory

The results of the survey on Congolese demography conducted in 1955-7 were published in official reports (see Figure A.2), and, in particular, current fertility levels are available in 5- or 10-year age categories at the territory level and for all territories in the country. The age categories are 15–19, 20–24, 25–29, 30–34, 35–44, 45–54, and +55.

[20] Zaire was the name of the country from 1971 to 1997. The French designation for these surveys is *Enquêtes démographiques et budgétaires des villes à l'Ouest du Zaïre* (Demographic and Budgetary Surveys of Cities in Western Zaire). A digital version of these data was stored in the *Belgian Archives for Social Sciences* of the University of Louvain la Neuve. Republique du Zaïre (1978) provides an overview of the survey.

[21] Changes in adult weight across cohorts capture changes in body size and body shape (fat in the body) (Cole, 2003). The measure of weight thus depends on both nutritional investments in childhood (which influence height) and access to nutrition as an adult (in the weeks preceding the survey) without allowing us to distinguish between the two. In any case, weight is associated with greater access to food (either as a child or an adult,) and we are quite confident that weight is positively correlated with health at that time. Overweight was not an issue in the 1970s, quite the contrary (Abarca-Gómez et al., 2017). The population of Zaire had a very low body mass index and suffered from chronic malnutrition and poverty.

Although this data set provides less precise information than that of the 1970s, it has the advantage of being representative of the population of the whole country. About 10% of the population of all territories was surveyed. The sample was stratified to be representative of both urban and rural areas. The published aggregated data accounts for this sampling strategy. Overall, it is considered to be the first scientific and high-quality survey conducted in the Congo (Romaniuk, 1967). To obtain our database, we digitized the published survey results.[22]

3.2 Exposure to colonial presence: Missions, missionaries, and missionary works

The main sources we have for the Catholic missions come from three official and exhaustive yearbooks published in 1924, 1935, and 1949 (Corman, 1924, 1935; Van Wing, 1949). These three yearbooks contain rich information as they indicate the precise dates of the opening of missionary posts, the name of the congregation managing the post, the presence of female missionaries (their number and dates of arrival), as well as the type of activities being conducted by missionary personnel at each post at the time of their publication. This information is completed by maps allowing us to pinpoint the geographical location of each post. Additional information is provided in the online appendix, Section A.1.2.

The sources for the Protestant missions are more scattered than for the Catholic missions, since Protestant societies were less centralized, and they came from various countries and regions of the world. To construct our indicators of Protestant missionary presence, we rely on two types of sources: two handbooks compiled in 1961 (Braekman, 1961) and 1978 (Irvine, 1978)[23] and six official maps indicating the presence of missionary posts published in 1905, 1921, 1930, 1944, 1953, and 1960.[24] Unfortunately, we have no systematic information on missionary activities within posts. Additional information is provided in the online appendix, Section A.1.3.

3.2.1 Dynamics of post openings and measures of colonial exposure

Figure 2 displays the dynamics of new post openings. Panel (a) illustrates that the Protestant presence predates that of the Catholics, with the latter catching up–in terms

[22] One report was never published, so that information is missing for six territories.

[23] Unlike the Catholic missions, these handbooks are not official, but the authors have scrupulously compiled the information they were able to obtain from various church reports and archives.

[24] We found the maps in the archives of the African Museum in Namur, Belgium.

of number of posts–only in the 1930s. This figure also shows the arrival of Catholic female missionaries roughly from the mid-1920s. Their presence intensifies up to the beginning of the Second World War. Panel (b) reveals that the missionary expansion implied a gradual occupation of the whole country. The number of territories with at least one post is increasing throughout the period, which implies that new posts are opening in territories that had not been colonized until then. By the end of 1948, almost all territories have at least one Catholic post, 80% have at least one Protestant post, and 66% have at least one Catholic post with Catholic nuns. The gradual occupation of the whole country is also illustrated by the maps presented in Figure A.3 in the online appendix.

We construct two types of measures of missionary presence at the territory level for any given year between 1886 and 1949. First, we use a binary variable equal to 1 if at least one Catholic (Catholic with nuns or Protestant) missionary post was active on date t in territory g. As the nuns are always under the supervision of a male congregation, the date of arrival of a Catholic female missionary is always posterior or equal to that of the opening of the post.

Second, we construct continuous measures of proximity that account for the density of missionary posts at the territory level. We follow the methodology proposed by Calvi and Mantovanelli (2018). Within each territory, we generate 1,000 randomly located points; for each of these points we compute the distance to the nearest Catholic post (Protestant or Catholic post with nuns, respectively) in any given year (between 1900 and 1948). We compute the average of these distances at the territory level in a given year. The advantage of this methodology is that it accounts for posts that are located in neighboring territories. If a post is built outside but close to a territory boundary, it will influence exposure within the territory considered.[25] Based on these distances, we construct two measures of proximity : the average proximity and the log-average proximity. The first is obtained by multiplying the distance by -1 and the second by applying the logarithm function before multiplying by -1. We apply the same methodology to define exposure to specific Catholic missionary activities.[26] Table A.2 in the online appendix reports the

[25]This measure accurately represents the exposure of a randomly selected inhabitant of the territory if the density of population is homogeneous within the territory. As there is no information available about variation in population density within territories, we can hardly refine our measure. Note that urbanization was limited before 1950.

[26]Note that the yearbooks only indicate whether these activities were in place at the time of publication and not the exact date of implementation of these activities. We assume that an activity starts in the year the yearbook is published and stops in the year before the next book is published if it is not mentioned

average proximity at the territory level in 1910 and 1948.

To define exposure measures for a given age category, we compute the arithmetic average of age-specific exposure measures. To match these measures to the demographic survey data of the 1970s, we use the territory of birth, available for each individual. To define exposure for a given woman we need to choose an age at which to compute her distance to missions. We choose to compute exposure at birth and at age 6. Using older thresholds would imply large losses of information because of the censuring in the variation in exposure from 1948 onward (the last year in which we observe th opening of Catholic missions). Moreover, the historical literature provides arguments for the choice of an early threshold, as missionaries targeted young children for education and conversion.[27] Our preferred measure is exposure at birth because it allows us to include more women in the analysis when we use the 1970s data.[28]

4 Impact of missions on fertility behavior

4.1 How may Christian have missions affected fertility behavior?

We see four main channels of influence of missions on fertility, corresponding to different sets of missionaries activities: conversion, health, education, and economic opportunities. First, conversion to a religion that promotes the image of women focused on reproduction may, by itself, increase fertility. If this is the case, we would expect male Catholic missionaries to (also) have a stimulating effect on fertility.

Second, health interventions may increase the general health of the population and thereby fertility (as healthier women are more fertile). If this is the main canal of missionary influence, Catholic missions with nuns but also Protestant missions – recognized for the quality of their health expertise during the period of study – should have a stimulating impact on fertility, while Catholic missions without nuns should not. Similarly, if the state-sponsored health programs targeting women's fertility proved successful, the impact

in the next book.

[27] Hunt (1988) writes that the higher conception of marriage and the social duties incumbent on spouses "*was not easily inculcated [...] usually requiring Christian education for both spouses, and was most likely about "girls raised among the nuns'."* Another historian, Cornet (2014), reports that adult women were "*less enthusiastic pupils when exposed to the mental revolutions proposed by occidental missionaries.".*

[28] As we measure missionary presence only up to 1948, when we use the six-year threshold, we need to restrict attention to those born before 1942 (and thus lose the observations of women born between 1942 and 1948).

of Catholic nuns may be more pronounced than that of Protestants (not sponsored), in particular when they operated health facilities. We would then also observe that women exposed to Catholic nuns should have relatively better health outcomes.

Third, education may decrease fertility by increasing women's access to new economic opportunities. Yet, if the teaching incites women to focus on their reproductive roles, the overall effect of education is ambiguous. As Catholic schools (and official programs) promoted more conservative gender roles, we hypothesize that they are less likely to reduce fertility than Protestant schools.

Fourth, missions may directly provide employment possibilities to women, thereby increasing the cost of child rearing and decreasing fertility. It is difficult to evaluate the differences between missions in this regard, and we expect this channel to lead to a decrease in fertility for all types of missions.

While our analysis will not permit us to precisely quantify the relative contributions of these distinct mechanisms, we will be able to rule out some scenarios by comparing the overall impact of Catholic male missionaries, Catholic nuns, and Protestants and by exploring the separate impact of the different activities that Catholic nuns engaged in. In Section 5, we review contributions by historians that help us assess the relative relevance of these channels.

4.2 Empirical strategies

We seek to evaluate the impact on women's fertility of growing up close to missions. To achieve this, we rely on a generalized difference-in-differences approach, and we leverage both the intensity of the missionary exposure and the timing of such exposure.

4.2.1 Differences-in-differences using 1970s individual records

For this data, our baseline specification is as follows:

$$Y_{i,t,g} = \alpha_0 + \alpha_1 \text{ ExpCatholics-Nuns}_{i,t',g} + \alpha_2 \text{ ExpProtestants}_{i,t',g} + \alpha_3 \text{ ExpCatholics-All}_{i,t',g} + \alpha_4\, t + \alpha_5\, t^2 + X_g'\alpha_6 + u_g + \epsilon_{i,t} \quad (1)$$

where $Y_{i,t,g}$ is the fertility outcome for woman i born in *territory* g in year t. ExpCatholics-Nuns$_{i,t',g}$, ExpProtestants$_{i,t',g}$, and ExpCatholics-All$_{i,t',g}$ are the exposure measures described in Section 3.2. They are either the extensive measure (whether there is at least one missionary post in *territory* g at time t') or the intensive margin variables (based on distances) and are

measured either at birth (in which case $t = t'$) or at age 6 ($t' = t+6$). The coefficient associated with ExpCatholics-Nuns$_{i,t,g}$ captures the effect of posts in which Catholic nuns are active, conditional on the effects of exposure to Catholic posts in general (ExpCatholics-All, which includes men and women) and Protestant posts (ExpProtestants). The variables t and t^2 allow us to account for quadratic year-of-birth time trends. The vector X_g includes controls, such as the city of residence, and a dummy variable indicating whether the place of birth within the territory is in a rural area or not. Importantly for our identification strategy, we introduce u_g, which is a territory of birth fixed effect. This last feature of the equation allows to conduct a *within* territory analysis. Thus, our coefficients of interest, α_1, α_2, and α_3, are identified by time variations of exposure to missions in a given territory. Finally, as our exposure measures are constructed at the territory level, the standard errors are clustered at this level.

4.2.2 Threats to identification

Endogeneity of new post installation The within-territory approach has two implications for our identification strategy. First, the main identifying assumption is that the settlement of missionaries in a given location is not correlated with fertility trends in that location. As time-invariant unobserved heterogeneity at the territory level is accounted for by the territory fixed effect, the omitted variable bias can arise from time-variant confounders at the territory level: for example, missionaries settle in a given location when territory's fertility rates start worsening because sanitary conditions deteriorate. We test for the parallel trend assumption in Section 4.5 using individual records from the 1970s sample and the representative, aggregated data from the 1950s. We then verify that our results are robust to the inclusion of time-variant district-level controls that proxy for economic conditions (to this end, we built a new data set from yearly administrative reports to the Belgian Parliament).

Second, this strategy is less demanding than what a typical estimation on the impact of missions requires. We do not need to assume that areas in which missionaries settled are comparable to areas where they did not settle. Indeed, with respect to the intensive-margin exposure measure, all territories are considered as "treated", only the intensity of this treatment matters. As for the extensive-margin approach (whether a territory has at least one missionary post), we are reassured by Figure 2, which shows that the vast majority of territories have been occupied by the end of the period.

Selective migration Another threat of identification is selective migration. Indeed, the 1970s sample is made up of urban dwellers who were born in a rural area and migrated in the late 1950s. We need to provide evidence that the selection into migration is not driving our estimates. Note that our comparison between mission types helps us in this regard (the selection into migration would need to be different in the vicinity of Catholic versus Protestant missions to drive our contrasted results).

To firmly rule out biases driven by selection into migration, we need the information from rural dwellers in 1970s. While this information is not available in the 1970s, we can use the representative data from the 1950s to investigate this question. We employ two strategies. First, we estimate the impact of missions on this data set (using aggregate records at the territory and age-category levels for ages above 35). Second, we build a 1950s counter-factual population using the 1970s data – we attribute each woman to her territory of birth and age-category in the 1950s and construct her fertility at the date of the 1950s survey. We can then compare the results obtained for the impacts of missions on fertility with the representative sample of the 1950s data and with the 1970s counter-factual sample.[29] If the results are similar, the missions' impacts can hardly be driven by selective migration.

To perform these analyses, we need to slightly adapt our estimation strategy to the characteristics of the data set. From the 1950s survey, we have available fertility measures at the territory level but only at the time of the survey and for specific age categories.[30] We thus need to construct an average exposure measure for each age category and have less variation in exposure. There is another reason why there is less variation in exposure in this data set: the posts opened toward the end of the period covered by our mission data (until 1948) are not used in this analysis because women above 35 at the time of the survey were born in the 1920s or earlier. As a result, we use continuous exposure variables only (which entails more variation than the discrete variable on presence of a given type

[29] For this analysis, we use all age categories (above 15). This is because women above 35 in the 1950s were above 55 in the 1970s, and we have too few of them in the 1970s data to have enough variation across space and time. Furthermore, our purpose with this analysis is more to compare estimates across the data set than to quantify the impact of Catholic missions on women's completed fertility.

[30] As we compute exposure using women territory of current residency at the time of the survey in the 1950s, we implicitly assume away migration prior to the 1950s. This assumption is particularly worrisome if women with future high levels of fertility are more likely to have migrated to places close to missions. This is unlikely in our context because the administration strictly controlled inter-territory migration until the end of the colonial period (a passport and a reason for work or family reunification were required to migrate), and migration was extremely limited (Likaka, 1997).

of post in a given territory), and we adapt Equation (1) by using (i) district fixed effects, which is the next highest administrative division after the territory, and (ii) age category fixed effect instead of year-of-birth trends.[31] When we change the level of analysis from territory to district, we limit the omitted-variable bias by introducing a state-of-the-art series of geographic and historical controls measured at the territory level that could be correlated to both the location choices of mission stations and fertility trends (Jedwab et al., 2022).

Heterogeneous treatments over time and estimator bias A recent literature has shown that the generalized difference-in-differences estimator can be biased in cases of heterogeneous treatment effects (de Chaisemartin and d'Haultfoeuille, 2020). Using the modified difference-in-differences estimator and the Stata command provided by de Chaisemartin and d'Haultfoeuille (2020), we show in Appendix A.4 that our results barely change when we apply this methodology.

4.3 Empirical results: Contrasted impacts of Catholic and Protestant missionaries on fertility outcomes

In this section, we start by investigating the impact of growing up closer to a mission on women's fertility. We then turn to the impact of missions on childlessness, age at first birth, birth spacing, child mortality, and weight. We distinguish between Catholic missions, Catholic missions with nuns, and Protestant missions. Recalling that Catholic missions with nuns always hosted male missionaries, exposure to a mission with male missionaries is captured by the variable ExpCatholics-All, while the impact of exposure to Catholic female missionaries is captured by the variable ExpCatholics-Nuns.

Table 1 provides the results of regressions for the total number of births at different ages using the 1970s data. While at older ages, fertility is more likely to be complete, the relevant sample size is smaller, as it includes only women who have reached the age considered. Exposure is defined at birth (Table A.3 in the appendix provides the same estimation when exposure is defined at age 6). Panels A, B, and C present the results for three different measures of exposure to missions: the presence of missions (of a given type) in the territory of birth (A), the proximity to the closest mission (of a given type) (B), or the log proximity (C).

[31] If we were to use territory fixed effects, we would lose several territories for which there is no variation in exposure across cohorts for the relevant time period.

The results reveal striking differences by type of mission. When women grew up closer to a Catholic mission with nuns they have more children at age 35, 40, and 45. Regardless of whether we use a binary indicator for exposure (panel A) or continuous measures (panels B and C), the coefficients on Catholic nuns are positive and (almost always) significant. The coefficients reported in panel A suggest that when a first post with nuns opens in a territory, fertility increases by 0.21 at age 35 (and 0.35 at age 45). Halving the distance to a Catholic mission with nuns translates into women having 0.16 more children at age 35 and 0.26 at age 45 (panel C).[32] When Catholic missions do not host a female missionary, they appear to have no influence on fertility (most coefficients on ExpCatholics-All are small and not significantly different from zero). In contrast, when women grow up closer to Protestant missions, they have fewer children. The coefficients are of similar (absolute) size to those for Catholic nuns : halving the distance to a Protestant post reduces fertility by 0.16 at age 35 and 0.17 at age 45 (panel C). If we define exposure at age 6 (Table A.3), the results are also very similar (with slightly larger standard errors, since the sample sizes are smaller). While the size of the estimated effects may seem modest at first sight, we believe that they suggest a substantial effect of missions on fertility. First, a new missionary post's influence certainly grows over time, and by exploiting the opening of new posts, we are focusing only on their early impact on women. Similarly, the number of individuals directly in contact with mission schooling or health activities was only a small share of the overall population of a territory during the period under study so a small average effect suggests an important influence on those actually exposed to the influence of missions. We are also averaging influence at the territory level, thereby introducing noise in the measures of women's exposure and leading to some attenuation in the estimated coefficients.

To further investigate the impact of missions on fertility, we estimate the impact of exposure on childlessness and on the fertility of women who have at least one child (Tables A.4 and A.5, online appendix). Proximity to Catholics nuns does not have a significant effect on childlessness, while proximity to Protestant missions tends to slightly increase it. The Catholic missions without nuns (coefficients on ExpCatholics-All) do not have a significant impact on this dimension. If we use exposure at age 6, none of the

[32] When distance d is halved, the change in $[-ln(d)]$, which is our measure of exposure in panel C, is $[-ln(d)] - [-ln(\frac{d}{2})] = ln(2) \simeq 0.693$. We thus multiply the coefficient in panel C by $ln(2)$ to obtain the effects of halving the distance.

coefficients are significantly different from zero (Table A.6, online appendix). The results on the fertility of women with at least one child are similar to those introduced above (see Tables A.5 and A.7, online appendix). This suggests that the overall impact of missions is not driven by the overcoming of primary infertility.

We now turn to the impact of missions on age at first birth and birth intervals. Table 2 reports these results.[33] Women who grew up closer to Catholic nuns are younger by several months when they have their first child, and the opposite holds for Protestants (the coefficients are significant only in the log specification in panel C). When we include all births, we find no effect of missions on child spacing, but when we focus on the first two births (thereby avoiding giving larger weight to larger families that generate more observations), we find a positive and significant effect of Protestant missions (column 3). Women who grew up closer to a Protestant mission have modestly larger birth intervals, having their second child 1.2 months later if the distance is halved (panel C).[34]

The impact of missions on infant mortality is reported in Table 3. Infant mortality appears generally lower for children whose mothers grew up closer to a Protestant mission, and the effect is often large – halving the distance by 100 km to either type of mission reduces mortality by 17 per thousand for children of mothers above age 35 (panel C).[35] Catholic nuns also appear to decrease child mortality, yet the estimated coefficient is rarely significant. The effect of other Catholic missions seems to go in the other direction. These effects are quite different if we use exposure at age 6 instead (Table A.9, online appendix). In this case, the estimated coefficients are much smaller and never statistically significant. Given this sensibility of the results to the definition of the exposure threshold, we do not want to draw strong conclusions on the impacts of missions on infant mortality.

Finally, we investigate the impact of exposure to missions in childhood on adult weight, an indicator of adult health. Results are reported in Table 4. We find that exposure to Protestant missions is positively correlated with a women's weight (panel C results suggest that halving the distance is associated with an additional 1.5 kg), while the coefficients on exposure to Catholic missions are never significantly different from zero.[36] This suggests

[33]The results are similar if we use exposure at 6, yet slightly less significant (Table A.8).

[34]When distance d is halved, the change in $[-ln(d)]$, which is our measure of exposure in panel C, is $[-ln(d)] - [-ln(\frac{d}{2})] = ln(2) \simeq 0.693$. We thus multiply the coefficient in panel C by $ln(2)$ to obtain the effects of halving the distance.

[35]When distance d is halved, the change in $[-ln(d)]$, which is our measure of exposure in panel C, is $[-ln(d)] - [-ln(\frac{d}{2})] = ln(2) \simeq 0.693$. We thus multiply the coefficient in panel C by $ln(2)$ to obtain the effects of halving the distance.

[36]The sample size is much smaller in these estimations because the question about weight was part of

that women who grew up closer to Protestant missions are in better health in the 1970s.

4.4 Empirical results: Uncovering the effects of Catholic nuns

In this section, we explore whether different types of missionary activities are associated with different fertility patterns. As explained above, this information is available for Catholic missions only. Diversity in activities is also a characteristic of posts with nuns. Catholic missions with only male missionaries focused on evangelizing and on boys' education. As mentioned above, Catholic orders systematically turned to female missionaries for any health care or girls' education activities.

We construct the following categories of activities (grouping the most common activities): general health, women and children health, housekeeping schools and workrooms. The results are reported in Table 5. The excluded category is general health because almost all missions with nuns are active in this area. One activity stands out with robust effects on fertility: housekeeping schools. The closer women grew up to a housekeeping school, the more children they have. Halving the distance is associated with 0.15 more children at age 40 (panel C). Similar (and even stronger) results are obtained if we use exposure at age 6 (Table A.10, online appendix).

4.5 Threats to identification: Endogeneity of new post installation, and selective migration

In this section we provide some evidence in favor of our identifying assumptions, as described in Section 4.2.

Endogenous timing of post installation Historical accounts of the deployment of Catholic and Protestant posts suggest that both religions had similar strategies regarding their occupation of the country (Markowitz, 1973). We found no evidence that would give credit to the idea that Catholic nuns settled precisely in areas where fertility would increase in the near future, while Protestants settled precisely where fertility would decrease.[37] A descriptive comparison of the characteristics of the locations of new Catholic, Catholic with nuns, and Protestant posts by decade is provided in the online appendix

the budgetary survey applied to only a subsample of respondents.

[37]Missions of a given religion first sought to be present in as many regions, districts, and territories as possible. Once present in a given area, they organized their expansion with the same hope to cover the area as extensively as possible (Markowitz, 1973). While many congregations and societies were active in the Congo, there was coordination between congregations for the Catholics and between societies for the Protestants and a great deal of competition between religions to avoid leaving large areas under the domination of the other religion.

(Table A.12), using the historical controls introduced in Section A.1.4. While for some decades, some of the characteristics are significantly different across types of mission, we find no systematic differences that would lend support to the idea that Catholic nuns systematically settled in better environments (recall that, in any case, these differences are largely absorbed by our territory fixed effects).

To more formally test for the parallel trend assumption, we use two strategies to investigate whether places where (different types of) missions settled were on different fertility trends. First, using the individual level data from the 1970s, we verify that the opening of new posts is not correlated with fertility levels at the time of opening. Specifically, we construct measures of exposure at age 25 and estimate whether they are correlated with fertility at the same age.[38] Results are reported in Table 6, column 1 and are reassuring. Most point estimates are small, and none is statistically significant. Second, we check that the fertility of the two eldest cohorts in the 1950s data (ages 45–55 and older than age 55) does not correlate with the installation of missions when they were too old to be affected, by using the same controls as in Equation (2). In practice, we compute exposure at age 38 and add it to our previous estimations to measure the installation of missions when women had (almost) completed their fertility.[39] Results are presented in Table 6, column 2. Exposure to missions at age 38 is uncorrelated with women's fertility, again suggesting that we cannot reject the parallel trend assumption.

Finally, we confirm that our point estimates are not affected by the inclusion of time-variant control variables that proxy for changes in local economic conditions. These controls would decrease the size and significance of our point estimates if we are confounding the effects of missions with the effects of these underlying changes. In fact, our estimates are only moderately affected by the inclusion of these controls, and if anything, the sizes of estimated coefficients on exposure to Catholic nuns or Protestant missionaries are slightly larger (see Table A.11, online appendix)

Selective urban migration Does selective migration account for the correlation between the fertility of urban women in the 1970s and missionary presence in their place of birth? To verify that this is not the case, we estimate the impact of missions using the

[38] We use exposure (and fertility) at age 25 and not at a later age to guarantee that we have enough observations. Women who were 25 in 1948 (the last year for which we observe post openings) were 50 or older in the 1970s sample, and there are only 2,606 of them.

[39] We use age 38 because the youngest women in the 45–54 cohort of the 1950s data were 38 in 1948, the last year at which we measure exposure.

1950s data, which is less granular but representative of both urban and rural areas. The results confirm the positive overall effect of Catholic nuns (especially when they operate housekeeping schools) on fertility and the negative effect of Protestants (see Table A.13, online appendix).[40]

Our second strategy to verify that the women surveyed in the 1970s in a city are similar to their rural counterparts is to build a counter-factual population of the territory in the 1950s using the 1970s data, as detailed in Section 4.2.2, to confirm that the women surveyed in the 1970s had similar fertility behavior as the general population of their territories in the 1950s. The coefficient estimates across the two samples are similar (see Table A.14, online appendix.[41]

5 Discussion of mechanisms in light of historians' contributions

We draw two main conclusions from our analysis. First, Catholic female missionaries appear to have successfully fulfilled the colonial state's expectations regarding their role in encouraging higher birth rates. Second, Protestant missionaries, largely independent of the state, have a diametrically opposite effect on fertility. Understanding the mechanisms behind these contrasted impacts is complex, yet combining our empirical results with historical evidence suggests partial answers that we develop below.

The first important point is that missions' activities directly targeted toward women seem of foremost importance for the observed change in fertility. Indeed, Catholic missions who did not organize these activities (those without nuns) have no impact on women's fertility (at least when focusing on the analysis of individual records from the 1970s).[42] This suggests that the conversion channel alone cannot account for the impact on fertility. Otherwise, we would have expected male missionaries (who focused on conversion and

[40] While point estimates are not always significant (the power of the estimation is much reduced by the age category aggregation), the coefficients on Catholic nuns and Protestant are significantly different from each other in all but one estimation. The coefficients are also similar in size to those obtained with the 1970s data.

[41] A formal test of the equality of the coefficients allows us to accept the null hypothesis of equality of the coefficients between the two data sets at standard levels of significance (results upon request). The similarity between the two estimations also suggests that the aggregations at the cohort $\times$ territory level are likely to drive the differences between the results obtained on the sample of individual records from the 1970s and the results obtained on the sample of cohort aggregates in the 1950s.

[42] The dichotomy between missions with and without female missionaries is irrelevant for the Protestants. Protestant missions hosted both male and female missionaries and engaged from the beginning in activities for women (and, in fact, welcomed girls together with boys in primary schools).

male education) to also lead to a decrease in fertility.

Now turning to the specific missionary works targeted at women, both health interventions and the promotion of the reproductive role of women by nuns (through education, for example) could contribute to the positive impact of nuns on fertility. We discuss the relevance of these channels and then turn to the contrasted impact of Protestant missionaries.

Could general improvements in women's health alone explain the positive effect of Catholic nuns on fertility (and the contrast with Protestants)? Several elements suggest that this is unlikely. First, historical evidence suggests that health interventions of Catholic missions were not of higher quality than those of the Protestants. While Protestant missions had more qualified personnel and started to run dispensaries and hospitals before the Catholics, [43] we cannot rule out that the activities of the average Catholic mission were of wider scale, given the easier access to state subsidies.[44] Furthermore, women who grew up closer to Catholic nuns do not enjoy larger weights in the 1970s (contrary to those who grew up closer to Protestants). To the extent that weight at that time is positively correlated with health, it is additional evidence against a pure general health channel. Finally, when we distinguish between the type of activities Catholic nuns engaged in, we do not find any positive correlation between health facilities and fertility.

Could nuns have modified women's demand for children through the promotion of conservative gender roles? Education in Catholic mission schools was not intended to train women to become successful professionals.[45] Education programs established by the state and Catholic religious precepts converged in promoting the image of women entirely dedicated to their children and husbands, and as submissive to their husbands.[46] Analyses of program contents by historians (Depaepe and Lembagusala Kikumbi (2018); Lauro

[43] Detailed archival work for several missionary societies and congregations in neighboring Rwanda – a country also under Belgian rule where health programs and missionary implementations followed the same dynamics as in the Congo – reveals that, in the interwar period, 52% of female Protestant missionaries were trained as nurses or medical doctors against 15% of Catholic female missionaries. No Catholic nun held a medical doctor degree (Cornet, 2014).

[44] It is difficult to find comparable figures for medical actions of Protestant versus Catholic missions. In contrast to aggregate statistics produced episodically for Protestant missions, Catholic yearbooks do not report systematic information on medical consultations, number of treated individuals, the qualification of the personal, the number of hospital beds, etc.

[45] It is not until the end of the colonial period that some programs were designed to train female school teachers and nurses.

[46] As late as 1952, the state's official text defining school organization in the colony states the necessity to "*design a girls' education program that trains good wives and good mothers and that does not neglect practical branches such as gardening, cooking, washing, ironing, sewing, child care, hygiene, and housekeeping*" (Service de l'enseignement, 1952), own translation.

(2020)) confirm that women's education focused on practical subjects and encouraged them to concentrate on their reproductive roles. The embedding of these prescriptions in religious and formal education contributed to increasing their legitimacy in the eyes of the targeted population. The historian Likaka (2006) writes in this regard, "*Catholic missionaries created schools, which they transformed into vehicles of cultural change to influence sexual behaviors of younger generations. [...] From mission stations, the 'pro-natal' discourse extended into local communities. In reality, this treaty had more far-reaching consequences in transforming sexual behavior and the ideologies of biological reproduction because of missionaries' control over schooling than the polygyny-taxation.*" Our empirical results suggest that missions that host housekeeping schools have the strongest impact on fertility. In other words, it is where missionaries invested the most in girls' education that fertility increased the most. This finding is consistent with an increase in demand for children for women who were in contact with Catholic missionary education activities.

Both health and education interventions may also have modified infant care, in particular breastfeeding practices, thereby, indirectly, influencing fertility. As detailed in Section 2.1, colonial authorities believed that an important factor contributing to low natality was the duration of breastfeeding periods. They were deemed excessive, especially given that it was accompanied by sexual abstinence. Mother and infant consultation programs were to promote appropriate diversification of infants' diet and a reduced reliance on mother's milk, with the hope of reducing birth spacing. Appropriate infant and child nutrition was also part of the girls' school program. It is difficult to assess how effective these attempts to change infant and child nutrition practices have been. However, it seems that birth spacing has not been dramatically reduced. Our empirical results show no significant impact of Catholic nuns on birth spacing (and an increase in birth spacing for women who grew up closer to Protestant missions).

Turning to the differential impact of Protestants on fertility, the discussion on the expected impacts of missionary works on fertility identifies two channels for an overall decrease in fertility: education (if it increases labour opportunities) and the development of missionary labour opportunities. The possibility also exists that Protestant missionaries promoted a slightly different ideal of a Christian woman. Historical evidence provides some support for all three elements. First, girls education may have been less focused on teaching practical traditionally "female" skills, if only because primary schools were

mixed (Depaepe and Lembagusala Kikumbi, 2018; Yates, 1982). Second, Protestants may have relied more intensively on indigenous labour to perform tasks that required some qualification, such as medical care.[47] There is also evidence that Protestant missionaries promoted the idea that Christian women should be leaders in their communities and contribute to actively spreading the faith, thereby giving women roles outside of their households (Richards, 2017). Third, the general description of the ideal " Christian marriage" by Protestant missionaries may have been subtly different to that of the Catholics. Indeed, there is much insistence on marriage being centered on the couple and on love between husbands and wives (Congo Missionary Conference, 1918; Richards, 2017, pp. 69–71). Protestant female missionaries were also women who considered marriage or were married (and often had children). They were examples of well-educated women who could choose to get married (or not) and who could successfully combine a career and children. Finally, female missionary views on the roles of women were likely more progressive among the Protestants simply because many Protestant missionaries came from England and Sweden where women's relative status was higher than in Catholic Belgium. In fact, in several missionary societies, leadership positions could be occupied by women. This was unthinkable in Catholic orders, where religious women were always formally under the authority of religious men (Cornet, 2014).

6 Mission locations and fertility today

Finding a strong influence of colonial pro-birth policies on fertility behavior raises the question of the long-term consequences of these policies in light of the delayed demographic transition in the Democratic Republic of the Congo. It is beyond the scope of this paper to provide an answer to this question. It would require a detailed investigation into family planning policies and their implementation after the colonial period. Yet, our data on missions, combined with recent waves of the DHS allows us to take a modest first step in this direction, by comparing the fertility of women who live today in the vicinity of former missions to that of women living further away.

There are important shortcomings to this investigation of the correlation between former missionary presence and present-day outcomes. First, we observe new posts open-

[47] Cornet (2014) argues that the Anglican Church Missionary Society based much of its medical work in Rwanda on local personnel, both male and female, and was the only group to put local employees in charge of dispensaries without being formally supervised by a European missionary.

ing until 1948, yet missionary presence further increased between 1948 and independence (1960). This was the case, in particular, for Catholic female missionaries who migrated in large numbers from Belgium to the Congo during the last decade of the colonial period, settling in more and more Catholic posts. Second, the country has gone through multiple conflicts and vast turmoil leading to massive displacements of population, and it is not clear to what extent the descendants of populations exposed to missions are still living close to former mission posts (especially in eastern provinces). Finally, as the country moved from pro-birth to family planning policies, it is not clear that the influence of colonial policies would be stronger where they were first implemented. Suppose that i) pro-birth programs gradually reached more distant places as missions sought to extend their influence as far away as possible from their post, ii) family planning programs that replaced pro-birth policies after the colonial period used existing health infrastructures (including former missionary hospitals), and iii) family planning programs were less effective in reaching population distant from these infrastructures than former missionary activities. In this case, the traces of the influence of colonial policies may be stronger further away from former missions.

With these caveats in mind, we estimate the following equation on the pooled cross-section of the 2007 and 2013-14 waves of the DHS :

$$\begin{aligned} Y_{i,t,c} = \alpha_0 + \alpha_1 \text{ ExpCatholics-Nuns}_{i,1948,c} + \alpha_2 \text{ ExpProtestants}_{i,1948,c} \\ + \alpha_3 \text{ ExpCatholics-All}_{i,1948,c} \\ + \alpha_4\, t + \alpha_5\, t^2 + X_c'\alpha_6 + \epsilon_i \quad (3) \end{aligned}$$

where $Y_{i,t,c}$ is the fertility outcome for woman i, aged t, and surveyed in DHS cluster c. $\text{ExpCatholics-Nuns}_{i,1948,c}$, $\text{ExpProtestants}_{i,1948,c}$, and $\text{ExpCatholics-All}_{i,1948,c}$ capture the proximity of the DHS cluster GPS coordinates and the nearest missionary post of each type in 1948. The vector X_c includes cluster-level historical control (the same as those used in the historical analysis), as well as district fixed effects. Errors are clustered at the DHS cluster level.

We investigate fertility at different ages (30, 35, and 40). We also run regression where we distinguish by type of work performed in missions where nuns were present. In particular, we add to the regression distance to posts with workrooms and housekeeping

schools (health activities are included in the overall "distance to nuns", as nearly all posts had these activities by 1948). Finally, to check whether former missions appear to influence todays' religious practices, we also run similar regressions on respondent's declared religion and confirm that individuals living today closer to a former mission are more likely to practice the religion of that mission (Table A.15, online appendix).

Table 7 reports the results of the regressions on fertility at different ages corresponding to Equation 3. The sample size decreases steeply with age from 9,800 observations for fertility at age 30 to only 3,725 for fertility at age 40. We are therefore more confident in the results for fertility at age 30 and 35. Overall, there is a negative correlation between proximity to former missions with nuns and fertility, and the correlation is significant with log distance for fertility at age 30 (column 1, panel B). Once distinguish by the type of activity conducted in 1948 in those posts, a striking contrast emerges. Proximity to posts that hosted a housekeeping school is associated with *higher* fertility today : halving the distance is associated with 0.05 more children at age 30 and 0.07 at age 35. Regarding proximity to Protestant missions, in line with the results on the historical data, proximity to a former Protestant mission tends to be negatively correlated with fertility (significant at age 30 with log distance).

In short, while the correlation between fertility today and proximity to housekeeping schools (or Protestant missions) is in line with the results on historical data, the correlation between fertility today and proximity with historical posts with nuns is not : closer to former posts, women tend to have fewer children. We may cautiously interpret the results on housekeeping schools as suggestive of a possible persistence of past missionary influence, yet attributing these correlations to the long-term impacts of missions is problematic for the reasons highlighted above. Regarding the negative correlation between the proximity to historical Catholic missions with nuns and fertility today, if asked to offer a tentative explanation, we would argue that there may be continuity in the location of health facilities so that health centers historically involved in maternal health (and thus first managed by Catholic nuns) remain more likely to offer these types of services. This implies that as public policies moved toward family planning in the late 1970s and 1980s, they implemented first in these places.[48] Lordemus (2021) analyses the correlation

[48]One may still have expected that when run by Catholics, health centers would be more reluctant to deliver modern contraceptives, leading to a negative relationship between fertility and the distance to Catholic posts (see, for example, Wulf (1985) on the resistance of the Catholic church in the DRC toward family planning programs). Yet, some scholars have argued that the resistance of the Catholic church

between hospital performance in the DRC today and their colonial origin and shows that hospitals built during the colonial era attract significantly more public funding today than those built after independence (controlling for a large set of covariates and regardless of the hospitals' religious denominations), in line with the idea of persistence in the location of health services.

7 Conclusion

Our results reveal that missions have been efficient at changing behaviors related to fertility, an aspect of life that is typically regarded as deeply culturally embedded (Fernandez and Fogli, 2009). The growing field of the economics of religion provides numerous examples of how religion influences attitudes, preferences, and behaviors (Iyer, 2016). A stark example is provided by Schulz (2020) who shows that the influence of the Catholic church was decisive for the ban of kin marriages in medieval Europe (in line with the arguments developed by Goody and Goody, 1983). Appealing to supernatural forces remains a powerful vector of change for family-related behavior in today's world. Bassi and Rasul (2017) highlight the remarkable powers of persuasion of the Catholic pope. Pope John Paul II's discourses against birth control during his visit to Brazil in 1991 translated into higher fertility in the country.

Our analysis raises the question of the legacies of colonial pro-birth policies on demographic dynamics after the colonial period. We took only a (very) modest step in this direction by investigating the correlation between former mission locations and fertility in the 2000s. We do not find that women have higher fertility in the vicinity of former Catholic missions with nuns.[49] Further research is needed to understand the origins of the twentieth century population growth in the country and why the demographic transition has been extremely slow in the DRC and slower than in neighbouring countries (Shapiro et al., 2017).

From a broader perspective, our paper contributes to the debate on the onset of population growth in sub-Saharan Africa. While classic theories of demographic transition suggest that population started to grow because mortality decreased in environments characterized by high natural birth rates (Caldwell, 2016; Iliffe, 2017), several contributions by demographers underline the possible role of increases in fertility under the influence

toward family planning programs was not as strong in the DRC as in other countries.

[49] Yet, the former presence of these missions appears negatively correlated with the breastfeeding of infants.

of various colonial policies (see, for example, Dawson 1987; Koponen 1986 and the review of the debate by Walters (2021)). In parallel, a recent literature questions the premise of the absence of birth control before the advance of modern family planning. For example, Drixler (2013) argues that several societies in the past exhibited " low reproductivity" regimes.[50] There are limited quantitative evaluations of the impact of colonial policies aimed at modifying fertility (one important exception is Canning et al., 2020, who compare present-day fertility regimes by colonial origin). Our paper makes an important contribution to showing that, in the Congo, colonial powers were remarkably successful at stimulating fertility among women directly exposed to pro-birth policies.

[50]Particularly relevant to our study, his analysis of nineteenth century eastern Japan describes a "reverse fertility transition" among a population that practiced birth control (through withdrawal and infanticide) and raised so few children that it did not replace itself. Governments were instrumental in changing the regime,offering to pay their subjects to have more children and aiming to change preferences regarding birth. Drixler argues that parents who practiced infanticide saw themselves as responsible parents toward their living children and governments tried to modify this perception by calling infanticide " murder".

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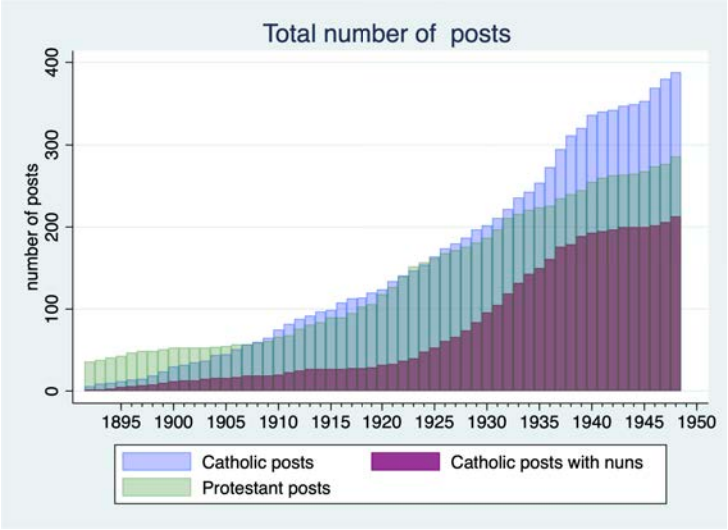
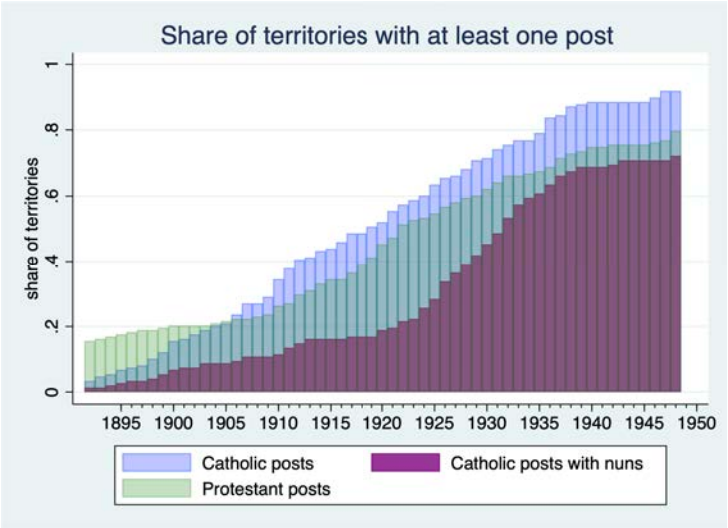
8 Figures and Tables

Figure 2: Opening of missionary posts, by religious affiliation



(a) Number of posts by year



(b) Share of territories with at least one post

Data: Multiple historical and archival sources described in Section 3.2.

Table 1: Total number of births at different ages
Missionary exposure measured at birth

	Age 35	Age 40	Age 45
	(1)	*(2)*	*(3)*
Panel A: Any post in district (0/1)			
ExpCatholics - Nuns (CN)	0.214**	0.145	0.349**
	(0.108)	(0.133)	(0.155)
ExpProtestants (P)	−0.260**	−0.290**	−0.251
	(0.131)	(0.138)	(0.159)
ExpCatholics - All (C)	−0.012	0.076	0.085
	(0.158)	(0.162)	(0.174)
Adjusted R2	0.13	0.13	0.12
pvalue(CN = P)	0.002	0.010	0.007
Panel B: Proximity to post - Linear measure			
ExpCatholics - Nuns (CN)	0.190*	0.194**	0.231***
	(0.112)	(0.086)	(0.085)
ExpProtestants (P)	−0.152	−0.165	−0.217*
	(0.111)	(0.106)	(0.128)
ExpCatholics - All (C)	−0.119	−0.003	0.014
	(0.177)	(0.208)	(0.209)
Adjusted R2	0.13	0.13	0.12
pvalue(CN = P)	0.042	0.010	0.003
Panel C: Proximity to post - Log measure			
ExpCatholics - Nuns (CN)	0.234*	0.217**	0.373***
	(0.121)	(0.104)	(0.106)
ExpProtestants (P)	−0.224**	−0.138	−0.250*
	(0.105)	(0.117)	(0.140)
ExpCatholics - All (C)	−0.059	−0.039	0.072
	(0.129)	(0.159)	(0.169)
Adjusted R2	0.13	0.13	0.12
pvalue(CN = P)	0.005	0.024	0.001
Controls	*Yes*	*Yes*	*Yes*
Territory FE	*Yes*	*Yes*	*Yes*
Mean of dep. variable	5.40	5.96	5.98
N	15752	9941	6354

Data: Demographic survey collected in the 1970s in seven major cities in Zaire (see Section 3.1.1). Sample: women aged 35 or older (column 1), 40 or older (column 2) and 45 or older (column 3). OLS regression. Dep variables : number of births a women had before age 35 (column 1), 40 (column 2) and 45 (column 3). ExpCatholics-Nuns, ExpProtestants and ExpCatholics-All are extensively described in Section 3.2. Panel A : whether there is at least one missionary post in territory g. Panels B and C : measures of territory-level proximity to posts (measured as minus the average distance to missionary posts. The unit is 100 km). Panel C includes the log transformation of this measure. All exposure variables are measured at birth. Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area and a quadratic year-of-birth trend. All regressions include territory fixed-effects.
Standard errors, in (), are clustered at the territory level.
* p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01.

Table 2: Age at first birth and birth intervals
Exposure measured at birth

	Age at first birth	Birth intervals	
		All births	Btw. 1st and 2nd births
	(1)	*(2)*	*(3)*
Panel A: Any post in district (0/1)			
ExpCatholics - Nuns	−0.691***	−0.273	−0.685
	(0.206)	(0.365)	(0.880)
ExpProtestants	0.211	0.540	1.040
	(0.330)	(0.420)	(0.910)
ExpCatholics - All	0.099	−0.165	−0.481
	(0.384)	(0.516)	(1.342)
Adjusted R2	0.09	0.02	0.02
pvalue(CN = P)	0.011	0.223	0.257
Panel B: Proximity to post - Linear measure			
ExpCatholics - Nuns	−0.373	0.215	0.723
	(0.300)	(0.396)	(0.870)
ExpProtestants	0.118	0.378	1.947**
	(0.281)	(0.376)	(0.956)
ExpCatholics - All	0.079	−0.380	−1.936
	(0.489)	(0.613)	(1.772)
Adjusted R2	0.09	0.02	0.02
pvalue(CN = P)	0.225	0.339	0.084
Panel C: Proximity to post - Log measure			
ExpCatholics - Nuns	−0.644**	0.040	−0.445
	(0.268)	(0.448)	(1.024)
ExpProtestants	0.496**	0.221	1.766**
	(0.245)	(0.406)	(0.800)
ExpCatholics - All	−0.335	0.103	−1.493
	(0.366)	(0.491)	(1.313)
Adjusted R2	0.09	0.02	0.02
pvalue(CN = P)	0.002	0.869	0.069
Controls	*Yes*	*Yes*	*Yes*
Territory FE	*Yes*	*Yes*	*Yes*
Mean of dep. variable	19.36	30.81	32.09
N	27699	125524	25760

Data: Demographic survey collected in the 1970s in seven major cities in Zaire (see Section 3.1.1). Sample: women aged 25 or older. (column 1) and women aged 25 or older who gave birth at least twice (columns 2 and 3). OLS regression. Dep variables : age at first child (column 1), birth intervals in months for all births the woman ever had (column 2), and restricted to the first and second births only (column 3). ExpCatholics-Nuns, ExpProtestants and ExpCatholics-All are extensively described in Section 3.2. Panel A : whether there is at least one missionary post in territory g. Panels B and C: measures of territory-level proximity to posts (measured as minus the average distance to missionary posts. The unit is 100 km). Panel C includes the log transformation of this measure. All exposure variables are measured at birth. Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area and a quadratic year-of-birth trend. In Column 2, we also include birth-order dummy variables. All regressions include territory fixed-effects.

Standard errors, in (), are clustered at the territory level.

* p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01.

Table 3: Infant mortality
Exposure measured at birth

	Age 35	Age 40	Age 45
	(1)	*(2)*	*(3)*
Panel A: Any post in district (0/1)			
ExpCatholics - Nuns (CN)	−3.159	−3.428	−2.603
	(7.269)	(8.250)	(10.626)
ExpProtestants (P)	−21.918**	−33.293***	−29.300**
	(10.137)	(11.536)	(11.422)
ExpCatholics - All (C)	5.148	6.995	3.968
	(11.459)	(10.683)	(10.590)
Adjusted R2	0.02	0.02	0.02
pvalue(CN = P)	0.177	0.059	0.121
Panel B: Proximity to post - Linear measure			
ExpCatholics - Nuns (CN)	−21.307***	−19.769***	−17.742**
	(7.937)	(7.546)	(7.666)
ExpProtestants (P)	−21.078***	−21.528***	−16.333**
	(7.516)	(6.883)	(7.605)
ExpCatholics - All (C)	47.849***	32.221*	27.537
	(17.285)	(18.800)	(18.980)
Adjusted R2	0.02	0.02	0.02
pvalue(CN = P)	0.984	0.881	0.911
Panel C: Proximity to post - Log measure			
ExpCatholics - Nuns (CN)	−14.907	−13.580	−13.299
	(10.327)	(10.149)	(10.605)
ExpProtestants (P)	−24.809***	−33.414***	−29.233***
	(9.063)	(9.789)	(9.662)
ExpCatholics - All (C)	21.941*	16.297	18.298
	(11.896)	(12.686)	(14.314)
Adjusted R2	0.02	0.02	0.02
pvalue(CN = P)	0.492	0.184	0.295
Controls	*Yes*	*Yes*	*Yes*
Territory FE	*Yes*	*Yes*	*Yes*
Mean of dep. variable	93.69	102.57	112.09
N	84101	58440	37344

Data: Demographic survey collected in the 1970s in seven major cities in Zaire (see Section 3.1.1). Sample: women aged 35 or older (column 1), 40 or older (column 2) and 45 or older (column 3). OLS regression. Dep variable : Dummy equal to 1 if the child died before age 1. This variable is multiplied by 1000 to ease the reading of the coefficients. ExpCatholics-Nuns, ExpProtestants and ExpCatholics-All are extensively described in Section 3.2. Panel A : whether there is at least one missionary post in territory g. Panels B and C: measures of territory-level proximity to posts (measured as minus the average distance to missionary posts. The unit is 100 km). Panel C includes the log transformation of this measure. All exposure variables are measured at birth. Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area and a quadratic year-of-birth trend. All regressions include territory fixed-effects.

Standard errors, in (), are clustered at the territory level.

* p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01.

Table 4: Women's weight
Exposure measured at birth

	All households	Households with one adult woman only
	(1)	*(2)*
Panel A: Any post in district (0/1)		
ExpCatholics - Nuns (CN)	−0.010	−0.445
	(1.358)	(1.367)
ExpProtestants (P)	4.519	3.457
	(3.151)	(3.201)
ExpCatholics - All (C)	0.940	1.784
	(2.489)	(2.606)
Adjusted R2	0.12	0.13
pvalue(CN = P)	0.215	0.278
Panel B: Proximity to post - Linear measure		
ExpCatholics - Nuns (CN)	0.121	0.016
	(0.735)	(0.819)
ExpProtestants (P)	3.533***	3.127*
	(1.292)	(1.575)
ExpCatholics - All (C)	−3.022	−0.497
	(2.468)	(2.943)
Adjusted R2	0.12	0.13
pvalue(CN = P)	0.050	0.121
Panel C: Proximity to post - Log measure		
ExpCatholics - Nuns (CN)	0.025	−0.237
	(1.025)	(0.975)
ExpProtestants (P)	3.928**	3.407*
	(1.516)	(1.860)
ExpCatholics - All (C)	−0.040	0.914
	(2.160)	(2.434)
Adjusted R2	0.12	0.13
pvalue(CN = P)	0.061	0.123
Controls	*Yes*	*Yes*
Territory FE	*Yes*	*Yes*
Mean of dep. variable	57.48	57.48
N	1067	775

Data: Budgetary survey collected in the 1970s in seven major cities in Zaire (see Section 3.1.1). Sample: all households where at least one woman over 25 resides (column 1), households where only one woman over 25 resides (column 2). OLS regression. Dep variable: woman's weight in kg. ExpCatholics-Nuns, ExpProtestants and ExpCatholics-All are extensively described in Section 3.2. Panel A : whether there is at least one missionary post in territory g. Panels B and C: measures of territory-level proximity to posts (measured as minus the average distance to missionary posts. The unit is 100 km). Panel C includes the log transformation of this measure. All exposure variables are measured at birth. Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area and a quadratic year-of-birth trend. All regressions include territory fixed-effects.

Standard errors, in (), are clustered at the territory level.

* p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01.

Table 5: Fertility levels at different ages and missionary activities targeting women and their children
Exposure measured at birth

	Age 35	Age 40	Age 45
	(1)	*(2)*	*(3)*
Panel A: Proximity to post - Linear measure			
ExpCatholics - Nuns	0.063	0.034	0.092
	(0.110)	(0.091)	(0.100)
ExpCatholics - Nuns - Workrooms	−0.071**	−0.083**	−0.012
	(0.028)	(0.039)	(0.039)
ExpCatholics - Nuns - Housekeeping school and workshops	0.144***	0.168***	0.141***
	(0.035)	(0.042)	(0.046)
ExpCatholics - Nuns - Women health activities	0.044**	0.020	−0.013
	(0.021)	(0.025)	(0.028)
ExpProtestants	−0.232**	−0.190	−0.163
	(0.112)	(0.130)	(0.154)
ExpCatholics - All	−0.080	0.021	0.008
	(0.173)	(0.207)	(0.209)
Adjusted R2	0.13	0.13	0.12
Panel B: Proximity to post - Log measure			
ExpCatholics - Nuns	0.100	0.046	0.202
	(0.135)	(0.121)	(0.137)
ExpCatholics - Nuns - Workrooms	−0.077*	−0.114	0.096
	(0.045)	(0.079)	(0.071)
ExpCatholics - Nuns - Housekeeping school and workshops	0.129**	0.218***	0.233**
	(0.060)	(0.081)	(0.092)
ExpCatholics - Nuns - Women health activities	0.138**	0.022	−0.078
	(0.059)	(0.054)	(0.065)
ExpProtestants	−0.298**	−0.140	−0.195
	(0.124)	(0.129)	(0.161)
ExpCatholics - All	−0.035	−0.035	0.050
	(0.130)	(0.157)	(0.176)
Adjusted R2	0.13	0.13	0.12
Controls	*Yes*	*Yes*	*Yes*
Territory FE	*Yes*	*Yes*	*Yes*
Mean of dep. variable	5.40	5.96	5.98
N	15752	9941	6354

Data: Demographic survey collected in the 1970s in seven major cities in Zaire (see Section 3.1.1). Sample: women aged 35 or older (column 1), 40 or older (column 2) and 45 or older (column 3). OLS regression. Dep variables: number of births a women had before age 35 (column 1), 40 (column 2) and 45 (column 3). ExpCatholics-Nuns, ExpProtestants and ExpCatholics-All are extensively described in Section 3.2. Definitions of Catholic activities can be found in section A.1.2 in the online appendix. Panel A : whether there is at least one missionary post in territory g. Panels B and C: measures of territory-level proximity to posts (measured as minus the average distance to missionary posts. The unit is 100 km). Panel C includes the log transformation of this measure. All exposure variables are measured at birth. Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area and a quadratic year-of-birth trend. All regressions include territory fixed-effects.
Standard errors, in (), are clustered at the territory level.
* p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01.

Table 6: Parallel trend test: fertility and late exposure in both data sets

	Age 25 Exp at 25 Data 70s *(2)*	Age 45+ Exp at 38 Data 50s *(1)*
Panel A: Any post in district (0/1)		
ExpCatholics - Nuns (CN)	−0.075	
	(0.248)	
ExpProtestants (P)	−0.003	
	(0.160)	
ExpCatholics - All (C)	−0.134	
	(0.344)	
Adjusted R2	0.07	
Panel B: Proximity to post - Linear measure		
ExpCatholics - Nuns (CN)	0.052	0.725
	(0.372)	(0.459)
ExpProtestants (P)	0.163	−0.377
	(0.331)	(0.511)
ExpCatholics - All (C)	0.113	−0.068
	(0.577)	(0.777)
Adjusted R2		0.07
Panel C: Proximity to post - Log measure		
ExpCatholics - Nuns (CN)	−0.149	0.389
	(0.247)	(0.325)
ExpProtestants (P)	0.007	0.062
	(0.143)	(0.296)
ExpCatholics - All (C)	−0.079	−0.353
	(0.154)	(0.464)
Adjusted R2	0.07	
Unit of obs	*Individual*	*Group*
Individual Controls	*Yes*	*Yes*
Territory Controls	*No*	*Yes*
Fixed effect	*Territory*	*District*
N	2606	216

Data for Column 1: Demographic survey collected in the 1970s in seven major cities in Zaire (see Section 3.1.1). Data for Column 2: Demographic survey collected in the 1950s. Sample: women aged 25 or older (column 1), 45 or older (column 2). OLS regression. Dep variables: number of births a women had before age 25 (column 1), 45 (column 2). ExpCatholics-Nuns, ExpProtestants and ExpCatholics-All are extensively described in Section 3.2. Panel A: whether there is at least one missionary post in territory g. Panels B and C: measures of territory-level proximity to posts (measured as minus the average distance to missionary posts. The unit is 100 km). Panel C includes the log transformation of this measure. Exposure is measured at 25 in Column 1 and at 38 in Column 2 (we use 38 as the youngest in the cohort 45+ in this survey were 38 in 1948, the last year at which we can measure exposure. Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area and a quadratic year-of-birth trend, and the following territory controls for Column 2: pre-colonial explorer route, latitude, longitude and their product, distance to coast, average elevation and ruggedness, population density in 1900 and area suitable for agriculture in 1900, the Tsetse Suitability Index, an historical malaria index, the exposure to slave trade, the presence of a colonial railroad in 1911, the average distance to Catholic and Protestant missions in 1886, territory area, and access to a navigable river.
Standard errors, in (), are clustered at the territory level.
* p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01.

Table 7: Fertility in the 2000s and missionary presence in 1948 (comparing Catholic and Protestant missions)

	(1) Age 30	*(2)* Age 35	*(3)* Age 40	*(4)* Age 30	*(5)* Age 35	*(6)* Age 40
Panel A: Linear distance						
ExpCatholics-Nuns	−0.179	−0.243	0.039	−0.483***	−0.620***	−0.287
	(0.122)	(0.158)	(0.215)	(0.155)	(0.219)	(0.308)
ExpCatholics-Nuns-Workrooms				0.009	0.029	0.130
				(0.072)	(0.102)	(0.136)
ExpCatholics-Nuns-HousekeepingSchool				0.279***	0.331***	0.215
				(0.079)	(0.118)	(0.166)
ExpProtestants	−0.147	−0.178	−0.043	−0.170	−0.202	−0.058
	(0.128)	(0.182)	(0.253)	(0.130)	(0.191)	(0.260)
ExpCatholics-All	0.140	0.010	−0.006	0.191	0.073	0.048
	(0.194)	(0.273)	(0.387)	(0.194)	(0.273)	(0.389)
Adjusted R2	0.08	0.09	0.09	0.09	0.10	0.09
Panel B: Log distance						
ExpCatholics-Nuns	−0.083**	−0.086	0.002	−0.126**	−0.177**	−0.010
	(0.039)	(0.053)	(0.077)	(0.054)	(0.076)	(0.112)
ExpCatholics-Nuns-Workrooms				−0.014	0.026	0.014
				(0.038)	(0.053)	(0.080)
ExpCatholics-Nuns-HousekeepingSchool				0.074*	0.102*	0.004
				(0.041)	(0.057)	(0.084)
ExpProtestants	−0.065*	−0.078	−0.039	−0.062*	−0.071	−0.038
	(0.037)	(0.053)	(0.073)	(0.037)	(0.054)	(0.074)
ExpCatholics-All	0.060	0.031	0.010	0.067	0.042	0.011
	(0.045)	(0.061)	(0.087)	(0.046)	(0.062)	(0.088)
Controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Region FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
N	9800	6455	3735	9800	6455	3735
Adjusted R2	0.08	0.09	0.09	0.09	0.09	0.09
Mean of dep. var.	3.87	5.16	6.14	3.87	5.16	6.14

Data: Pooled 2007 and 2013-14 waves of the DHS in the DRC. Sample: Women who, at the time of the survey, had reached the aged considered. OLS regression.
Dep variables : Fertility at the age indicated in the column title.
DistCatholics and DistProtestants are the distance measures computed for the DHS cluster to missions post in 1948. Controls include: age and age square, a binary for the DHS wave and pre-colonial explorer route, latitude, longitude and their product, distance to coast, average elevation and ruggedness, population density in 1900 and area suitable for agriculture in 1900, the Tsetse Suitability Index, an historical malaria index, the exposure to slave trade, the presence of a colonial railroad in 1911, the average distance to Catholic and Protestant missions in 1886, territory area, and access to a navigable river.
Standard errors, in (), are clustered at the DHS cluster level.
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.

Online Appendix

A.1 Details on the data used

A.1.1 1970s demographic surveys

To select the sampled households, in each city, a census was conducted to count and identify all existing households in each city. From this census, one in eight households was randomly selected so that a total of 270,000 individuals in 46,000 households were interviewed. The census and data collection took between one and six months depending on the city and its population size.

This database is an essential asset for this project and more generally for the understanding of the link between exposure to colonial presence and fertility choices. Indeed, there are very few databases of this quality that have rigorously collected information from individuals who lived under the colonial system with this level of coverage (Sanderson, 2010). Yet, a potential concern is that these surveys were conducted under the Mobutu dictatorship, in a context of hyperinflation and economic hardship, and thus the data may have been strategically manipulated by interviewers or respondents for political or economic purposes. While we found no documents that explicitly address this possible caveat, we are reassured by the following considerations. First, the design of the survey was developed by a team of recognized demographers based at the Congolese Official Institute of Research and Statistics in Kinshasa and at Louvain-la-Neuve University in Belgium. The implementation of the survey was jointly managed by these teams. The statistical programming, data cleaning, analysis and storage of the information were performed in Louvain-la-Neuve. Documents found in the archives show an impressive level of care taken in data collection and control of the quality levels. Second, these data have been used by prominent demographers specializing in African demography for a significant number of published works (see for instance Shapiro, 1996 and Tabutin, 1982), and they are cited as a reference for measuring infant mortality in the Democratic Republic of Congo during the colonial period (Sanderson, 2010). Finally, this survey uses the same birth calendar methodology to reconstruct measures of fertility and infant mortality as current benchmark surveys, such as the Demographic and Health Surveys. All in all, we believe that the quality of the data meets high social science standards.

A.1.2 Catholic missions

The yearbooks we digitize indicate the type of activities being conducted by missionary personnel at each post at the time of their publication. Jedwab et al. (2022) underline that the majority of workers in missions were local personnel. Unfortunately, we have no systematic information on these workers that would allow to construct a more accurate and continuous measure of missionary activities. While missionary activities are diverse, they remain closely related to the two main functions of missionary work: education and health. Table A.1 presents four categories of activities dedicated to women and their children that are highlighted in this article: (i) the workrooms, in which women were paid to make handicrafts that the female missionaries then sold in Belgium; (ii) the housekeeping schools and marriage preparation workshops; (iii) the infrastructures and workshops related to maternal and child health: maternity wards, childcare classes, etc.; and finally, (iv) the dispensaries and general health infrastructures.

While some posts are sometimes transferred from one Catholic congregation to another (and this transfer sometimes means that the post is abandoned for a few years), very few posts closed permanently during the period from 1886 to 1949: only 6 posts out of the 389 posts identified with our data were permanently closed.[51] We can thus assume that when a Catholic post is open, it remains so throughout the period, and that the surrounding populations are therefore exposed to the missionary presence.

A.1.3 Protestant missions

To recover the opening dates of the Protestant posts, we rely on the information contained in both handbooks and in the 1944 map. Only 6 posts out the 286 posts in the final data set do not have an opening date.[52] Theses sources allows us to reconstruct the opening dates of protestants posts for the period 1878-1960. However, as this information is censored for Catholic post from 1948 onward, we focus on the 1886-1948 period. Finally, based on the 1978 handbook, only 17% of the posts closed permanently. As with the Catholic posts, we assume that once opened the posts are active (although the church that manages them may change during the period).

The sources we have for Protestant missions do not contain systematic information

[51] This, however, does not mean that other posts opened and closed permanently in between yearbook publications or before 1924.

[52] For these posts we randomly draw a date between the last map on which the post does not appear and the first map on which it is indicated. For example, if a post first appears in 1930, we draw a random date between 1930 and 1921.

on missionary activities within posts. Yet, based on the 1978 handbook, we can easily hypothesize a generalized female presence in Protestant missions: at least one woman participated to the opening of 88% of the posts listed. Also, it allows us to confirm that the Protestant religious personnel was different from that of the Catholic missions: a typical mission was composed of a reverend and his wife, sometimes accompanied by educated unmarried women.

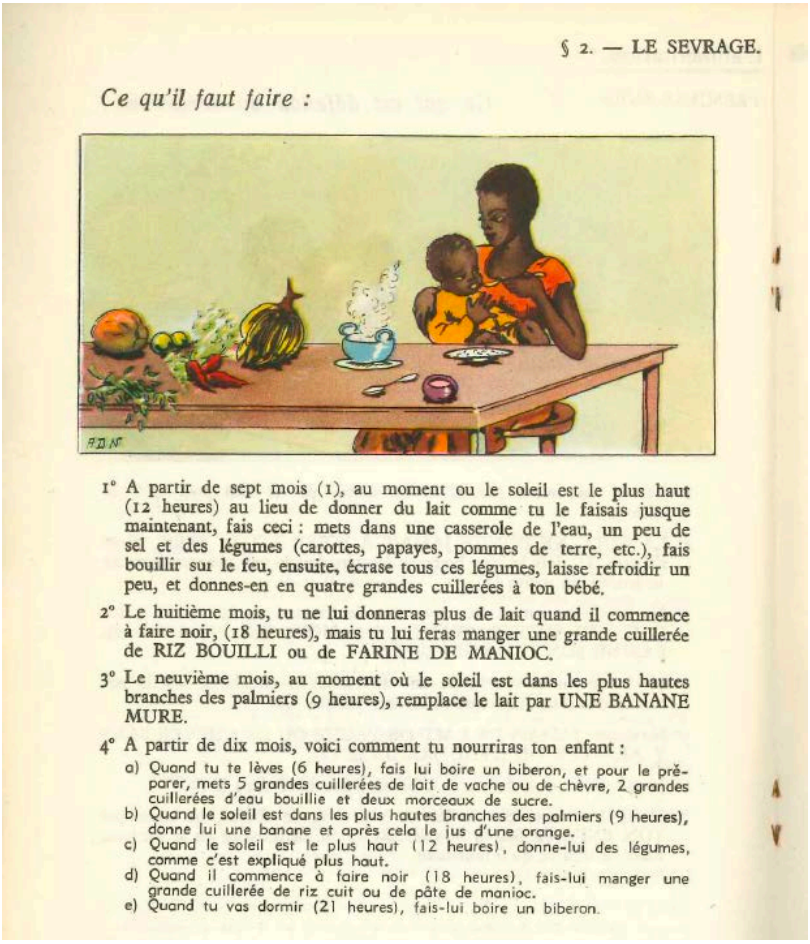
A.1.4 Control variables

Time-varying control variables at the district level We built a new data set at the district level from yearly reports on the administration of the colony presented to the Belgium parliament (for the period 1920-1948). These reports vary in content and structure over the period but allowed to find district-level information (for most districts over most years) for the following relevant dimensions: the size of the white Belgian and white non-Belgium population, the size of the indigenous population and the amount of per-capita tax levied from the indigenous population. To account for changes in the border of districts, we rely on the details provided by de Saint Moulin (1988). The size of the indigenous population captures the tax base rather than the total population (as acknowledged in the reports). Note also that missionaries only account for a small share of the white population.

Territory level control variables We use the following covariates, as suggested by Jedwab et al. (2022): pre-colonial explorer route (data from Nunn and Wantchekon, 2011), latitude, longitude and their product, distance to coast, average elevation and ruggedness (from Jarvis et al., 2008), population density in 1900 and area suitable for agriculture in 1900 (Klein Goldewijk et al., 2010), the Tsetse Suitability Index (data from Alsan, 2015), an historical malaria index from Kiszewski et al., 2004, the exposure to slave trade (data from Nunn and Wantchekon, 2011), the presence of a colonial railroad in 1911 (data from Nunn and Wantchekon, 2011), the average distance to Catholic and to Protestant missions in 1886, territory area, and access to a navigable river (from the *Referentiel Geographique Commun*, an online repository for GIS maps for DRC).All controls are constructed at the territory level (averages). Pre-colonial explorer routes, colonial railways and access to a navigable river are binary variables that take value one if an explorer route, a railway or a river crosses the territory.

A.2 Additional Figures

Figure A.1: Official booklet giving advice to mothers on how to properly raise their children



§ 2. — LE SEVRAGE.

Ce qu'il faut faire :

1° A partir de sept mois (1), au moment ou le soleil est le plus haut (12 heures) au lieu de donner du lait comme tu le faisais jusque maintenant, fais ceci : mets dans une casserole de l'eau, un peu de sel et des légumes (carottes, papayes, pommes de terre, etc.), fais bouillir sur le feu, ensuite, écrase tous ces légumes, laisse refroidir un peu, et donnes-en en quatre grandes cuillerées à ton bébé.

2° Le huitième mois, tu ne lui donneras plus de lait quand il commence à faire noir, (18 heures), mais tu lui feras manger une grande cuillerée de RIZ BOUILLI ou de FARINE DE MANIOC.

3° Le neuvième mois, au moment où le soleil est dans les plus hautes branches des palmiers (9 heures), remplace le lait par UNE BANANE MURE.

4° A partir de dix mois, voici comment tu nourriras ton enfant :

a) Quand tu te lèves (6 heures), fais lui boire un biberon, et pour le préparer, mets 5 grandes cuillerées de lait de vache ou de chèvre, 2 grandes cuillerées d'eau bouillie et deux morceaux de sucre.
b) Quand le soleil est dans les plus hautes branches des palmiers (9 heures), donne lui une banane et après cela le jus d'une orange.
c) Quand le soleil est le plus haut (12 heures), donne-lui des légumes, comme c'est expliqué plus haut.
d) Quand il commence à faire noir (18 heures), fais-lui manger une grande cuillerée de riz cuit ou de pâte de manioc.
e) Quand tu vas dormir (21 heures), fais-lui boire un biberon.

Source : Donny (1950).
This page illustrates the very detailed guidelines that mothers must follow in order to wean their child (in French).

Figure A.2: Picture of one report of population survey carried in the mid-1950s.

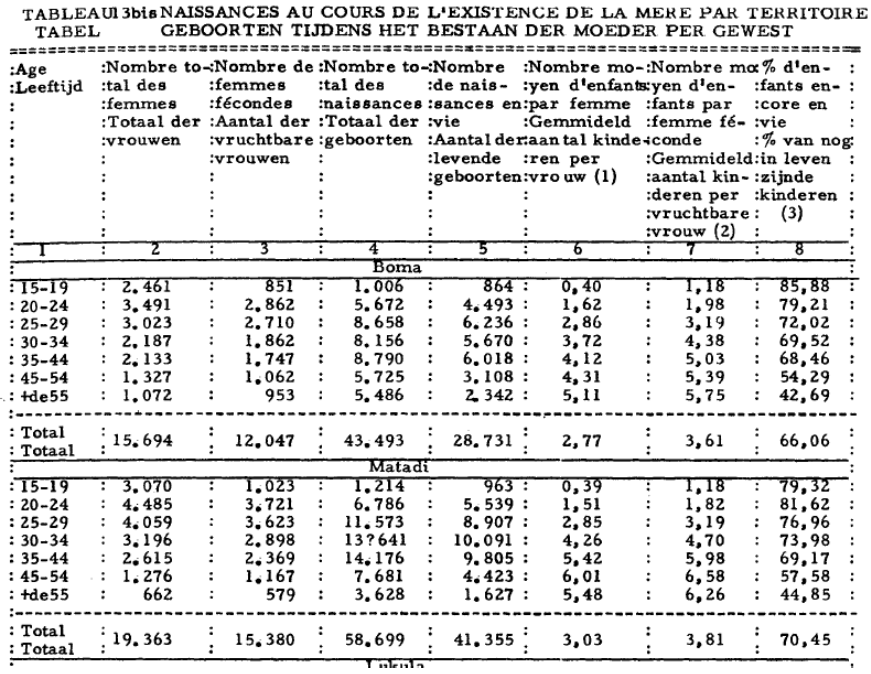
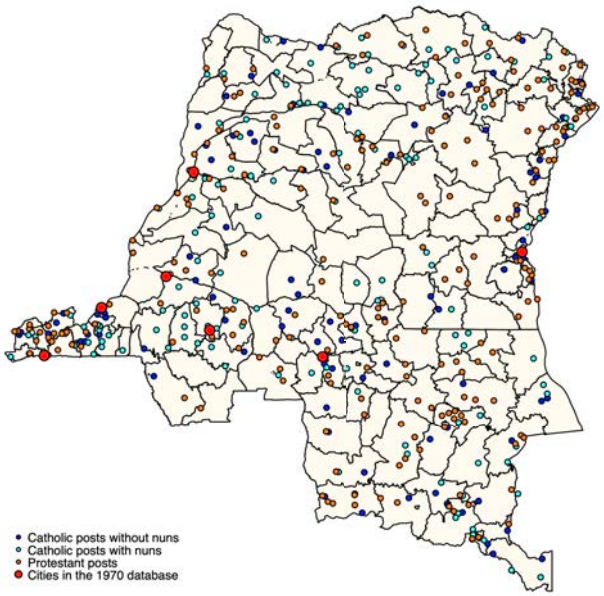


TABLEAU 13bis NAISSANCES AU COURS DE L'EXISTENCE DE LA MERE PAR TERRITOIRE
TABEL GEBOORTEN TIJDENS HET BESTAAN DER MOEDER PER GEWEST

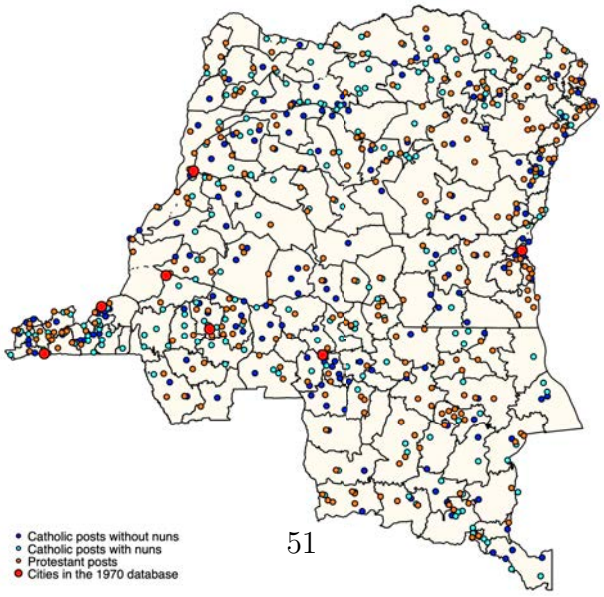
Age / Leeftijd	Nombre total des femmes / Totaal der vrouwen	Nombre de femmes fécondes / Aantal der vruchtbare vrouwen	Nombre total des naissances / Totaal der geboorten	Nombre de naissances en vie / Aantal der levende geboorten	Nombre moyen d'enfants par femme / Gemmideld aantal kinderen per vrouw (1)	Nombre moyen d'enfants par femme fécondé / Gemmideld aantal kinderen per vruchtbare vrouw (2)	% d'enfants encore en vie / % van nog in leven zijnde kinderen (3)
1	2	3	4	5	6	7	8
Boma							
15-19	2.461	851	1.006	864	0,40	1,18	85,88
20-24	3.491	2.862	5.672	4.493	1,62	1,98	79,21
25-29	3.023	2.710	8.658	6.236	2,86	3,19	72,02
30-34	2.187	1.862	8.156	5.670	3,72	4,38	69,52
35-44	2.133	1.747	8.790	6.018	4,12	5,03	68,46
45-54	1.327	1.062	5.725	3.108	4,31	5,39	54,29
+de55	1.072	953	5.486	2.342	5,11	5,75	42,69
Total / Totaal	15.694	12.047	43.493	28.731	2,77	3,61	66,06
Matadi							
15-19	3.070	1.023	1.214	963	0,39	1,18	79,32
20-24	4.485	3.721	6.786	5.539	1,51	1,82	81,62
25-29	4.059	3.623	11.573	8.907	2,85	3,19	76,96
30-34	3.196	2.898	13?641	10.091	4,26	4,70	73,98
35-44	2.615	2.369	14.176	9.805	5,42	5,98	69,17
45-54	1.276	1.167	7.681	4.423	6,01	6,58	57,58
+de55	662	579	3.628	1.627	5,48	6,26	44,85
Total / Totaal	19.363	15.380	58.699	41.355	3,03	3,81	70,45
Lukula							

Figure A.3: Spatial distribution of missionary posts

(a) Missionary posts in 1924



(b) Missionary posts in 1935



(c) Missionary posts in 1949

A.3 Additional Tables

Table A.1: Type of activities targeting women and their children in Catholic posts with nuns (proportion of total posts), by Catholic missions yearbooks:

	1924	1935	1949
Workrooms	0.21	0.19	0.34
Housekeeping schools	0.29	0.26	0.46
General health	0.62	0.84	0.94
Women and children health	0.19	0.67	0.91
N	48	150	217

Data from the Catholic Missions yearbooks (*Annuaires des Missions Catholiques au Congo Belge*) published in 1924, 1935 and 1949. For more detailed information, see Section A.1.2 in the online appendix. The last row indicates the number of Catholic posts with female missionaries.

Table A.2: Change in territory average proximity to different type of posts between 1910 and 1948:

	(1)			
	mean	sd	min	max
ExpCatholics_Nuns-1910	-1.85	1.09	-4.71	-0.15
ExpCatholics_Nuns-1948	-0.55	0.31	-1.59	-0.03
ExpProtestants-1910	-1.32	0.92	-3.61	-0.15
ExpProtestants-1948	-0.44	0.18	-1.15	-0.13
ExpCatholics_All-1910	-1.09	0.75	-3.45	-0.15
ExpCatholics_All-1948	-0.37	0.17	-1.01	-0.03

The measures of exposure are average linear proximity (measured as minus the distance) to the closest post of either type, using 1000 random location in the territory. The unit is 100 km.

Table A.3: Total number of births at different ages
Missionary exposure measured at 6 years

	Age 35	Age 40	Age 45
	(1)	*(2)*	*(3)*
Panel A: Any post in district (0/1)			
ExpCatholics - Nuns (CN)	0.253**	0.207	0.484***
	(0.114)	(0.135)	(0.164)
ExpProtestants (P)	−0.098	−0.243	−0.404
	(0.237)	(0.262)	(0.256)
ExpCatholics - All (C)	−0.125	−0.015	0.024
	(0.242)	(0.248)	(0.283)
Adjusted R2	0.13	0.13	0.12
pvalue(CN = P)	0.203	0.125	0.001
Panel B: Proximity to post - Linear measure			
ExpCatholics - Nuns (CN)	0.241	0.272**	0.250**
	(0.157)	(0.126)	(0.118)
ExpProtestants (P)	−0.250	−0.250	−0.267
	(0.177)	(0.181)	(0.204)
ExpCatholics - All (C)	0.136	0.173	0.369
	(0.240)	(0.282)	(0.265)
Adjusted R2	0.13	0.13	0.12
pvalue(CN = P)	0.074	0.037	0.056
Panel C: Proximity to post - Log measure			
ExpCatholics - Nuns (CN)	0.296*	0.288**	0.386***
	(0.154)	(0.136)	(0.146)
ExpProtestants (P)	−0.232	−0.175	−0.287
	(0.178)	(0.192)	(0.185)
ExpCatholics - All (C)	0.078	−0.065	0.155
	(0.226)	(0.226)	(0.278)
Adjusted R2	0.13	0.13	0.12
pvalue(CN = P)	0.043	0.070	0.013
Controls	*Yes*	*Yes*	*Yes*
Territory FE	*Yes*	*Yes*	*Yes*
Mean of dep. variable	5.40	5.96	5.98
N	15749	9941	6354

Data: Demographic survey collected in the 1970s in seven major cities in Zaire (see Section 3.1.1). Sample: women aged 35 or older (column 1), 40 or older (column 2) and 45 or older (column 3). OLS regression. Dep variables : number of births a women had before age 35 (column 1), 40 (column 2) and 45 (column 3). ExpCatholics-Nuns, ExpProtestants and ExpCatholics-All are extensively described in Section 3.2. Panel A : whether there is at least one missionary post in territory g. Panels B and C : measures of territory-level proximity to posts (measured as minus the average distance to missionary posts. The unit is 100 km). Panel C includes the log transformation of this measure. All exposure variables are measured at age 6. Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area and a quadratic year-of-birth trend. All regressions include territory fixed-effects.
Standard errors, in (), are clustered at the territory level.
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.

Table A.4: Childlessness
Exposure measured at birth

	Age 35	Age 40	Age 45
	(1)	*(2)*	*(3)*
Panel A: Any post in district (0/1)			
ExpCatholics - Nuns (CN)	−0.009	−0.003	−0.012
	(0.012)	(0.013)	(0.014)
ExpProtestants (P)	0.029	0.035	0.034*
	(0.021)	(0.022)	(0.019)
ExpCatholics - All (C)	−0.019	−0.014	−0.011
	(0.024)	(0.024)	(0.023)
Adjusted R2	0.07	0.06	0.07
pvalue(CN = P)	0.066	0.111	0.046
Panel B: Proximity to post - Linear measure			
ExpCatholics - Nuns (CN)	−0.010	−0.006	0.004
	(0.018)	(0.014)	(0.010)
ExpProtestants (P)	0.016	0.022	0.018
	(0.016)	(0.015)	(0.013)
ExpCatholics - All (C)	0.013	0.005	−0.007
	(0.025)	(0.023)	(0.019)
Adjusted R2	0.07	0.06	0.07
pvalue(CN = P)	0.304	0.177	0.455
Panel C: Proximity to post - Log measure			
ExpCatholics - Nuns (CN)	−0.007	−0.008	−0.002
	(0.014)	(0.013)	(0.012)
ExpProtestants (P)	0.027	0.030*	0.030**
	(0.016)	(0.016)	(0.013)
ExpCatholics - All (C)	0.013	0.022	0.006
	(0.023)	(0.024)	(0.022)
Adjusted R2	0.07	0.07	0.07
pvalue(CN = P)	0.136	0.092	0.131
Controls	*Yes*	*Yes*	*Yes*
Territory FE	*Yes*	*Yes*	*Yes*
Mean of dep. variable	0.07	0.07	0.08
N	16572	10604	6904

Data: Demographic survey collected in the 1970s in seven major cities in Zaire (see Section 3.1.1). Sample: women aged 35 or older (column 1), 40 or older (column 2) and 45 or older (column 3). OLS regression. Dep variables : Dummy equal to 1 if the woman never gave birth before age 35 (column 1), 40 (column 2) and 45 (column 3). ExpCatholics-Nuns, ExpProtestants and ExpCatholics-All are extensively described in Section 3.2. Panel A : whether there is at least one missionary post in territory g. Panels B and C : measures of territory-level proximity to posts (measured as minus the average distance to missionary posts. The unit is 100 km). Panel C includes the log transformation of this measure. All exposure variables are measured at birth. Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area and a quadratic year-of-birth trend. All regressions include territory fixed-effects.

Standard errors, in (), are clustered at the territory level.

* p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01.

Table A.5: Total number of births at different ages for women with at least one birth
Missionary exposure measured at birth

	Age 35	Age 40	Age 45
	(1)	*(2)*	*(3)*
Panel A: Any post in district (0/1)			
ExpCatholics - Nuns (CN)	0.181*	0.153	0.338**
	(0.104)	(0.134)	(0.154)
ExpProtestants (P)	−0.260**	−0.267**	−0.255
	(0.119)	(0.125)	(0.162)
ExpCatholics - All (C)	−0.015	0.072	0.098
	(0.142)	(0.147)	(0.171)
Adjusted R2	0.11	0.12	0.11
pvalue(CN = P)	0.004	0.010	0.008
Panel B: Proximity to post - Linear measure			
ExpCatholics - Nuns (CN)	0.171*	0.160*	0.216**
	(0.093)	(0.083)	(0.084)
ExpProtestants (P)	−0.186*	−0.134	−0.197
	(0.102)	(0.108)	(0.126)
ExpCatholics - All (C)	−0.067	0.035	0.012
	(0.149)	(0.206)	(0.203)
Adjusted R2	0.11	0.12	0.11
pvalue(CN = P)	0.018	0.031	0.005
Panel C: Proximity to post - Log measure			
ExpCatholics - Nuns (CN)	0.217**	0.176*	0.352***
	(0.107)	(0.102)	(0.105)
ExpProtestants (P)	−0.240***	−0.103	−0.225
	(0.087)	(0.115)	(0.140)
ExpCatholics - All (C)	−0.028	0.000	0.069
	(0.111)	(0.151)	(0.163)
Adjusted R2	0.11	0.12	0.11
pvalue(CN = P)	0.001	0.068	0.002
Controls	*Yes*	*Yes*	*Yes*
Territory FE	*Yes*	*Yes*	*Yes*
Mean of dep. variable	5.40	5.96	5.98
N	15425	9854	6331

Data: Demographic survey collected in the 1970s in seven major cities in Zaire (see Section 3.1.1). Sample: women aged 35 or older (column 1), 40 or older (column 2) and 45 or older (column 3). All women included in the sample have at least one child. OLS regression. Dep variables : number of births a women had before age 35 (column 1), 40 (column 2) and 45 (column 3). ExpCatholics-Nuns, ExpProtestants and ExpCatholics-All are extensively described in Section 3.2. Panel A : whether there is at least one missionary post in territory g. Panels B and C : measures of territory-level proximity to posts (measured as minus the average distance to missionary posts. The unit is 100 km). Panel C includes the log transformation of this measure. All exposure variables are measured at birth. Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area and a quadratic year-of-birth trend. All regressions include territory fixed-effects. Standard errors, in (), are clustered at the territory level.
* p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01

Table A.6: Childlessness
Exposure measured at age 6

	Age 35 *(1)*	Age 40 *(2)*	Age 45 *(3)*
Panel A: Any post in district (0/1)			
ExpCatholics - Nuns (CN)	−0.015	−0.002	0.003
	(0.018)	(0.018)	(0.018)
ExpProtestants (P)	0.019	0.013	0.030
	(0.027)	(0.028)	(0.033)
ExpCatholics - All (C)	−0.036	−0.023	−0.020
	(0.030)	(0.028)	(0.031)
Adjusted R2	0.07	0.06	0.07
pvalue(CN = P)	0.289	0.643	0.487
Panel B: Proximity to post - Linear measure			
ExpCatholics - Nuns (CN)	−0.035	−0.027	−0.006
	(0.026)	(0.021)	(0.016)
ExpProtestants (P)	0.020	0.019	0.018
	(0.021)	(0.021)	(0.020)
ExpCatholics - All (C)	0.002	−0.006	−0.032
	(0.050)	(0.045)	(0.045)
Adjusted R2	0.07	0.07	0.07
pvalue(CN = P)	0.181	0.199	0.440
Panel C: Proximity to post - Log measure			
ExpCatholics - Nuns (CN)	−0.019	−0.014	0.002
	(0.023)	(0.021)	(0.020)
ExpProtestants (P)	0.027	0.022	0.033
	(0.020)	(0.020)	(0.023)
ExpCatholics - All (C)	−0.012	0.005	−0.018
	(0.032)	(0.031)	(0.034)
Adjusted R2	0.07	0.06	0.07
pvalue(CN = P)	0.208	0.291	0.398
Controls	*Yes*	*Yes*	*Yes*
Territory FE	*Yes*	*Yes*	*Yes*
Mean of dep. variable	0.07	0.07	0.08
N	16569	10604	6904

Data: Demographic survey collected in the 1970s in seven major cities in Zaire (see Section 3.1.1). Sample: women aged 35 or older (column 1), 40 or older (column 2) and 45 or older (column 3). OLS regression. Dep variables : Dummy equal to 1 if the woman never gave birth before age 35 (column 1), 40 (column 2) and 45 (column 3). ExpCatholics-Nuns, ExpProtestants and ExpCatholics-All are extensively described in Section 3.2. Panel A : whether there is at least one missionary post in territory g. Panels B and C : measures of territory-level proximity to posts (measured as minus the average distance to missionary posts. The unit is 100 km). Panel C includes the log transformation of this measure. All exposure variables are measured at age 6. Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area and a quadratic year-of-birth trend. All regressions include territory fixed-effects.

Standard errors, in (), are clustered at the territory level.

* p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01.

Table A.7: Total number of births at different ages for women with at least one birth
Missionary exposure measured at age 6

	Age 35	Age 40	Age 45
	(1)	*(2)*	*(3)*
Panel A: Any post in district (0/1)			
ExpCatholics - Nuns (CN)	0.184*	0.190	0.474***
	(0.099)	(0.129)	(0.168)
ExpProtestants (P)	−0.117	−0.301	−0.415*
	(0.202)	(0.244)	(0.247)
ExpCatholics - All (C)	−0.137	0.024	0.044
	(0.232)	(0.246)	(0.279)
Adjusted R2	0.11	0.12	0.11
pvalue(CN = P)	0.200	0.073	0.001
Panel B: Proximity to post - Linear measure			
ExpCatholics - Nuns (CN)	0.138	0.175	0.226**
	(0.123)	(0.111)	(0.114)
ExpProtestants (P)	−0.296**	−0.251	−0.259
	(0.149)	(0.193)	(0.207)
ExpCatholics - All (C)	0.281	0.303	0.388
	(0.192)	(0.271)	(0.265)
Adjusted R2	0.11	0.12	0.11
pvalue(CN = P)	0.048	0.093	0.071
Panel C: Proximity to post - Log measure			
ExpCatholics - Nuns (CN)	0.215	0.201	0.353**
	(0.131)	(0.126)	(0.145)
ExpProtestants (P)	−0.256	−0.202	−0.271
	(0.163)	(0.190)	(0.185)
ExpCatholics - All (C)	0.129	0.032	0.169
	(0.192)	(0.220)	(0.281)
Adjusted R2	0.11	0.12	0.11
pvalue(CN = P)	0.040	0.105	0.021
Controls	*Yes*	*Yes*	*Yes*
Territory FE	*Yes*	*Yes*	*Yes*
Mean of dep. variable	5.40	5.96	5.98
N	15422	9854	6331

Data: Demographic survey collected in the 1970s in seven major cities in Zaire (see Section 3.1.1). Sample: women aged 35 or older (column 1), 40 or older (column 2) and 45 or older (column 3). All women included in the sample have at least one child. OLS regression. Dep variables : number of births a women had before age 35 (column 1), 40 (column 2) and 45 (column 3). ExpCatholics-Nuns, ExpProtestants and ExpCatholics-All are extensively described in Section 3.2. Panel A : whether there is at least one missionary post in territory g. Panels B and C : measures of territory-level proximity to posts (measured as minus the average distance to missionary posts. The unit is 100 km). Panel C includes the log transformation of this measure. All exposure variables are measured at age 6. Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area and a quadratic year-of-birth trend. All regressions include territory fixed-effects.
Standard errors, in (), are clustered at the territory level.
* p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01.

Table A.8: Age at first birth and birth intervals
Exposure measured at age 6

	Age at first birth	Birth intervals	
		All births	Btw. 1st and 2nd births
	(1)	*(2)*	*(3)*
Panel A: Any post in district (0/1)			
ExpCatholics - Nuns	−0.242	−0.295	−0.322
	(0.347)	(0.468)	(1.291)
ExpProtestants	−0.129	0.391	2.577**
	(0.648)	(0.508)	(1.211)
ExpCatholics - All	−0.060	−0.561	−2.337
	(0.587)	(0.890)	(2.236)
Adjusted R2	0.07	0.01	0.02
pvalue(CN = P)	0.883	0.294	0.091
Panel B: Proximity to post - Linear measure			
ExpCatholics - Nuns	−0.529	−0.032	0.036
	(0.459)	(0.461)	(0.723)
ExpProtestants	−0.890**	0.661	2.494**
	(0.374)	(0.512)	(1.231)
ExpCatholics - All	0.896	−1.071	−2.172
	(0.777)	(1.294)	(3.159)
Adjusted R2	0.07	0.01	0.02
pvalue(CN = P)	0.578	0.225	0.198
Panel C: Proximity to post - Log measure			
ExpCatholics - Nuns	−0.414	0.033	−0.036
	(0.437)	(0.515)	(1.007)
ExpProtestants	−0.806	0.454	2.629**
	(0.495)	(0.613)	(1.277)
ExpCatholics - All	0.837	−0.152	−1.906
	(0.591)	(0.951)	(2.552)
Adjusted R2	0.07	0.01	0.02
pvalue(CN = P)	0.587	0.647	0.193
Controls	*Yes*	*Yes*	*Yes*
Territory FE	*Yes*	*Yes*	*Yes*
Mean of dep. variable	19.36	30.81	32.09
N	13640	73100	12643

Data: Demographic survey collected in the 1970s in seven major cities in Zaire (see Section 3.1.1). Sample: women aged 25 or older. (column 1) and women aged 25 or older who gave birth at least twice (columns 2 and 3). OLS regression. Dep variables : age at first child (column 1), birth intervals in months for all births the woman ever had (column 2), and restricted to the first and second births only (column 3). ExpCatholics-Nuns, ExpProtestants and ExpCatholics-All are extensively described in Section 3.2. Panel A : whether there is at least one missionary post in territory g. Panels B and C : measures of territory-level proximity to posts (measured as minus the average distance to missionary posts. The unit is 100 km). Panel C includes the log transformation of this measure. All exposure variables are measured at age 6. Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area and a quadratic year-of-birth trend. In Column 2, we also include birth-order dummy variables. All regressions include territory fixed-effects.

Standard errors, in (), are clustered at the territory level.

* p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01.

Table A.9: Infant mortality
Exposure measured at age 6

	Age 35	Age 40	Age 45
	(1)	*(2)*	*(3)*
Panel A: Any post in district (0/1)			
ExpCatholics - Nuns (CN)	0.579	1.629	−5.593
	(9.191)	(9.237)	(9.773)
ExpProtestants (P)	−5.503	−4.550	−14.097
	(9.876)	(14.664)	(18.429)
ExpCatholics - All (C)	2.356	−5.165	9.771
	(16.048)	(16.235)	(18.930)
Adjusted R2	0.02	0.02	0.02
pvalue(CN = P)	0.582	0.689	0.646
Panel B: Proximity to post - Linear measure			
ExpCatholics - Nuns (CN)	−7.043	−5.200	−4.013
	(12.141)	(10.480)	(10.615)
ExpProtestants (P)	−3.613	−10.418	−7.874
	(18.104)	(19.666)	(20.017)
ExpCatholics - All (C)	5.675	−8.630	−2.419
	(24.085)	(23.835)	(23.415)
Adjusted R2	0.02	0.02	0.02
pvalue(CN = P)	0.873	0.815	0.865
Panel C: Proximity to post - Log measure			
ExpCatholics - Nuns (CN)	−6.300	−4.162	−6.671
	(10.284)	(9.234)	(10.103)
ExpProtestants (P)	−4.029	−13.106	−15.414
	(10.148)	(14.522)	(17.560)
ExpCatholics - All (C)	−8.815	−11.754	5.395
	(16.828)	(16.804)	(15.789)
Adjusted R2	0.02	0.02	0.02
pvalue(CN = P)	0.867	0.589	0.666
Controls	*Yes*	*Yes*	*Yes*
Territory FE	*Yes*	*Yes*	*Yes*
Mean of dep. variable	93.69	102.57	112.09
N	84101	58440	37344

Data: Demographic survey collected in the 1970s in seven major cities in Zaire (see Section 3.1.1). Sample: women aged 35 or older (column 1), 40 or older (column 2) and 45 or older (column 3). OLS regression. Dep variable : Dummy equal to 1 if the child died before age 1. This variable is multiplied by 1000 to ease the reading of the coefficients. ExpCatholics-Nuns, ExpProtestants and ExpCatholics-All are extensively described in Section 3.2. Panel A : whether there is at least one missionary post in territory g. Panels B and C : measures of territory-level proximity to posts (measured as minus the average distance to missionary posts. The unit is 100 km). Panel C includes the log transformation of this measure. All exposure variables are measured at age 6. Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area and a quadratic year-of-birth trend. All regressions include territory fixed-effects.

Standard errors, in (), are clustered at the territory level.

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.

Table A.10: Fertility levels at different ages and missionary activities targeting women and their children
Exposure measured at age 6

	Age 35	Age 40	Age 45
	(1)	*(2)*	*(3)*
Panel A: Proximity to post - Linear measure			
ExpCatholics - Nuns	0.083	0.091	0.039
	(0.149)	(0.116)	(0.113)
ExpCatholics - Nuns - Workrooms	−0.067**	−0.060*	−0.030
	(0.030)	(0.035)	(0.041)
ExpCatholics - Nuns - Housekeeping school and workshops	0.201***	0.207***	0.214***
	(0.042)	(0.043)	(0.047)
ExpCatholics - Nuns - Women health activities	−0.042	−0.043	−0.071**
	(0.031)	(0.033)	(0.035)
ExpProtestants	−0.124	−0.110	−0.038
	(0.178)	(0.193)	(0.219)
ExpCatholics - All	0.085	0.124	0.304
	(0.238)	(0.311)	(0.288)
Adjusted R2	0.13	0.13	0.12
Panel B: Proximity to post - Log measure			
ExpCatholics - Nuns	0.199	0.166	0.177
	(0.168)	(0.146)	(0.166)
ExpCatholics - Nuns - Workrooms	−0.074	−0.092	−0.049
	(0.049)	(0.065)	(0.074)
ExpCatholics - Nuns - Housekeeping school and workshops	0.200***	0.249***	0.348***
	(0.074)	(0.078)	(0.097)
ExpCatholics - Nuns - Women health activities	0.001	−0.047	−0.066
	(0.085)	(0.082)	(0.083)
ExpProtestants	−0.190	−0.115	−0.203
	(0.183)	(0.186)	(0.165)
ExpCatholics - All	0.070	−0.074	0.139
	(0.227)	(0.228)	(0.268)
Adjusted R2	0.13	0.13	0.12
Controls	*Yes*	*Yes*	*Yes*
Territory FE	*Yes*	*Yes*	*Yes*
Mean of dep. variable	5.40	5.96	5.98
N	15749	9941	6354

Data: Demographic survey collected in the 1970s in seven major cities in Zaire (see Section 3.1.1). Sample: women aged 35 or older (column 1), 40 or older (column 2) and 45 or older (column 3). OLS regression. Dep variables : number of births a women had before age 35 (column 1), 40 (column 2) and 45 (column 3). ExpCatholics-Nuns, ExpProtestants and ExpCatholics-All are extensively described in Section 3.2. Definitions of Catholic activities can be found in section A.1.2 in the online Appendix. Panel A : whether there is at least one missionary post in territory g. Panels B and C : measures of territory-level proximity to posts (measured as minus the average distance to missionary posts. The unit is 100 km). Panel C includes the log transformation of this measure. All exposure variables are measured at age 6. Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area and a quadratic year-of-birth trend. All regressions include territory fixed-effects.

Standard errors, in (), are clustered at the territory level.

* p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01.

Table A.11: Including time-varying controls : total number of births at different ages
Missionary exposure measured at birth

	Age 35	Age 40	Age 45
	(1)	*(2)*	*(3)*
Panel A: Any post in district (0/1)			
ExpCatholics - Nuns (CN)	0.217**	0.140	0.319**
	(0.109)	(0.138)	(0.156)
ExpProtestants (P)	−0.292**	−0.294**	−0.246
	(0.127)	(0.136)	(0.165)
ExpCatholics - All (C)	0.045	0.087	0.120
	(0.159)	(0.163)	(0.188)
Adjusted R2	0.13	0.13	0.12
pvalue(CN = P)	0.002	0.013	0.016
Panel B: Proximity to post - Linear measure			
ExpCatholics - Nuns (CN)	0.240**	0.204**	0.218**
	(0.106)	(0.085)	(0.086)
ExpProtestants (P)	−0.255*	−0.227	−0.222
	(0.134)	(0.150)	(0.183)
ExpCatholics - All (C)	−0.108	0.027	0.072
	(0.170)	(0.211)	(0.212)
Adjusted R2	0.13	0.13	0.12
pvalue(CN = P)	0.013	0.019	0.042
Panel C: Proximity to post - Log measure			
ExpCatholics - Nuns (CN)	0.284**	0.224**	0.382***
	(0.117)	(0.111)	(0.111)
ExpProtestants (P)	−0.262**	−0.162	−0.263
	(0.117)	(0.148)	(0.181)
ExpCatholics - All (C)	−0.075	−0.015	0.143
	(0.109)	(0.152)	(0.166)
Adjusted R2	0.13	0.13	0.12
pvalue(CN = P)	0.003	0.058	0.009
Controls	*Yes*	*Yes*	*Yes*
Time-varying Controls	*Yes*	*Yes*	*Yes*
Territory FE	*Yes*	*Yes*	*Yes*
Mean of dep. variable	5.40	5.96	5.98
N	15752	9941	6354

Data: Demographic survey collected in the 1970s in seven major cities in Zaire (see Section 3.1.1). Sample: women aged 35 or older (column 1), 40 or older (column 2) and 45 or older (column 3). OLS regression. Dep variables : number of births a women had before age 35 (column 1), 40 (column 2) and 45 (column 3). ExpCatholics-All, ExpCatholics-Nuns and ExpProtestants are extensively described in Section 3.2. Panel A : whether there is at least one missionary post in territory g. Panels B and C : measures of territory-level proximity to posts (measured as minus the average distance to missionary posts. The unit is 100 km). Panel C includes the log transformation of this measure. All exposure variables are measured at birth. Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area, a quadratic year-of-birth trend as well as the following time-varying controls, constructed at the year*province level : the size of the white Belgian and white non-Belgium population, the size of the indigenous population and the amount of per-capita tax levied from the indigenous population (see Section 4.2.2). All regressions include territory fixed-effects.
Standard errors, in (), are clustered at the territory level.
* p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01.

Table A.12: Differences between Catholic and Protestant posts, by opening decade

	1900-1910			1920-1930			1940-1948		
	Catholic	Protestant	p-value(1-2)	Catholic	Protestant	p-value(1-2)	Catholic	Protestant	p-value(1-2)
	(1)	(2)		(1)	(2)		(1)	(2)	
Longitude	21.963	23.228	0.396	23.132	24.449	0.123	22.561	23.498	0.284
Latitude	-2.599	-1.689	0.482	-3.923	-3.622	0.743	-2.810	-2.776	0.963
Elevation	568.664	664.965	0.393	726.201	735.825	0.899	685.208	719.918	0.659
Ruggedness Index	5.227	4.719	0.754	4.694	5.450	0.422	6.056	5.333	0.515
Malaria Suitability Index	14.588	12.528	0.240	11.790	12.239	0.719	14.236	12.739	0.147
Distance to navigable river (km)	58.271	90.860	0.210	140.256	98.444	0.077	82.527	112.076	0.128
Distance to coast (km)	1194.633	1275.922	0.650	1331.350	1264.488	0.489	1243.386	1509.821	0.010
Distance to Kinshasa (km)	868.453	926.350	0.716	1011.975	941.810	0.438	918.114	1166.291	0.005
Disantance to colonial routes (km-	79.256	108.589	0.189	99.683	107.704	0.581	101.217	91.132	0.524
Distance to colonial railroad (km)	655.757	511.468	0.213	560.390	644.113	0.163	574.660	694.486	0.022
Population density in 1900	18.146	74.364	0.088	10.300	13.945	0.499	14.790	8.341	0.186
Area suitable for agriculture in 1900	5.352	5.578	0.886	4.125	2.739	0.044	3.975	3.024	0.107
TseTse Fly Suitability Index	0.735	0.515	0.340	0.339	0.535	0.217	0.586	0.663	0.554
Exposure to the Atlantic Slave Trade	344,711.844	6,007.636	0.317	149,143.385	86,064.467	0.624	80,851.923	2,497.541	0.207
N	45	11		78	45		52	74	

Note : This table shows the differences in means between Catholic and Protestant posts along selected variables, depending on the decade in which the posts were opened. A description of the variables and their sources can be found in Section 4.2.1

Table A.13: Mission exposure and cohort fertility (women above 35) in the representative sample of the 1950s

	Exposure at 0	Exposure at 0	Exposure at 6	Exposure at 6
	(1)	*(2)*	*(3)*	*(4)*
Panel A: Proximity to post - Linear measure				
ExpCatholics-Nuns	0.082	−0.195**	0.280**	0.338**
	(0.096)	(0.076)	(0.122)	(0.129)
ExpCatho-Nuns-HousekeepSchool		0.523***		0.094
		(0.115)		(0.101)
ExpCatho-Nuns-Workrooms		−0.303***		−0.224**
		(0.104)		(0.088)
ExpCatho-Nuns-Woman-Health		0.215**		0.015
		(0.093)		(0.030)
ExpProtestants	−0.246	−0.262*	−0.199	−0.320
	(0.155)	(0.150)	(0.244)	(0.259)
ExpCatholics-All	0.177	0.175	0.167	0.165
	(0.120)	(0.109)	(0.128)	(0.126)
Adjusted R2	0.68	0.71	0.69	0.70
pvalue(CN = P)	0.034		0.120	
Panel B: Proximity to post - Log measure				
ExpCatholics-Nuns	0.223	−0.420**	0.427**	−0.126
	(0.162)	(0.164)	(0.200)	(0.200)
ExpCatho-Nuns-HousekeepSchool		0.919***		1.320***
		(0.277)		(0.292)
ExpCatho-Nuns-Workrooms		0.104		−0.094
		(0.316)		(0.366)
ExpCatho-Nuns-Woman-Health		−0.043		−1.097**
		(0.319)		(0.442)
ExpProtestants	−0.320**	−0.212	−0.293	−0.252
	(0.155)	(0.143)	(0.209)	(0.205)
ExpCatholics-All	0.172	0.130	0.049	−0.109
	(0.179)	(0.168)	(0.151)	(0.139)
Adjusted R2	0.68	0.72	0.68	0.72
pvalue(CN = P)	0.025		0.021	
Controls	*Yes*	*Yes*	*Yes*	*Yes*
District FE	*Yes*	*Yes*	*Yes*	*Yes*
Mean of dep. variable				
N	324	324	324	324

One observation is one age category in a given territory. Age categories are: 35-44, 45-54, +55. Observations are weighted by the number of women they represent. Standard errors are clustered at the territory level. Controls include district fixed effects, age category fixed effects and the following control at the territory level: distance to Catholic and Protestant missions in 1886, latitude, longitude and their product, area, area suited for agriculture in 1900, mean elevation, standard deviation in elevation, population density in 1900, tse-tse index, malaria index, the presence of railroad, navigable river, the intensity of the Atlantic slave trade and distance to the coast. These controls are detailed in Section A.1.4.

Table A.14: Comparison of results on the representative sample of 1950s and on the counter-factual sample of migrants observed in the 1970s:

	Exposure at 0 50s data *(1)*	Exposure at 0 70s data *(2)*	Exposure at 6 50s data *(3)*	Exposure at 6 70s data *(4)*
Panel A: Proximity to post - Linear measure				
ExpCatholics-Nuns	0.055	0.044	0.052	0.171
	(0.122)	(0.134)	(0.140)	(0.191)
ExpProtestants	−0.330**	−0.329**	−0.251	−0.390**
	(0.128)	(0.155)	(0.188)	(0.196)
ExpCatholics-All	0.447**	0.234	0.548***	0.157
	(0.181)	(0.257)	(0.207)	(0.356)
Adjusted R2	0.84	0.88	0.84	0.88
Panel B: Proximity to post - Log measure				
ExpCatholics-Nuns	−0.047	−0.072	−0.036	−0.120
	(0.148)	(0.126)	(0.151)	(0.139)
ExpProtestants	−0.214*	−0.167	−0.204	−0.234
	(0.126)	(0.143)	(0.125)	(0.147)
ExpCatholics-All	0.202	−0.052	0.253	0.034
	(0.217)	(0.193)	(0.216)	(0.201)
Adjusted R2	0.84	0.87	0.84	0.88
Controls	*Yes*	*Yes*	*Yes*	*Yes*
District FE	*Yes*	*Yes*	*Yes*	*Yes*
Mean of dep. variable				
N	575	575	575	575

Columns 1 and 3 use the 1950s data, for age categories/territories represented in the 1970s data. Columns 2 and 4 use the reconstructed 1950s fertility of women surveyed in the 1970s. One observation is one age category in a given territory. Age categories are: 15-19, 20-24, 25-29, 30-34, 35-44, 45-54, +55. Observations are weighted by the number of women they represent. Standard errors are clustered at the territory level. Controls include district fixed effects and the following control at the territory level: distance to Catholic and Protestant missions in 1886, latitude, longitude and their product, area, area suited for agriculture in 1900, mean elevation, standard deviation in elevation, population density in 1900, tse-tse index, malaria index, the presence of railroad, navigable river, the intensity of the Atlantic slave trade and distance to the coast. These controls are detailed in Section A.1.4.

Table A.15: Religion in the 2000s and missionary presence in 1948

	(1) Catholic	*(2)* Protestant	*(3)* Catholic	*(4)* Protestant
Panel A: Linear distance				
ExpCatholics-Nuns	0.064*	−0.157***	0.063	−0.101**
	(0.036)	(0.040)	(0.046)	(0.048)
ExpCatholics-Nuns-Workrooms			0.015	0.013
			(0.019)	(0.020)
ExpCatholics-Nuns-HousekeepingSchool			−0.009	−0.061**
			(0.024)	(0.025)
ExpProtestants	−0.048	0.095**	−0.047	0.101**
	(0.040)	(0.038)	(0.041)	(0.039)
ExpCatholics-All	0.131**	0.011	0.130**	0.001
	(0.053)	(0.064)	(0.053)	(0.063)
Adjusted R2	0.10	0.10	0.10	0.10
pvalue(C + CN = 0)	0.000	0.003		
pvalue(C + CN = P)	0.000	0.000		
pvalue(C = P)	0.012	0.275	0.014	0.198
Panel B: Log distance				
ExpCatholics-Nuns	0.019	−0.032**	0.009	−0.021
	(0.012)	(0.013)	(0.017)	(0.017)
ExpCatholics-Nuns-Workrooms			0.010	0.011
			(0.012)	(0.011)
ExpCatholics-Nuns-HousekeepingSchool			0.004	−0.027**
			(0.012)	(0.012)
ExpProtestants	−0.010	0.033***	−0.009	0.032***
	(0.011)	(0.011)	(0.011)	(0.011)
ExpCatholics-All	0.027**	−0.007	0.028**	−0.009
	(0.012)	(0.014)	(0.012)	(0.014)
Controls	*Yes*	*Yes*	*Yes*	*Yes*
Region FE	*Yes*	*Yes*	*Yes*	*Yes*
N	24356	24356	24356	24356
Adjusted R2	0.09	0.09	0.09	0.10
Mean of dep. var.	0.29	0.28	0.29	0.28
pvalue(C + CN = 0)	0.000	0.000		
pvalue(C + CN = P)	0.001	0.000		
pvalue(C = P)	0.027	0.030	0.028	0.023

Data: Pooled 2007 and 2013-14 waves of the DHS in the DRC. Sample: all women aged 15 to 49. OLS regression.
Dep variables : Binary for Catholic (column 1) or Protestant (column 2).
DistCatholics and DistProtestants are the distance measures computed for the DHS cluster to missions post in 1948. Controls include: age and age square, a binary for the DHS wave as well as: pre-colonial explorer route, latitude, longitude and their product, distance to coast, average elevation and ruggedness, population density in 1900 and area suitable for agriculture in 1900, the Tsetse Suitability Index, an historical malaria index, the exposure to slave trade, the presence of a colonial railroad in 1911, the average distance to Catholic and Protestant missions in 1886, territory area, and access to a navigable river.
Standard errors, in (), are clustered at the DHS cluster level.
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.

A.4 Testing heterogeneous treatment effects

A recent literature has focused on the identification of settings in which the canonical difference-in-difference estimator might be biased. One of these settings is exactly the one of this paper : multiple periods (post openings are staggered across time) and potential heterogeneous effects (due to unobserved confounders, the effects of post openings may display different trends across territories). de Chaisemartin and d'Haultfoeuille (2020) provides an estimator that is robust to these potential biases, and as well as a Stata command *did_multiplegt*. In order to apply their estimator to our framework and main results, we need to slightly modify our estimation. First, we focus here on the binary treatments (Panel A of Table 1) : indeed our continuous treatments, because of the large number of values they take, prevent the convergence of the algorithm. Second, to comply with de Chaisemartin and d'Haultfoeuille (2020)'s framework we need to replace the year-of-birth linear trend by year-of-birth fixed effects in Equation (1) (see Section 4.2.1). Third, the command only allows one treatment. Thus we focus here on *ExpCatholics - Nuns* (resp. *ExpProtestants*), considering the two other main indepent variables as controls. Panel A of Table A.16 shows the results of this modified version of our empirical framework. A first remark is that the coefficients barely change but since the year-of-birth fixed-effect estimation is more variation-demanding, the coefficients are less precisely estimated. Yet, we can be reassured by Panel B, that uses 5-year birth cohort fixed-effects : significance is now similar to Table 1 and point estimates are again of comparable magnitude. Panel C1 (resp. Panel C2) of Table A.16 shows the de Chaisemartin and d'Haultfoeuille (2020)'s estimator when applied to *ExpCatholics - Nuns* (resp. *ExpProtestants*), the coefficients are similar in magnitude to those in our main table, which reassures us about the potential size of the biases.

Table A.16: Accounting for heteregenous effects using de Chaisemartin and d'Haultfoeuille (2020)'s estimator

	Age 35	Age 40	Age 45
	(1)	*(2)*	*(3)*
Panel A: Baseline estimator - Any post in district (0/1)- 1 year-of-birth fe			
ExpCatholics - Nuns (CN)	0.155	0.128	0.332**
	(0.111)	(0.130)	(0.152)
ExpProtestants (P)	−0.235*	−0.278*	−0.248
	(0.141)	(0.143)	(0.157)
ExpCatholics - All (C)	−0.005	0.071	0.088
	(0.157)	(0.159)	(0.177)
Panel B: Baseline estimator - Any post in district (0/1) - 5 year-of-birth fe			
ExpCatholics - Nuns (CN)	0.223**	0.218*	0.413**
	(0.103)	(0.130)	(0.159)
ExpProtestants (P)	−0.197	−0.236*	−0.196
	(0.149)	(0.142)	(0.158)
ExpCatholics - All (C)	−0.028	0.061	0.104
	(0.156)	(0.160)	(0.172)
Panel C1: de Chaisemartin and d'Haultfoeuille (2020)'s estimator - 1 year-of-birth fe			
ExpCatholics - Nuns (CN)	0.120	0.303	0.351
Panel C2: de Chaisemartin and d'Haultfoeuille (2020)'s estimator - 1 year-of-birth fe			
ExpProtestants (P)	−0.577	−0.283	−0.814
Mean of dep. variable	5.40	5.96	5.98
N	15742	9930	6342

Data: Demographic survey collected in the 1970s in seven major cities in Zaire (see Section 3.1.1). Sample: women aged 35 or older (column 1), 40 or older (column 2) and 45 or older (column 3). Dep variables : number of births a women had before age 35 (column 1), 40 (column 2) and 45 (column 3).
Panels A and B: OLS regression. ExpCatholics-Nuns, ExpProtestants and ExpCatholics-All are binary treatments (whether there is at least one missionary post in territory g, see Section 3.2). Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area and year-of birth fixed effects (Panel A) or 5-year cohort of birth fixed effects (Panel B). All regressions include territory fixed-effects. All exposure variables are measured at birth.
Panels C1 and C2 : Estimates of the de Chaisemartin and d'Haultfoeuille (2020)'s estimator using as only treatment ExpCatholics-Nuns (Panel C1) or ExpProtestants (Panel C2). Controls include: city of residence, a dummy variable indicating whether the place of birth of the mother is in a rural area, year-of birth fixed effects, ExpCatholics-All, ExpProtestants (Panel C1) or ExpCatholics-Nuns (Panel C2). All regressions include territory fixed-effects. All exposure variables are measured at birth.

Standard errors, in (), are clustered at the territory level.
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.