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At the Roots of Niger's population growth: Estimating fertility trends in colonial Niger, 1910–1970

Abstract

Today, Niger is the country with the highest estimated total fertility rate globally. Historical studies have indicated that these high fertility rates may not have been a constant in the country's history. Instead, research on Niger and other sub-Saharan African countries has shown that fertility rates may have started increasing during the late colonial period. The goal of this paper is to test whether fertility rates indeed rose in this period and, if so, to explore what may have caused this increase. To do this, we draw on retrospective fertility data from the national sample census conducted in 1960–61 to estimate total fertility rates until the 1910s. To adjust for possible under registration of births, we apply a relational Gompertz model to the data for women between the ages of 15 and 49. Our estimates provide evidence for an in-crease in fertility rates that commenced around the late 1940s or, at the latest, the 1950s. Our exploration into what may have caused this fertility increase finds that declines in infertility were an unlikely factor, as primary and secondary infertility likely increased between 1940 and 1960. We argue that the most probable driver of increased fertility was the decline in birth spacing, which would have led to an increase in births per woman.

Keywords

Niger; Demography; Late-Colonial Period; Fertility Rise; Relational Gompertz Model

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Introduction

While most of the world went through what demographers term the demographic transition, the transition from a high mortality, high fertility regime to a low mortality, low fertility regime, several sub-Saharan African regions persistently retain high fertility levels in the face of declining mortality. To date, demographers have attempted to explain the delayed transition in some sub-Saharan African countries (Bongaarts and Casterline 2013; Bongaarts 2017; Schoumaker 2019; Timaeus and Moultrie 2020). These high fertility rates combined with declining mortality have led to rapid population growth in sub-Saharan Africa, a growth whose origins we still cannot precisely pinpoint. Although historians agree that sustained population rises commenced somewhere during the late-colonial period (1920–1960), there is still much debate about whether mortality declines or fertility increases were mainly responsible (Doyle 2013a; Walters 2021). In this paper, we aim to shed light on the understudied question of the historical roots of high fertility in sub-Saharan Africa by leveraging previously dismissed sources for the country of Niger, the country with the highest fertility rate worldwide.

Producing such estimates can contribute to a central debate in African historical demography. The discussion focuses on whether mortality declines or fertility increases during the colonial period were responsible for the boom in sub-Saharan African population growth (Iliffe 1989; Doyle 2013a). On the one hand, some argue that because fertility had always been high, health improvements were crucial for declines in mortality, which caused the sub-Saharan population to swell (Caldwell 1985; lliffe 1989). More recently, however, studies have suggested that rising fertility was crucial in driving population growth rates (Doyle 2013a; Walters 2021).

Demographic studies have given indications of a rise in fertility rates in colonial French-speaking West Africa (FWA) after the mid-20th century (Bongaarts and Casterline 2013). The rising fertility phenomenon is not unprecedented—it is documented in many historical contexts (Dyson and Murphy 1985; Spoorenberg 2015). Lack of reflection on the existence and causes behind this apparent fertility rise for FWA, using quantitative data, has, however, kept us in the dark about potential historical reasons for this increase. Firstly, we do not know when this rise in fertility started for any FWA country. Secondly, we know little about the underlying causes of this increase, not only in FWA but in SSA more generally. These underlying causes likely differ from the ones found in historical Europe, where a decline in age at first marriage for women was mainly responsible (Dyson and Murphy 1985; Walters 2021).

Among the countries that have experienced the latest onset of the fertility transition is Niger, which, despite showing some of the highest fertility rates to date, has received marginal attention in the demographic literature (Spoorenberg 2019). The country is one of the few examples, in demographic terminology, which had not yet entered a prolonged fertility decline by 2012 (Schoumaker 2019; see also Spoorenberg 2019). We aim to estimate historical fertility trends going back to at least 1940, beyond the period usually documented in the literature. This exercise allows us to question whether the post-1960 fertility rates also characterized the late-colonial period or to explore whether and when an increase in fertility took place during the colonial period. We do this by back-projecting total fertility rates (TFR)[1] mainly drawing data from the 1960 Niger sample census, which we adjust for common errors using a relational Gompertz model (Moultrie et al. 2013: 54–68).[2]

Based on these longer and more detailed trends, we explore some causes that may have been responsible for changes in fertility patterns. To this end, we primarily focus on potential declines in birth spacing, documented by ethnographers and historians in several regions of West Africa (Schoenmaeckers et al. 1981; Cooper 2019: 230–231). As a basis, we draw on Barbara Cooper's (2019) recent work on reproductive health in (colonial) Niger, which, in part, focuses on social transformations that may have caused a rise in fertility. In addition to the role of birth spacing, we examine the potential role of other factors. The factors include improved health, such as declines in female sterility (Romaniuk 1980) and better nutrition, and changes in the age at first marriage (Kitching 1983). Based on other literature, we argue that, compared to changes in birth spacing, these factors were less crucial and possibly even detrimental to a rise in fertility.

The paper is structured as follows: we start with an overview of the debates on fertility transitions in sub-Saharan Africa. In that section, we outline the gap in data on fertility change during colonial times and introduce previously unexploited sources. We then elaborate on how we can use these new sources to produce estimates of pre-1950s fertility levels in Niger. Afterward, we present our results, which uncover a slow but sustained rise in fertility starting around the 1940s. In two separate sub-sections, we explore some potential factors that may have led to this rise in fertility in that period—health developments and social changes, which may have contributed to decreased birth spacing. In our conclusions, we reflect on the theoretical and empirical pay-off of the study for understanding the fertility trajectory in West Africa and beyond.

Literature Review: Fertility change in African historical demography

In the field of African historical demography, one of the longest-lasting debates revolves around the underlying causes of sub-Saharan Africa's population growth. While most historians agree that this growth takes its roots in the colonial period, there is much discussion on the timing and causes of this growth. On the one hand, a position adhered to by John Iliffe (2017: 251–252) and John Caldwell (1985) maintains that a decline in mortality rates, primarily crisis mortality during the colonial period, led to high population growth rates. In their view, fertility change had little to do with the onset of population growth, as fertility was high throughout the sub-continent's history. They argue that high-fertility regimes, which dominated sub-Saharan Africa, were a response to the high mortality levels prevalent in the land-rich, labor-poor subcontinent (Iliffe 1989). The causes of mortality decline are held to be a combination of rising nutritional standards, new transportation methods, medical advancements, and, in some cases, educational improvements, which increased population growth rates as fertility remained high (Caldwell 1985; Iliffe 1989; Notkola et al. 2000).[3]

On the other hand, some scholars maintain that rising fertility rates have been responsible for the growth rates in some contexts (Dawson 1987; Turshen 2010; see also Doyle 2013a). Meredith Turshen (2010), for example, argues that colonial authorities pursued pro-natalist policies amid fears of depopulation of many regions of sub-Saharan Africa, which led to declines in traditional birth control methods, such as prolonged breastfeeding. For long, arguments supporting the rising fertility thesis had little quantitative backing, but recent studies have shed light on how fertility rates increased in some East and Central African contexts. Some of these rises were driven by reduced birth intervals, caused by (Catholic) missionary interventions on breastfeeding patterns in the second quarter of the 20th century (Walters 2021). Sarah Walters (2021) shows that there is merit to both positions in the debate, illustrating that changes in both mortality and fertility were responsible for population growth in Tanzania. Regions in Tanzania went through a sharp fall in mortality but also witnessed a non-negligible increase in fertility between 1940 and 1970 before the onset of fertility decline.

So far, the few studies that talk to this debate, some of which have attempted to quantify historical demographic developments, almost exclusively rely on insights from East, Central, and Southern Africa (Romaniuk 1980; Dawson 1987; Walters 2021; Notkola et al. 2000).[4] Research on FWA is surprisingly absent. The limited quantitative work on this region mainly focuses on the post-1960 period, when increasing fertility and declining mortality were likely already underway (Benoit et al. 1981). An exception is a study that uses data from a parish in western Senegal to study its demographic profile (Lacombe 1970). The focus of the study is, however, not on historical fertility trends, as it analyzes the period 1940–1965 as a whole, without examining diachronic change. Hence, changes in fertility in colonial SSA, specifically FWA, remain understudied.

While we still lack quantitative studies that pinpoint historical changes in fertility, several scholars have produced competing, but not mutually exclusive, explanations for why a rise in births in the 20th century could have occurred. Some historians analyze colonial interventions aimed at increasing population growth and focus on the discursive side of the topic. They highlight instances of 'depopulation fears' by colonial officials throughout sub-Saharan Africa, officials that relied on patchy population data (Gervais and Mandé 2010; Turshen 2010; Coghe 2022). In this context, colonial policies tried to curb mortality to stimulate population growth but, crucially, also intervened in fertility (Coghe 2022: 19). Studies on the Belgian Congo note that government-financed catholic nuns pushed pro-natal measures, such as encouraging monogamy and early stops in breastfeeding, which led to shorter birth intervals (Hunt 1988; Likaka 2006).[5]

In FWA, fears of depopulation also entered the colonizers' discourse until at least the 1940s (van Beusekom 1999). Yet, colonial administrators seemingly took little action to boost fertility rates, especially in the inland of their West African colonies. The lack of personnel spread over the inland of West Africa made it difficult for the colonial government to assert its will outside a few domains, such as the mobilization of forced labor between 1912 and 1946 (Fuglestad 1983: 81–86; Cooper 2019: 116–117; Fall and Roberts 2019). This likely prevented many of the pro-natal actions taken in other areas of sub-Saharan Africa from even being enacted into policy in regions like the Sahel. Effective pro-natal measures were seemingly only taken in a limited number of French colonies, all outside West Africa (Cooper 2019: 116). Moreover, the French-speaking Sahel and Sudan regions were characterized by a minimal presence of Christian missionaries;[6] only one mission was established in Niger during the colonial period (Cooper 2019: 20–23). Thus, in Niger, a combination of a weak colonial state and the absence of missionaries who, in areas such as the Belgian Congo, were the primary promoters of pro-natal interventions meant that fertility-increasing policies would have hardly impacted the region.

Despite the attempts of missionaries and colonial regimes to decrease or eliminate birth spacing in many regions of sub-Saharan Africa, we still know little about how and why birth intervals changed in most of the subcontinent. Historically, women from several regions in the subcontinent used measures such as prolonged breastfeeding, abstinence, abortion, or infanticide to space births (van de Walle and van de Walle 1988; Bledsoe 2002: 73, 100–101; Turshen 2010). The main function of these practices was ensuring higher survival chances of infants and young children during breastfeeding (van de Walle and van de Walle 1988; Iliffe 2017: 73). Hence, long birth intervals probably served *pro-natal* goals in that they aimed at maximizing the number of healthy children (van de Walle and van de Walle 1988). In this sense, even if it directly decreased the number of births a woman could deliver over her reproductive lifespan, spacing served as a pro-natal tool, not a family-limitation one. Nevertheless, a decline in spacing practices would, assuming other factors remained constant, lead to an increase in fertility.

Qualitative work by historians suggests that an erosion of birth spacing practices occurred in several West African societies (Schoenmaeckers et al. 1981). Ethnographic research shows that this erosion likely also took place in Niger (Cooper 2019: 156–160, 231). Thus, despite the absence of missionaries and a strong colonial administration, which could directly pursue pro-natal measures, birth spacing possibly declined, which suggests that other factors drove this change. Socioeconomic changes linked to the emergence of monetization through wage labor and the rise of Islam reportedly altered birth spacing patterns and may have led to increased fertility in Niger as well (Cooper 2019: 156–160), which is a proposal we will further explore.[7]

Aside from colonial policies and changes in birth spacing, the epidemiological context has also been mentioned as a potential explanation for the rise of fertility. Researchers studying Central Africa emphasize the role of improved health conditions on fertility rise through a decline in female infertility (Romaniuk 1980; Headrick 1990; Doyle 2013b: 383). In Gabon, probably because of a high prevalence of sexually transmitted infections (STIs), more than one in three women born in 1915 was childless in the 1960s. This share substantially declined in the later cohorts (Headrick, 1990). Although on a smaller scale, declines in sterility among women in the Belgian Congo reportedly also occurred (Romaniuk 1980). The role of changes in the incidence of infertility on fertility rates has not been studied in the context of Niger, which, to a certain extent, we can analyze using the available surveys.

Data, Measures, and Method

For our estimates for the longest part of the colonial period (1910s–1960s), we use retrospective data from the 1960–61 national sample census of Niger. The census was held within the national boundaries of 1960 (as delineated during the colonial period after 1947) but excludes the northern part of the country. The surveyors drew a rough line between some 50 kilometers north of Tahoua in the West and N'Guigmi in the East and left out the regions north of this, which meant the exclusion of the nomadic Tuareg and Bella populations.[8] The census sampled a uniquely high number of women, even by today's standards. Enumerators interviewed about 24,000 women of 14 years and older on their fertility history, a number that supersedes today's Demographic and Health Surveys (DHS) in sample size, which usually ranges between 3,500 and 4,500 interviewees. In addition to the 1960–61 survey, we include a general census from 1988[9] and the 1992 DHS[10] to check whether the projected fertility rates for the 1970s based on the 1960 data produce similar estimates to the 1988 and 1992 enumerations. Thus, we merely use the 1988 and 1992 enumerations to check the reliability of the 1960 census, not in our analysis of fertility rise. We did not include the 1977 census in our exercise as it included no questions on fertility.

The nominal sample census of 1960 stratified Niger into six as homogenous as possible zones in terms of ethnic composition, population density, and agricultural practices.[11] A clustered sampling method selected villages or towns within each zone of increasing population size to capture different settlement sizes. In these villages, all household heads and women above 14 were to be interviewed.[12] Importantly for us, the questionnaires used at the time asked women how many live births they had in the last 12 months (i.e. recent/current fertility) and how many live births they had throughout their life until the moment of the survey (i.e. parity). The answers to these questions resulted in aggregated tables by five-year age groups (15-19, 20-24, …, 45-49). Using these tables, we can get the current fertility rate from the live births in the last 12 months and the total number of women in every age category.[13] The parity data for the census go as far back as the age category of 75-79,[14] which allows us to produce estimates back to the 1910s. It should be kept in mind, however, that the further back in time we go, the smaller the sample of women and the less reliable our estimates are expected to become. Therefore, we mainly focus on the estimates produced by the age groups between 15-19 and 45-49.

Data derived from survey questionnaires on women's fertility similar to the ones found in the Niger survey have been used to back-project fertility rates in other contexts. Thomas Spoorenberg (2015) employs the 1979 and 1989 Mongolian censuses to estimate TFR as far back as the 1920s. For sub-Saharan Africa, to the best of our knowledge, only one study uses census data to back-project fertility rates for the period before 1960, using a relational Gompertz model (Walters 2008). Walters (2008: 156–158) uses data on parity and recent fertility to estimate historical TFRs for Tanzania back to 1925. Combined with microdata from parish registers, she tracks the start of a prolonged increase in fertility from the 1940s.

The censuses and one survey we are using, while substantially improved compared to their error-ridden pre-1950s predecessors (Gervais and Mandé 2010), have their own deficiencies. They frequently suffer from an underestimation of fertility metrics, errors in age structures, and problems in the categorization and accuracy of responses (Piché 1977; Hill 1985; Moultrie et al. 2013). Nevertheless, as we show below, corrections do not radically alter the fertility estimates.

Concerning fertility, two issues are prevalent in census operations, which might lead to faulty results for average parity in a West African context. Women of earlier cohorts often do not include children who passed or are no longer in the household, which can lead to an underestimation of parity (Hill 1985; Moultrie et al. 2013: 25). The former issue is somewhat addressed in the survey questionnaire for the enumerations we use, as it instructed enumerators to ask how many children the women ever gave birth to and how many of these children are still alive. This should reduce the underestimation as it made clear to both the enumerator and the respondent that the first question concerned children ever born and the latter how many of these children were still alive. Different interpretations of what 'live birth' meant could, however, still lead to miscommunication between enumerators and respondents. For example, infants dying shortly after birth may not be considered full persons in several areas of sub-Saharan Africa (Coquery-Vidrovitch 1988: 16; Cooper 2019: 6). More importantly, some women did not wish to talk about their children that passed at young ages, therefore and therefore chose not to mention them (Caldwell 1981). For the second issue—women not counting children that have left the household—we assume that it was not addressed by enumerators. Hence, the underestimation probably grows as we move into older cohorts, where children have a longer exposure to the possibility of migration. We have no way of precisely accounting for these biases. Therefore, as we get into earlier periods, we increasingly expect our estimates to underestimate TFRs.

To check whether the underestimation in fertility data is inaccurate to a prohibitive extent, we apply the relational Gompertz model as described in Moultrie et al. (2013: 54–69). The Gompertz model corrects for common errors of underestimation in surveys where women tend to underreport their number of births (Moultrie et al. 2013: 54–69). The inputs required are the parities in five-year age groups of women between 15 and 49 and the age-specific fertility rates (ASFRs; recent fertility) for the same groups. In all the questionnaire forms for women, the age of the mother was classified at the time of the census, not at the time of the last birth. We selected the 'Shape F - Level P' variant of the model, which uses recent fertility (F) to correct the shape of the fertility schedule and parity (P) to correct the level of the fertility schedule. The model allows for fitting the 'F-points' and 'P-points'. In the appendix, we show the three possible versions with their diagnostics and select the one with the lowest Root Mean Square Error (RMSE; Fit #3 in Table A1). Using other fits slightly impacted the magnitude of fertility change but not the trend, therefore not significantly affecting our conclusion (Appendix Figure A1).

We compare the reported raw data to the Gompertz-corrected data in Figure 1. The corrected data do not differ substantially from the raw parity data. This can either mean that the differences between age groups are not prohibitively great, that the survey underestimates recent fertility and parity, or that the Gompertz relational model is unsuitable for the Nigerien case. The second case would not be a substantial issue since we are likely already underestimating the 'true' level of fertility. The first case—the underestimation changing depending on the age of the women asked—is possible, as seen in Figure 1, but the model corrects this by adjusting reported parities for the ages 35–49 upwards. The implication of this is that we must assume that unadjusted estimates of women of age groups 50-54 and higher are also underestimated. Regarding the third issue, the model not being suitable for Niger, the model has been specifically designed for high-fertility countries (Moultrie et al. 2013: 54–55), meaning that Niger would have to be subject to an exceptional fertility regime, even when compared to other high-fertility regimes. We cannot exclude this possibility, but it is unlikely to be the case, considering the fertility schedule calculated in the 1960 census produces a reasonable curve for the age groups 15-19 to 45-49.[15]

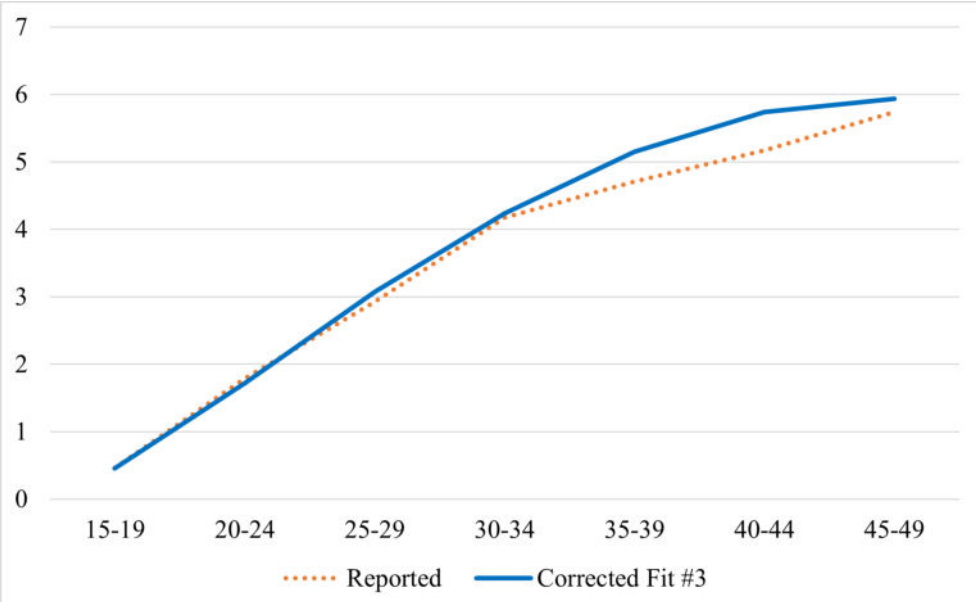

Figure 1. Reported and Gompertz–corrected parities by age group, Niger 1960 *Source*:[27], authors' computations. *Note*: For other fits, see Appendix.

We have no way of assessing whether there are substantial underestimations in the age groups above 50 since the Gompertz model can only adjust for ages that are still in childbearing age. There seems to be some increase in the underestimation of parity as we move into older cohorts, with the difference between reported and corrected estimates reaching 0.6 births in the age group 40-44 and 0.2 births in the 45-49 age group. Therefore, we keep in mind that we might be (increasingly) underestimating TFRs the further back in time we go, as for the age groups above 50 because children of women in these age groups had more time to leave the household.

Keeping these shortcomings in mind, we take the Gompertz corrected parities for the 1960s, 1988, and 1992 censuses/surveys for the age groups 15-49 and the (unadjusted) reported parities for the age groups 50-79 from the 1960 sample census. To arrive at TFR estimates, we compute the average completed family size of each cohort.[16] To do that, we use future ASFRs, taken from the United Nations (UN) World Population Prospects (WPP) fertility data,[17] and add these to the parities of every age group as they move into new age groups with time. As this gives us ASFRs for enumeration years only, we linearly interpolate the ASFRs between survey or census years.[18] The data points for Equation (1) illustrate the process in which we estimated the future average parity of an age group as time passes:

$$P_{i,j} = P_{i-1,j-5} + 2.5 \cdot F_{i-1,j-2.5} + 2.5 \cdot F_{i,j} \qquad (1)$$

Where P is the parity of the age group *i* (2, 3, …, 7) at year *j* (expressed in half years), F is the ASFR of the age group *i* (2, 3, …, 7) at year *j*. For example, to estimate the parity of the age group 20-24 (*j=2*) in year 1966 (*j*=1966), the formula takes the parity of the age group 15-19 (*i–1*) in year 1961 (*j–5*) and adds to that the ASFRs of the age group 15-19 in 1963.5 and age group 20-24 in 1966 to get the parity when the cohort reaches the average age of 22.5. Of course, producing parity estimates using available future estimates of current fertility is less than ideal. This is, however, the only option we have to get completed fertility trajectories of women who are still at childbearing ages at the time of the survey. Moreover, we believe that the approach does not suffer from the risk of large fluctuations. Changing to other available ASFR data from the UN WPP, or taking all available data points makes a minor difference in our results.[19]

This method gives us a measure of cohort TFR, which needs to be translated into an estimate of period TFR that represents the TFR for a given year. To time translate our cohort TFR estimates, we follow Spoorenberg (2015) by backdating the estimated completed family sizes of every cohort to their mean age at childbearing (MAC), which we find to be stable at around 29 years old for the period 1956–1988.[20]

Results

Total Fertility Rate Estimates

In Figure 2, we plot estimates of period TFRs for Niger.[21] Despite the limitations discussed in the previous section, the fact that the estimated TFRs for the late 1960s and early 1970s closely correspond to the ones produced using the 1988 census and 1992 DHS makes us confident in the reliability of our estimates, at least for the later period. Based on our results, we posit that at least some growth in fertility took place after 1940. We are less confident about the apparent stability of TFR found before the 1940s. For these years, we have only reported parities—as we cannot apply corrections to earlier cohorts.

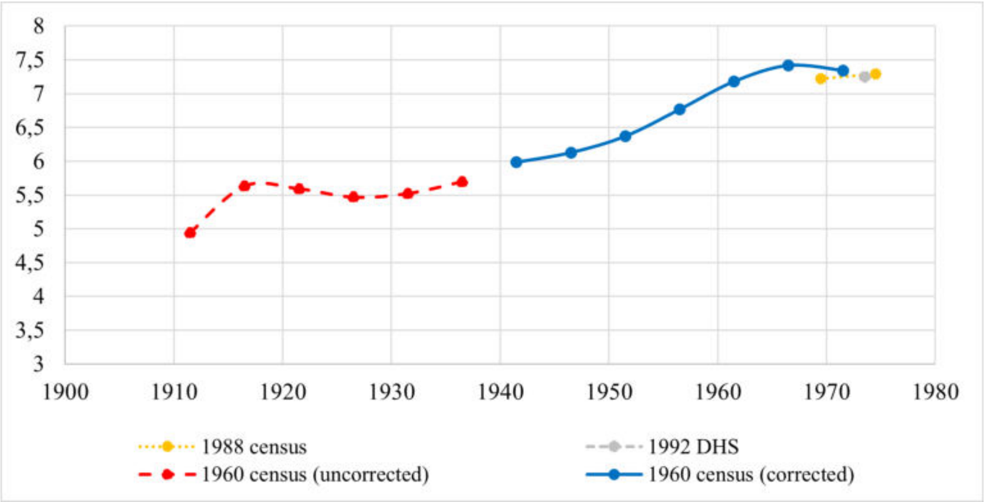

Figure 2. Niger estimated TFR, 1910–1975. *Source*:[28] ; authors' computations.
Note: The corrected estimates are based on fit #3 from Table A3.

We can, however, affirm that fertility was probably not rising before 1940, as the further back in cohorts we go, the more likely it is that we underestimate fertility. Hence, if the TFR was not stable before 1940, we believe it could have only been decreasing. Focusing on the corrected estimates (post-1940), it seems thus that a prolonged rise in fertility started during the 1940s and lasted for about three decades.

Our estimates place Niger's TFR in 1941 at around six births per woman for sedentary populations. After an almost three-decade increase, Niger seemingly reached an estimated peak TFR of 7.5 in the early post-colonial period. According to the retrospective data, between 1941 and the late 1960s, the TFR rose by almost 1.5 births per woman, providing evidence that a rise in fertility was taking place in the late colonial period.

The survey also produced parity data based on a regional distinction that roughly follows ethnic lines, population density, and agricultural specialization.[22] Unfortunately, the regional data do not allow us to construct trends in TFRs because the recent fertility rates for post-1960 years—which we need to estimate TFRs—are unavailable for a similar regional division in future censuses or surveys, like the 1988 and 1992 ones. We can, however, use the data to check if the regional division produces plausible estimates given today's differences in fertility between ethnic groups. Figure 3 shows the regional differences in Gompertz-corrected parities, roughly moving from the East (Zone I) to the West (Zone VI). As we can see, women from the easternmost region (Zone I), the region close to Lake Chad, where over 50 percent of household heads were reportedly from the Kanuri ethnic group,[23] had the lowest parity through all age groups (Figure 3). This lower fertility of Kanuri women is driven by the high number of women between 30 and 49 who had not borne any children or just one (Table 1).[24] There is limited research on fertility among Kanuri women but one study that surveys Kanuri women in Northern Nigeria, shows that high rates of infertility were prevalent in the region in the 1980s (Udjo 1991). Particularly, rural women above the age of 40 were childless at a rate close to 50 percent, and so was almost one in three women between 30 and 39 (Udjo, 1991).

Table 1. Reported zero or one birth for women aged 30–49 by survey zone, 1960 (dominant ethnic groups in brackets)

	Reported zero births	Reported one birth
Zone I (Kanuri)	24,01%	16,64%
Zone II (Hausa)	11,91%	9,64%
Zone III (Songhai)	7,31%	5,64%
Zone IV (Hausa)	8,38%	5,19%
Zone V (Hausa)	6,83%	5,31%
Zone VI (Djerma, Peul)	7,50%	6,35%

Source :[17.]

Note: We assume that the percentage of women with 0 or 1 reported live births is a proxy for respectively primary and secondary infertility.

This coherent picture of the Kanuri-dominated Zone I lends support to the overall reliability of our results. In the overall picture, the weight of the Eastern, Kanuri-inhabited zones is small. However, the lower fertility in these regions, coupled with a higher share of infertility, makes us more confident about the reliability of the data when it comes to providing a general outline of fertility developments in Niger.

Even if the magnitude of the TFR increase was smaller than our estimates suggest—due to earlier cohorts still underestimating their parities and current fertility more than the latter cohorts—we argue that a rise in fertility in Niger

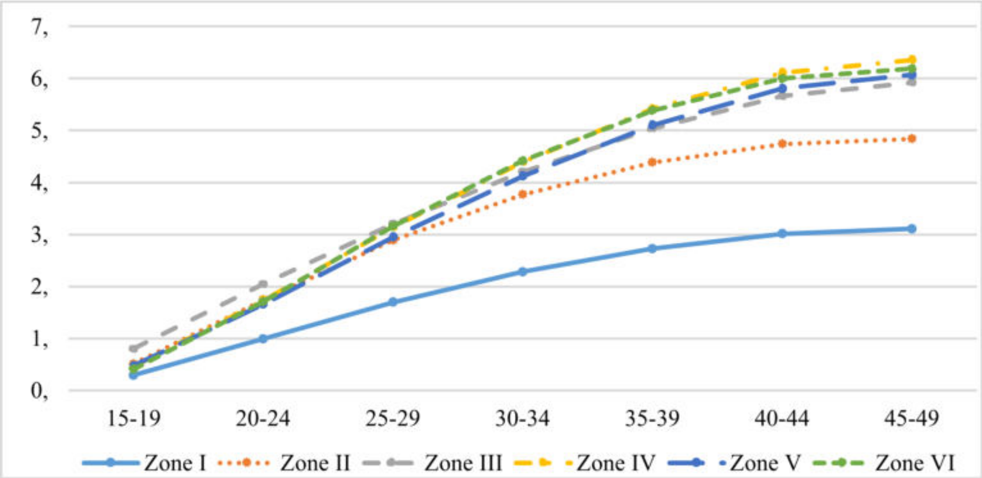

Figure 3. Gompertz-corrected parity by age group, by survey zone Niger, 1961
Source:[17].

commenced, at the earliest, somewhere in the late-1940s or, at the latest, in the 1950s. As we are less confident about the pre-1940 data and because we are mainly interested in fertility increase, we will only focus on explaining the apparent rise in fertility from 1940 onwards.

Understanding fertility rise: Stagnating reproductive health in colonial Niger

In the following two subsections, using previous ethnographic and historical evidence, we mainly evaluate two potential causes of fertility rise in the late-colonial period: improvements in reproductive health through a decline in infertility (Romaniuk 1980; Headrick 1990; Doyle 2013b: 383) and a reduction in birth spacing. The logic behind the first mechanism is relatively straightforward: improved reproductive health leads women to have more live births on average through a decline in (post-partum) sterility. The second mechanism is less obvious, but we are guided on this by historical and anthropological literature, which highlights how changes in kinship structures and gender power dynamics were crucial factors in changes in birth spacing. Social structures in much of SSA encouraged prolonged breastfeeding and lengthy periods of post-partum abstinence, which effectively reduced the number of pregnancies (Iliffe 2017: 73; Cooper 2019: 137; Walters 2021). In the case of Niger, Cooper (2019: 230) argues that sociocultural changes led to a decline in birth spacing, which she hypothesized to have led to rising fertility.

Another health factor that some have argued can lead to higher fertility rates is improved nutrition, which can increase fecundity through the earlier onset of puberty or the decline of the period of post-partum infertility caused by lactational amenorrhea (Ferry 1981; Lesthaeghe et al. 1981). The impact of a decline in post-partum infertility or an earlier onset of puberty would be that women could experience more live births over their lifetime. We do not possess the data to make a claim on improved nutrition in the period studied, but Cooper (2016) demonstrates that French interventions in nutrition and reproductive health in Niger hardly ever successfully targeted women and children and remained focused on the military and laborers.

Concerning improvements in reproductive health, little has been published on the role of colonial interventions in healthcare in FWA and much less so for Niger. As noted above, the colonial regime in Niger continuously suffered from staff shortages, rendering it impossible to pursue most of the goals set in Paris or Dakar (Fuglestad 1983: 85–86). Moreover, except for various smallpox vaccination campaigns (Schneider 2009), few or unsuccessful health interventions and campaigns to improve nutrition were undertaken (Cooper 2019: 175–186, 194–198).

In an investigation of changes in reproductive health in colonial Niger, Cooper (2019: 182, 185–186) shows that improvements in health for women were minimal. Niger not only sent the fewest students to the medical school of Dakar, but it also received by far the smallest number of nurses and doctors (Cooper 2019: 175–178). In addition, the ones it did receive were military-trained, making them less suitable for treating maternal, infant, and childcare issues. In 1942, Nigerien medical students of the medical school of Dakar accounted for only five of the 329 students of medicine and five out of 319 midwives, making it the region with the lowest number of students (Cooper 2010: 231). In FWA, midwives and doctors were originally supposed to come from the areas they would serve (Cooper 2010: 69–70, 83), but the lack of colonially-educated medical personnel from Niger meant that most of them were drawn from regions far away (Cooper 2019: 175–177). The few French- and locally-trained midwives (*matrones*), often engaged in struggles over who would have the authority over childbirth issues (Cooper 2010: 83; Cooper 2019: 179, 183). It is unclear how lacking cooperation between midwives impacted reproductive health, but the result was likely not positive.

Despite the dominance of military medicine in Niger, fears of STIs were prevalent throughout FWA, primarily because they affected soldiers. Consequently, there are documented cases of campaigns against syphilis affecting civilians in the 1940s, mainly using penicillin (Mathurin 1953). It seems, however, that such interventions primarily focused on nomadic groups, like the Peul and the Tuareg, groups that showed a significantly higher incidence of STIs (Mathurin 1953). Nevertheless, a successful decrease in the prevalence of STIs would likely increase fertility through a decline in sterility.

While we possess no quantitative data for reproductive health from the colonial period to evaluate the outcomes, a closely linked metric that could stand as a proxy for investigating reproductive health developments is women's infertility. In research on equatorial Africa, Anatole Romaniuk (1980) and Rita Headrick (1990) link reductions in infertility and, consequently, increases in fertility to a decline in venereal diseases. In Gabon, gonorrhea became prevalent in the early colonial period when increasing rural-urban migration caused a proliferation of sexually transmitted infections (Headrick 1990). In a study on the Belgian Congo, Romaniuk (1980) draws similar conclusions. Romaniuk, however, explicitly takes the position that the expansion of maternal healthcare facilities and the decline in venereal disease led to a decrease in infertility. Headrick (1990), despite noting that medical care improvements played a role in sterility declines, argues that the rise in sterility was linked to the early colonial occupation in the first place. The 1960 sample census allows us to analyze changes in infertility in Niger, as it details how many live births women had per age group. We can show what share of women reported zero live births (primary infertility) or one live birth (secondary infertility). Despite probably occurring in some circumstances, voluntary childlessness, or limiting family size to one child, was a marginal phenomenon in a region where social pressures for large families were so prevalent (Iliffe 2017: 71). Decreasing infertility can also be a determining factor leading to higher TFRs as more women who wanted children could achieve higher parities. A rise in TFR combined with a decline in infertility would, therefore, mean that rising fertility was not necessarily caused by an increase in average "complete" family size but by the fact that fewer women saw their reproductive careers stopped in their tracks by (early) infertility.

We have no estimates for infertility among women by age group at different years, which is the most reliable metric to assess changes in infertility with census data (Romaniuk 1980). However, we can plot rates of childlessness by cohort using the retrospective data (backdated using the MAC). Figure 4 shows no declining trend in the rates of women with zero or one live births. On the contrary, the proportion of women who had zero or one child was reportedly increasing in Niger, from about ten percent in the cohort born in the early 1890s (year at MAC: 1921,5) to about nineteen percent for the cohort born in the late 1920s (year at MAC: 1956,5). These figures may be the result of mortality differences by parity, which may have been higher in earlier cohorts.[25] Another caveat is the possibility that some women in the age group 30–34 did not yet have the chance to have a first or second birth. Provided the average age at first marriage was around 15 years old (Garenne 2004), we believe that the share of women in this group must have been negligible.

The data indicate that the state of reproductive health did not improve until 1960. Despite the doubts about the reliability of these estimates, these figures suggest that a decrease in primary infertility is unlikely to be the driving cause of the rise in fertility rates starting in the 1940s.

Understanding Fertility Rise: Declines in birth spacing, erosion of kinship structures, and religious change

Although the impacts of shifts in kinship structures and religious changes on birth spacing are topics that would require more detailed analysis, a reflection on these issues sheds some light on why Niger's TFRs may have risen after the 1940s. In this section, we link our chronology of fertility rise to the literature on social change in Niger and West Africa more broadly to explore some of the dynamics that may have led to a decline in birth spacing. Given that little is known about changes in women's behavior during the colonial period, most of the links we lay between social changes and fertility change are tentative. Nevertheless, we argue that, in the presence of stable or increasing infertility, a reduction in birth intervals must have been at least partly responsible for the rise in births per woman. Moreover, we posit that the drivers were social, possibly the result of a slow erosion of kinship structures due to colonial occupation, the emancipation from slavery, and the rise of the cash economy (Peterson 2011: 139, 167–175; Klein 1998: 207–208, 219). In addition, Islam's unprecedented rise to dominance in the region may have contributed to declines in birth spacing, as it subverted norms surrounding prolonged post-delivery abstinence, an assertion made by Cooper (2019: 157–160), which we explore here.

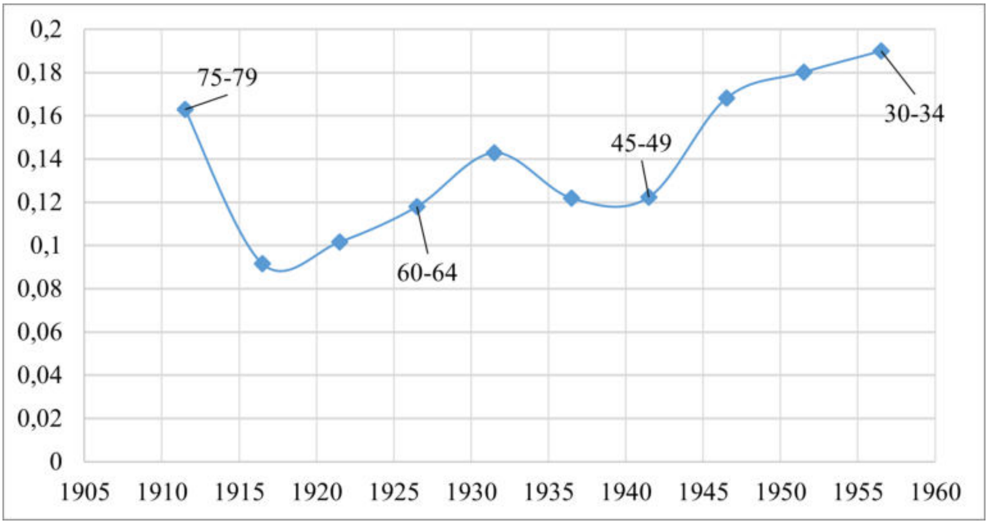

Figure 4. Rate of primary and secondary infertility in Niger, 1910s–1950s (age groups on labels). *Source:*[17]

The aforementioned social changes, which started manifesting in the first quarter of the 20th century but were likely most impactful in the second quarter, increased younger men's freedom from their elders (Klein 1998: 219). Young men, who became more mobile and economically independent from their kin groups due to labor migration to cash-crop regions, increased their power to renegotiate their autonomy over issues of marriage and, importantly, the reproduction of their wives (Peterson 2011: 167–175, 189; Rossi 2017). An effect of this renegotiation was the weakening of previous norms surrounding reproductive behavior, which rested on close control of women's sexual behavior by women amongst each other or by their kin (Cooper 2019: 103–105, 157). Some of these forms of kin control over sexual behavior were likely to ensure that newborns and infants would maximize their chances of survival, as breastfeeding would not be interrupted by a new pregnancy in the case that lactational amenorrhea ends (Lesthaeghe et al. 1981; Iliffe 2017: 73; Cooper 2019: 137, 148, 156–160). While these forms of fertility control limited the freedom of women over reproductive choices to some extent, they also limited some of the power of men over their wives. Cooper (2019: 156, 231) argues that around the mid-20th century, young men were increasingly able to ignore this practice, which may have partly resulted from men's increased control over marital practices (see also Peterson 2011: 173).

A study that uncovers how similar social transformations impacted fertility rise is that of Henley (2006) on colonial Sulawesi. Henley's (2006) research illustrates how the emerging market economy eroded the control of matrifocal corporate kin groups over marriages and reproduction. The historian holds that this can be seen in the increasing claims of men over their wives' reproduction, which was coupled with the marginalization of women as support from the corporate kin group they once relied on was diminishing. The wife's family was gradually removed from the decision-making processes around reproduction. In such a context, women likely found it hard to enforce fertility-inhibiting measures such as long periods of abstinence, which, consequently, would have decreased birth intervals and increased fertility rates. Henley (2006) illustrates that the rise of a conjugal household organization took place, which, he argues, led to rising fertility as men had a greater capacity to enforce their will in such a context where the matrifocal kin group was absent. For West Africa, we would then have to find declines in fertility control practices that kept birth rates low in a context that strove, contrary to Henley's Southeast Asian Sulawesi, to maximize the number of births. Declines in such practices of fertility control in the 1940s could, then, explain the phenomenon of rising fertility.

West African kinship structures, let alone women's agency structures, are in no way similar to the ones found in Henley's (2006) study. Nonetheless, Iliffe (2017: 246–249) notes similarly that capitalist penetration and the emergence of a market economy diminished the power of kin control over marriages in West Africa. One of the impacts was that men could marry earlier because of the monetization of bridewealth and their ability to earn cash through labor migration (Kitching 1983; Klein 1998: 219). Other aspects that followed colonial occupation, such as, but not limited to, the gradual decline of slavery after 1905, the rise and fall of the French forced labor regime (1912–1946), and the growth of Islam also impacted intergenerational power relations in varying ways (Fuglestad 1983: 68; Manchuelle 1989; Klein 1998: 219; Peterson 2011: 167–175; Cooper 2019: 84, 156–160). Changes in said power relations that could have led to changing reproductive practices.

As noted above, fertility-limiting practices, in the form of long birth intervals, were used throughout West Africa. Long intervals were achieved through various measures, but mainly through prolonged breastfeeding, which extended the period of post-partum infecundability, abstinence after birth (Cooper 2019: 229–231), and, according to some, polygyny, which made abstinence easier (Garenne and van de Walle 1989; Schoenmaeckers et al., 1981). Polygyny arguably facilitated the practice of spousal sexual abstinence (Garenne and van de Walle 1989; Bledsoe 2002: 101, 143; Walters 2021). We have no data or studies on changes in the duration of breastfeeding in Niger. However, this likely was and remained long throughout the colonial period.

Regarding abstinence, Cooper (2019: 156–160, 229–231, 299) notes that the practice strongly declined after the early colonial period and that it "inevitably accelerated the fertility rate" (Cooper 2019: 230). Islam's quick expansion in the first half of the 20th century, was a central driver of this phenomenon as it undermined norms that previously taught sexual restraint. When used effectively, post-partum abstinence included the return of the wife to her maternal household for up to two years (Cooper 2019: 159, 191). Around the mid-20th century, it had become increasingly difficult to sustain the practice, as Islam's prescription of a mere forty-day sexual abstinence was proliferating (Cooper 2019: 84, 156–159, 299; see also Schoenmaeckers et al., 1981).

The undermining of these practices, seemingly important only to the household, can be linked, as noted above, to a much broader process of intergenerational renegotiation of power around questions of marriage and asset control. Brian Peterson (2011: 167–168), in his account of Islam's rise in French southern Soudan (today's Mali), highlights how the religious change factored into conflicts between generations that expose a gradual emancipation of young men from some of the controls of their elders—(former) masters, chiefs, or lineage heads. In the pre-colonial and early colonial periods, young household members relied on their lineage or household heads for marriage because of the older generation's control over 'assets' such as cattle and the control over the labor of slaves, younger men, and women. This control was, however, declining as the legal abolition of slavery in 1905 eliminated the gerontocracy's most valuable form of wealth: enslaved people (Manchuelle 1989). This loss of slaves was partly ameliorated by the introduction of the French forced labor regime. In this period, chiefs were given the power to 'recruit' younger males for so-called *prestations*—a specified number of days of coerced labor per year for the administration, with little or no enumeration (Peterson 2011: 134–140; Rossi 2014). Nevertheless, this did not prevent young males from gaining increasing access to cash through short- and medium-term migration to the rising cash-crop regions, leading to further loss of elder ability to command human labor (Peterson 2011: 173; Klein 1998: 219). As a result, young men's growing economic independence allowed them to bypass their elders on marital issues (Klein 1998: 219).

Younger generations were also increasingly attracted to Islam because, as Peterson (2011: 175) describes, in their view, "Islam provided the moral language for critiquing a system that had served to keep them enslaved". Combined, the rising independence of younger generations and the adoption of Islamic norms and practices by the region's vast majority destabilized practices prevalent in West Africa since before colonial times. Among the practices coming under pressure was the two-year spousal separation, which young men increasingly challenged. The practice was seemingly weakened significantly as, by the 21st century, some women dismissed the practice as having ever existed (Cooper 2019: 156–160, 231).

A decline in spousal separation, which could very likely have accelerated in the 1940s, as the forced labor regime ended and Islam proliferated in FWA, would have inextricably led to an increase in births per woman.

Another potential mediating cause of increased fertility could be a decline in marriage age, which, given the social rearrangements we outline above, was a likely phenomenon. We can say very little about changes in marriage age for men and women, a factor that some historians of East Africa reflect on (Kitching 1983; Walters 2021). The increased monetization of the economy likely allowed men to marry for the first time at a younger age. However, when it comes to fertility, the decline in marriage for women, not that of men, is important (Iliffe 1989). No data for first marriage ages are available for Nigerien women born before 1940, but available data suggests that for cohorts born between 1940 and 1960, the marriage age remained at about 15 years old (Garenne 2004). It could be that a slight decline occurred a bit earlier, as neighboring countries like Cameroon and Nigeria saw a drop in average ages at first marriage for women born between 1930 and 1950, from 18 to 16,8 years old and from 17,7 to 16,5 years old, respectively. However, FWA countries like Senegal, Mali, and Ivory Coast seemingly maintained a stable age at first marriage for women between comparable periods (Garenne 2004). We cannot confirm nor exclude whether age at first marriage for women impacted the rise in fertility between 1940 and 1960. What we can say is that if a decline in age at first marriage took place in Niger that was similar to that of Cameroon and Nigeria, of a magnitude of 1.2 years, it would not explain a change in TFR of about one to two live births.

In our exploration of some causes of fertility increase, we have almost exclusively focused on the crucial developments in the agency of young men in the decline of birth spacing. Due to the lack of reflection on women in the sources, it is unclear how the gradual abolition of slavery and the changes in kin control impacted the agency of women. Studies using the scarce material available to examine West African women's position in social hierarchies find different results depending on the region. For example, Yade (2007) argues that in countries like Senegal, women's options regarding their marital life expanded as they could maneuver into divorces and gain some degree of independence. In French Sudan and Niger, in a context of rapid socioeconomic and religious change, women were slowly becoming able to contest arranged marriages (Cooper 1997: 90–109; Peterson 2011: 172, 174–175). According to Rossi (2017), however, 20th-century gender hierarchies in Niger tilted against women as emancipation from slavery led to a 'feminization of poverty.' For Rossi (2017), men could make more of their emancipation due to higher mobility, while women were largely restricted to their home regions, where colonial and postcolonial wages remained below subsistence levels. Thus, although women could contest norms and practices around marriage, they remained under heavy mobility restrictions. Moreover, in marriage, women gained few freedoms and may have even lost some. Absolute obedience to their husbands was (still) expected in marriage; their central duty as a wife remained and may have even increasingly become that of a child-bearer (Peterson 2011: 153; Cooper 2019: 5, 299).

Conclusion

In this paper, we attempted to produce new estimates of TFR for Niger between the 1910s and the 1970s. This exercise reveals a rise in fertility rates from the 1940s, sustained until at least 1970. Our finding aligns Walters' (2021) finding for Tanzania, highlighting that similar roots may explain the phenomenon. The finding supports the view shared by some, namely that fertility rates may have been increasing before the onset of mortality decline in some sub-Saharan African contexts. We lack data to test hypotheses for why this rise in fertility took place, but we argue that medical advancements, nutritional improvements, and declines in marriage age were likely inconsequential, as infertility rates were seemingly on an upward trend until 1960. Based on ethnographic and historical literature, we posit that socioeconomic changes, which led to declines in birth spacing, were more influential in increasing fertility. Developments associated with the erosion of kinship structures and the rise of Islam possibly led to the decline of strict control over birth spacing. This decline in birth spacing likely resulted from the rising economic freedom of younger generations, thanks to the rise of labor migration, and it meant that young husbands could increasingly ignore the practice of post-partum abstinence, which was supervised more tightly in the era of strong control by kin. Moreover, as Islam spread, so did the prescription of a mere 40-day sexual abstinence after birth, which may have been increasingly adopted as a practice in Niger.

More generally, our findings shed new light on the comparison of historical fertility trends across different sub-Saharan regions. They show that Niger, despite its distinct political and religious contexts, experienced a similar rise in fertility as recorded in some former British and Belgian colonies. For instance, recent evidence for the Belgian Congo shows changes in birth intervals, which have been, among other factors, linked to missionary interventions in breastfeeding patterns.[26] Declines in birth intervals seem also to have been taking place in multiple areas on the subcontinent without clear explanations for some of these cases (Walters 2021). We believe that such declines in birth spacing were also crucial in Niger, a country where missionaries barely played a role. The question, however, of whether the main driving factors behind fertility rise are shared across the subcontinent remains unanswered, but the decline of long birth intervals seems to have been central to rises in fertility around the middle of the 20th century.

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Appendix

Table A1. Selected points, P/F ratios, and diagnostics of three relational Gompertz model fits.

Age Groups	Fit #1			Fit #2			Fit #3		
	Parity	P-point?	P/F ratio	Parity	P-point?	P/F ratio	Parity	P-point?	P/F ratio
15–19	0,457	yes		0,462	yes		0,454	yes	
20–24	1,708	yes	0,938	1,716	yes	0,935	1,718	yes	0,905
25–29	2,996	yes	0,842	3,011	yes	0,839	3,071	yes	0,812
30–34	4,063	yes	0,866	4,088	yes	0,863	4,236	yes	0,835

35–39	4,863	yes	0,803	4,901	yes	0,800	5,147	no	0,774
40–44	5,361	yes	0,790	5,412	no	0,788	5,741	no	0,762
45–49	5,515	no	0,851	5,571	no	0,849	5,937	no	0,821
Diagnostics									
	Fit #1			Fit #2			Fit #3		
α	0,145			0,138			0,078		
β	0,977			0,971			0,945		
RMSE	0,156			0,163			0,071		

Note: With the exception of the age-group 45–49, all F-points are selected in the three fits

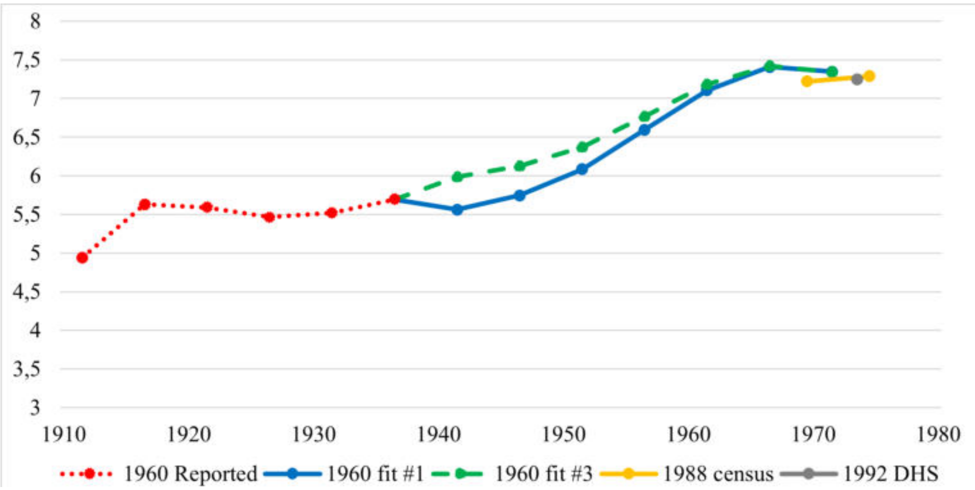

Figure A1. TFR estimates using fit #1 and fit #3
Note: Fit #2 produced TFR estimates between fit #1 and fit #3 which is why we excluded it from the graph.

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Notes

1 Defined as the average number of births a person would be expected to give over their lifetime if they were to exhibit the current age-specific fertility rates over their reproductive lifetime. It is calculated by adding up all the age-specific current fertility rates at the moment of a survey or census.

2 INSEE (1963), *Étude Démographique du Niger : 2me Fascicule*, Paris: INSEE.

3 For an overview of the debate, see Doyle (2013a).

4 Studies focusing on West Africa primarily examine post-colonial periods and focus mainly on British West Africa. See, for example, Gaisie (1968). See also Guirkinger C. and Villar P. (2022), *Pro-Birth Policies, Missions and Fertility: Historical Evidence from Congo*, in "DeFiPP Working Papers", https://econpapers.repec.org/paper/namdefipp/2204.htm, (last accessed 30 September 2024).

5 Guirkinger C. and Villar P. (2022), *Pro-Birth Policies, Missions and Fertility: Historical Evidence from Congo*, in "DeFiPP Working Papers", https://econpapers.repec.org/paper/namdefipp/2204.htm, (last accessed 30 September 2024).

6 One exception is the region of north-central Burkina Faso, where missionaries established some missions in the first half of the 20th century (Benoit et al. 1981).

7 The rise of Islam and some of the socioeconomic consequences of the rise have been highlighted by Peterson (2011) for the French Soudan in 1905-1960.

8 These populations were the focus of the 1964 survey, which, unfortunately, has different age categorizations and yields odd fertility schedules that are too unreliable to be included in the analysis. INSEE, *Étude Démographique du Niger : 2me Fascicule*, 1963, Paris: INSEE, pp. 13-17.

9 Republique du Niger, *Recensement General de la Population R.G.P. 1988 Tableaux des Données Brutes Echantillon 10%*, 1990, Niamey, Ministère du Plan.

10 Kourguéni I. A., Garba B. and Barrère B. (1993), *Niger Enquête Démographique et de Santé 1992*, Columbia, USA, Direction de la Statistique et des Comptes Nationaux/ Niger and Macro International.

11 INSEE (1963), *Étude Démographique du Niger : 2me Fascicule*, Paris: INSEE, pp. 13-16.

12 INSEE (1959), *Rapport sur la Préparation de l'Enquête Démographique par Sondage du Niger*, unpublished Report. Available at: https://www.odsef.fss.ulaval.ca/sites/odsef.fss.ulaval.ca/files/fonds_gp/niger_doc_tech_5.pdf (last accessed on 13 September 2023). INSEE, *Liste des Documents Techniques. Niger*, 1960, available at: https://ireda.ceped.org/inventaire/ressources/ner-1959-1964-onc-c1_fiches_depouillement_manuel.pdf (last accessed on 13 September 2023).

13 These tables are available on ODSEF, *Fonds Grégory-Piché*, https://www.odsef.fss.ulaval.ca/intro-fonds-gp (last accessed on 13 September 2023).

14 The age groups 80-99 and 99+ are also included but are unusable due to the different intervals used, the odd figures for TFR that they produce, and the low number of women surveyed in these age categories.

15 INSEE (1963), *Étude Démographique du Niger : 2me Fascicule*, Paris: INSEE, pp. 42-45.

16 For the age groups 50-54, …, 75-79, the reported parities are taken to be the completed family sizes.

17 United Nations, Department of Economic and Social Affairs, Population Division (2019), *World Population Prospects 2019, Online Edition. Rev. 1.* https://population.un.org/wpp2019/Download/Standard/Fertility/. (last accessed 30 September 2024).

18 Until 2000, the years for which the UN provides estimates of ASFRs by 5-year age group are roughly, 1975, 1980, 1981, 1984–1986, 1988–1992, and 1994–2000. We took the ASFRs for 1975, 1988, 1992, and 1997 and interpolated the remaining years to get a completed family size estimate for each age group found in the 1960 census.

19 Results not shown. Available upon request.

20 According to the data from the World Population Prospect, the MAC fluctuates between 28.5 and 29.7 over this period. We thus use 29 for all cohorts.

21 For a sensitivity analysis using a different fit, see Figure A1 in the appendix.

22 INSEE (1962), *Étude Démographique du Niger: 1er Fascicule*, Paris: INSEE, pp. 14-16.

23 INSEE (1963), *Étude Démographique du Niger : 2me Fascicule*, Paris: INSEE, p. 32.

24 INSEE (1962), *Étude Démographique du Niger : 1er Fascicule*, Paris: INSEE, p. 38.

25 Another related explanation could be that women who have no reported live births in their lifetime face lower long-term survival chances compared to women with two children, at least in contemporary societies (Barclay and Kolk 2019). This would mean that the proportion of infertile women would increasingly decline as we move into older cohorts because they face higher mortality. However, women with five or more births also face higher mortality chances compared to women with two births (Barclay and Kolk 2019). Given that many women in Niger would fall into that group, the effects should, to some extent, cancel each other out.

26 Guirkinger C. and Villar P. (2022), Pro-Birth Policies, Missions and Fertility: Historical Evidence from Congo, DeFiPP Working Papers, https://econpapers.repec.org/paper/namdefipp/2204.htm (last accessed 30 September 2024).

27 INSEE (1963), *Étude Démographique du Niger : 2me Fascicule*, Paris: INSEE.

28 INSEE (1963), *Étude Démographique du Niger : 2me Fascicule*, Paris: INSEE; Republique du Niger (1990), *Recensement General de la Population R.G.P. 1988 Tableaux des Données Brutes Echantillon 10%*, Niamey, Ministère du Plan; Kourguéni I. A., Garba B. and Barrère B. (1993), *Niger Enquête Démographique et de Santé 1992*, Columbia, USA, Direction de la Statistique et des Comptes Nationaux/ Niger and Macro International.

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