Analysis of Variables Associated with a Fertility Rate of Less than 4 Children per Woman in the Sikasso Circle in Mali

Balkissa Yattara¹, Mariam F. Konate², Famagan-Oulé Konate^{2*}

¹Institut de Pédagogie Universitaire (IPU), Bamako, Mali

²Centre DELTA-C, Bamako, Mali

Email: yabakad@yahoo.fr, mk6711768@gmail.com, *famagankonate@yahoo.fr

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Abstract

The objective of this research is to analyse the variables associated with a Total Fertility Rate [TFR] of less than 4 children per woman in the Sikasso circle. The study is interesting because it aims to identify the most relevant variables associated with the decline in [TFR] in the Sikasso circle. The methodology was based on desk research and a questionnaire survey that was conducted from November 2020 to January 2021. The “Household” section of the questionnaire was administered to a randomly selected sample of 270 households. The “Household” section of this questionnaire was administered to a randomly selected sample of 270 households, while the “Individual” section was administered to 394 women in these households aged 15 - 49 years or older, 79 of whom were urban and 315 rural. This quantitative survey was complemented by a logit-linear study which produced adjusted odds ratios (ORaj). These were calculated for variables with a probability value ($p < 0.05$, in bivariate analysis). Women who have had a child die have a 79% lower probability of having a [TFR] of less than 4 children compared to those whose children survive (ORaj = 0.21; $p = 0.000$; 95% CI). Women with a reproductive interval of 2 years or more have a 2.46 times higher probability of having a [TFR] of less than 4 children than those with a reproductive interval of fewer than 2 years. (ORaj = 2.46; $p = 0.005$; 95% CI). Women who can read are 1.8 times more likely to have a [TFR] of less than 4 children per woman than their sisters who cannot read. (ORaj = 1.80; $p = 0.031$; 95% CI). Thus, the relevant variables associated with a [TFR] of less than 4 children per woman are: the variables child survival, reproductive interval and education level. Considering these relevant variables will improve the effectiveness of interventions for fertility control to balance the interrelationships between population growth and economic growth.

Keywords

Analysis, Circle of Sikasso, Fertility, Mali, Total Fertility Rate, Variables, Women of Childbearing Age

1. Introduction

According to the extensive literature from the Mali Demographic and Health Surveys, Institut National de la Statistique du Mali (INSTAT, 2014: pp. 64-70; INSTAT, 2019: pp. 5, 6, 93, 135, 137), a woman has, on average, 6.3 children at the end of her fertile life. Fertility has fallen from 7.1 children per woman in 1987 to 6.3 in 2018. The proximate determinants of fertility analyzed in this work relate mainly to place of residence, education level, household standard of living, reproductive interval and the insusceptibility of becoming pregnant (due to postpartum amenorrhea, postpartum abstinence or menopause). Thus, the average number of children varies significantly according to place of residence; women in rural areas have about two more children than women in urban areas (6.8 versus 4.9 children per woman). Fertility is lower as the level of education increases. Women with secondary education or higher have, on average, 4.5 children compared to 6.8 children for those with no education. In Mali, the median inter-reproductive interval is 32.1 months. However, 23% of births still occur after an inter-reproductive interval of fewer than 24 months. The median duration of postpartum amenorrhea is 9.6 months and that of postpartum abstinence is 2.7 months after delivery. The median duration of postpartum insusceptibility is shorter among women in the District of Bamako (5.4 months) than among those in other cities (12.5 months) and in rural areas (10.9 months). The median duration of postpartum insusceptibility is shorter among women with secondary education or more (6.7 months) than among those with primary education (11.0 months) and those with no education (11.3 months). Given that, no previous study in Mali, at the level of a circle, has provided information on these variables that influence the fertility of women of childbearing age. This observation led us to conduct a study on the factors associated with a [TFR] of fewer than 4 children per woman in the circle of Sikasso. To achieve this objective, our argument is based on the general hypothesis that socio-demographic and economic factors are variously associated in a statistically significant manner with this [TFR]. The results of this research will enable the implementation of fertility control programs in this circle of Mali.

2. Review of the Literature

The literature review will focus on the levels and determinants of fertility: biological variables (natural fertility, infertility, post-partum amenorrhea, sterility and infertility); population health status (high infant mortality); political, cultural and economic variables (population policy, premarital sex, post-partum ab-

stinence, labor needs, status of women) and finally the health system (reproductive health programs).

Traditionally, the Sahel is an area of high fertility, with the average number of children per woman still above 6. In a world where most rural African economies are still based on male and female labor, without powerful tools or chemical inputs, having many children is an advantage. For, like land, women's access to labor is limited. Their offspring are therefore an essential resource. The productive value of the child for women remains essential (Bajos et al., 2000: pp. 17-39). Fertility in sub-Saharan Africa is still high, but in recent years, there has been a significant downward trend in some countries, less pronounced in others. Medical advances have led to a decline in mortality. This has led to a natural population increase in countries where fertility has remained stable. In 2012, depending on the country, the total fertility rate was 4.6 (Senegal); 4.4 (Mauritania); 4.7 (Gambia); 6.1 (Chad); 5.7 (Cameroon); 5.4 (Nigeria) (UNFPA, 2017: pp. 75, 112-114). In Mali, fertility rates increase by age group from 164 ‰ among young women aged 15 - 19 to 278 ‰ among those aged 20 - 24 before decreasing very rapidly to 24 ‰ among those aged 45 - 49 (INSTAT, 2019: pp. 5, 6, 93).

In natural fertility, each normally fertile woman can theoretically carry to term eighteen to twenty pregnancies. At an average of one birth every thirty-nine months (two years of breastfeeding, six months of delay in conception, nine months of pregnancy), in twenty-five years of reproductive life (from sixteen to forty-one years), a woman can give birth to about ten children, of whom six to eight will survive. Primary infertility (inability to achieve a pregnancy) affects an average of 5% of couples; 10% - 15% suffer from secondary infertility (inability to achieve and/or carry to term a new pregnancy). However, infertility (primary or secondary) can affect up to 50% of couples in countries with a very high prevalence of genital infections (chlamydia, gonorrhea) (<https://devsante.org/article/determinants-of-fertility>). In addition, the influence of amenorrhea and post-partum abstinence on the level of fertility is no longer in question, since according to the National Institute of Cameroon (INS, 2020: p. 103), amenorrhea offers protection against conception and its duration depends on the duration and intensity of breastfeeding. For nearly three out of ten births (29%) in the three years preceding the survey, mothers are in amenorrhea; for 21% of births in the three years preceding the survey, they are in postpartum abstinence; overall, for 36% of births in the last three years, mothers are not likely to become pregnant. The median duration of postpartum amenorrhea is 8.3 months and that of postpartum abstinence is 4.2 months after delivery. Overall, half of the women are not likely to become pregnant until 10.9 months after delivery. Breastfeeding, the third intermediate variable, also affects fertility because it prolongs postpartum amenorrhea, especially if it is full breastfeeding (without the addition of food) and if the mother breastfeeds frequently. In the absence of contraception, breastfeeding is in fact one of the most effective contraceptive

methods (Beli-lamda, 2010).

The biological variables are influenced by the health situation: the AIDS epidemic, the nutritional status of mothers and children, and above all, high infant mortality has always conditioned fertility behavior, encouraging women to have numerous pregnancies close together, which worsen maternal morbidity and mortality (<https://devsante.org/article/the-determinants-of-fertility>).

To better understand the relevance of the national population policy, it is important to understand the demographic context of Mali and its population issues. Looking back, for more than 50 years, the population dynamics in Mali has been characterized by rapid growth. From 3.5 million inhabitants in 1960, the population rose to 6.3 million in 1976, then to 9.8 million in 1998, reaching 14.6 million in the last general population and housing census (INSTAT, 2009). This dynamic led to intercensal growth rates of 2.2% over the period 1987-1998 and 3.6% over the period 1998-2009. According to Mali's Ministry of Land Use and Population, Population Projections (2016), if this trend continues, the population, estimated at 18.3 million in 2016, will reach 23.5 million in 2025 and 30.3 million in 2035, i.e. a double in 25 years.

Thus, the first population policy was adopted in 1991, as the "National Population Policy Declaration". It was revised in 2003 and in 2016. The first population policy of 1991 and that of 2003 had as their general objective the improvement of the standard of living and living conditions of the population: control of population growth, reduction of morbidity and mortality, spatial redistribution of the population, integration of international migration into the development strategy, integration of women into development, improvement of the living conditions of children and young people, promotion of human resources, coverage of food needs, protection and preservation of natural resources, and improvement of sociodemographic knowledge. Unlike the first two policies, the one adopted in 2017 is designed to contribute to the achievement of the Demographic Dividend by accelerating the demographic transition (Canning et al., 2015). To achieve this objective, it integrates emerging themes and new paradigms: social barriers to girls' schooling; gender disparities supported by low female empowerment; disparities according to the place of residence; climate change, natural disasters, armed conflicts, population shift, etc. and their repercussions on the spatial distribution of the population (Ministry of Planning and International Cooperation, 1991, 2003). These populations have not yet contributed to fertility control, as the Total Fertility Rate was 6.3 children per woman in 2018.

Mali has ratified numerous international conventions and charters relating to reproductive rights and health, including The International Convention on the Rights of the Child (ICRC) in 1990, the Convention on the Elimination of Discrimination against Women (CEDAW) in 1985 and its protocol in 2000, the Cairo Programmed of Action (ICPD) in 1994, the African Charter on Human and Peoples' Rights in 1981 and the Protocol to the African Charter on Human

and Peoples' Rights on the Rights of Women in Africa, known as the "Maputo Protocol" in 2005. At the national level, the Government has promulgated and adopted several laws or texts contributing to the implementation of international conventions. While some of these texts represented a legislative and legal advance towards greater equality between men and women and recognition of health and reproductive rights, Malian legislation remains poorly harmonized with international human rights texts. According to [UNFPA \(2017: pp. 18-22\)](#), the law on reproductive health (02-044, 24 June 2002) states that "men and women have equal rights and dignity in matters of reproductive health". Nevertheless, Mali has problems with the application of this law: insufficient dissemination of the law, lack of appropriate SRH services and persistent prejudices that limit these services to married couples.

[Deschamps et al. \(1996: pp. 22-24\)](#) already pointed out that sex education is not unanimous in society. For example, in opposition, conservatives have ignored the need to pursue contraception against unwanted pregnancy and disease, and have created programs that adopt abstinence until marriage as the only acceptable behavior. Evidence shows that these programs have neither delayed nor reduced the frequency of sex. A fourth group of HIV/AIDS education programs aimed to change the sexual behavior of adolescents without building on the successes and failures of earlier programs, while the new programs are based on theoretical approaches with proven effectiveness in other health areas.

Considered an important cultural variable, age at marriage emerges as a key determinant of differential fertility ([Canning et al., 2015: p. 106](#)). Fertility levels are influenced by several socio-economic and cultural factors. High population growth in the third world is the result of low economic development, not the cause. Fertility is a family survival strategy and therefore differs from one class to another. As shown by [Joshi and David \(2002: pp. 222-245\)](#): in developing countries, fertility is less a matter of socio-economic factors than of social variables. Industrialization and urbanization bring about changes in economic and social structures, which in turn bring about changes in family structures. Families are forced to adapt to this new environment, which is no longer compatible with the old family system. The nuclearisation of the family is beginning, particularly with the new perception of the economic and social role of the child, the formation of a couple based on free choice by individuals ([Allarabaye, 2008: pp. 71-84](#)). In general, women with a higher level of education want fewer children on average than those with a lower level of education because the cost of maternal time to be devoted to the child increases. This high cost of child-rearing, therefore, leads more educated women to have fewer children. Moreover, educated women often start childbearing late and space out births as long as possible thanks to modern contraceptive methods, whose traditional obstacles to their use have been removed and which are also easier to access for them. Increasing the duration of girls' schooling has mechanical effects on the fertility rate by de-

laying the age of marriage and the first pregnancy, and by increasing women's economic independence through access to better quality and better-paid work (Joshi & David, 2002: pp. 222-245).

Tagang et al. (2021: pp. 153-154) have summarized several economic and cultural theories on fertility. These theories underestimate the weight and resistance of traditional African values relating to gender, family and fertility. For Becker (1960), decisions to have children are aimed at maximizing their utilitarian (profit) functions, taking into account the availability of resources and the costs that might be allocated to other competing goods and services. In other words, parents have an economic incentive to have an additional child when the benefits of the child exceed the costs. However, with economic development, parents' incomes increase, their socio-economic status improves and their individual tastes and ambitions increase. As the costs of the goods and services they access also increase, they prefer to invest more in the quality rather than the quantity of children. This is accompanied by a decline in fertility. Most of the determinants of fertility have been considered at an aggregate level (population, regions, and nations). In the city of Kita, Mali, Konate and Konate (2021: pp. 20-21, 346-347), showed statistically significant associations between a woman's likelihood of being a user and variables such as level of education, level of knowledge of modern contraceptives, number of living children, ease of access to information and approval of [FP]. In other studies in the same town, they revealed that factors such as education level, access to information and religious affiliation were not statistically significantly associated with 4 or more ANC (Konate, Konate, & Coulibaly, 2021: p. 15). Josiane (2020), in the contribution of the qualitative approach to the analysis of contraceptive responsibility, revealed that the holding of discussions with the partner or male spouse on the use of responsible contraceptive practice is apprehended in a variable manner from one respondent to another. The effectiveness of the discussion depends on the couple's fertility plans, the partner's opinion on contraception (or interest in the subject), the frequency of use of the pill or the woman's perception of contraceptive management. Financing the purchase of ECPs can be a trigger for discussion.

The determinants analyzed at the level of a circle will allow this literature review to be reinforced at the local level, i.e. the circle.

3. Methodology

3.1. Scope of the Study

The circle of Sikasso, located in the region of Sikasso, constitutes the scope of this study (Figure 1):

Its geographical coordinates are 11°30'00" North, 5°55'00" West. The circle of Sikasso has a surface area of 15,375 km² and a population, in 2020, of 1,068,026 inhabitants, including 524,887 men and 543,138 women (Direction Nationale de la Population: Projections Démographiques, 2010-2035).

Figure 1. Health map of the communes and neighborhoods targeted by the survey.

The circle has 43 communes, and its population increased from 514,740 in 1998 to 734,984 in 2009, a growth rate of 2.1% between 1998 and 2009 (Institut National de la Statistique (INSTAT) du Mali (2009)). It is mainly composed of the Senoufo ethnic group, which cohabits with other ethnic groups such as the Minianka, the Gana, the Samogo, the Peulh breeders, the Soninkés and the Bambaras. The most widespread languages of communication are Senoufo and Bamanankan. The religious landscape is dominated by three faiths: Islam, Christianity and Animism. The population is predominantly rural (80%). The main activities are agriculture, forestry, trade and fishing.

In terms of health, the communes surveyed in the district have 1 reference health center [CSREF], 2 community health centers [CSCOM], and 8 private clinics, for 107 health workers, distributed as follows: doctors represent 9.2%, midwives, 12.6%, obstetric nurses, 25.3%; nursing assistants, 20.7%, midwives, 17.2%, and laboratory technicians, 14.9%. In terms of ethics, a request for the survey was sent to the village or neighborhood chiefs followed by written authorization. The free and informed consent of each woman of childbearing age [WCA] was obtained before the interview. Anonymity was respected and the information collected was kept confidential.

The data collection for this research was based on a questionnaire survey complemented by an analytical study.

3.2. Quantitative Study or Questionnaire Survey

3.2.1. Sampling Frame for the Questionnaire Survey

We carried out quantitative surveys among households in the target communes of the survey. We adopted the principle of a 3-stage survey, defined as follows:

- Primary units: communes;
- Secondary units: the concessions;
- Tertiary units: households in the concessions.

In the first stage, we selected six communes, five of which were rural and one urban.

In the second stage, three villages or neighborhoods per commune selected in the first stage were drawn at random according to a sampling step and from a random starting point.

In the third stage, 15 concessions per village or neighborhood selected in the second stage were drawn at random according to a sampling step and from a random starting point.

In the fourth stage, one household per concession selected in the third stage was drawn at random. The head of the household (male or female) was asked to complete the “Household” module of the questionnaire. The women in the household aged 15 - 49 years were asked to complete an individual questionnaire to collect their characteristics in terms of socio-demographic and economic variables.

3.2.2. Household Sample

In the quaternary units, this is done in three stages. In the first stage, all heads of household, 270 in number ($6 \times 3 \times 15$) are questioned about the members of the unit for which they are responsible. If 1/10th of the heads of household do not take part in the questionnaires for various reasons (refusal, absence), the real size of the sample is at least $[270 - (270/10)]$, i.e. at least 243 heads of household who are questioned on the socio-demographic characteristics of the members of their household.

3.2.3. Sample of Women of Childbearing Age [WCA]

The calculation of the reference population is because the 2009 census revealed that there were on average 6.5 persons per household. If this structure has not changed between 2009 and 2020, then the reference population is $270 \times 6.5 = 1755$ persons.

In the second stage, the study proposes to interview women aged 15 - 49 from this sample of 1755 people. Women in this age group are estimated to be 224,944 out of a total population of 1,068,026, or 21.06%. (DNP: Population Projections, 2020). Therefore, the female sample size is at least $1755 \times 0.210 = 370$ women, of which 74 (370×0.2) are in urban areas and 296 (370×0.8) in rural areas. The overall sampling fraction $F = 1755/1,068,026 = 1/608$.

This quantitative study provided information on the socio-demographic variables of the women interviewed (age, area of residence, religion, number of deceased children, attitudes towards family planning [FP], current level of con-

traceptive use, duration of the inter-reproductive interval; socio-economic variables (level of education and access to information). This description generated figures and percentages.

3.3. Analytical Study

3.3.1. Independent Variable and Explanatory Variables

The dependent variable chosen in this research is the level of fertility translated by a [TFR] of less than 4 children per woman. It was dichotomized according to the requirements of logistic regression. The number zero (0) corresponded to “Yes” and the number one (1) to “No”.

The independent variables or socio-demographic and economic characteristics are summarized in **Table 1** below.

3.3.2. Bivariate and Logit-Linear Analysis

This consisted of looking for associations between this level of the dependent variable and the characteristics of the predictors (independent variables) by comparing the proportions using the chi-square test. CSPRO software was used to code the data and SPSS to perform the bi-variate analyses. For this purpose, the PEARSON chi-square test at the 5% risk level was used. This step was decisive in the choice of variables to be included in the logit-linear model, under the condition of independence of each of these variables; at this stage, if two variables were related, one of them was retained for the logistic regression. For all the variables retained, the adjusted odds ratio or Odd ratio (ORaj) was calculated.

4. Analysis of the Results

4.1. Socio-Demographic and Economic Characteristics of the [WCA]

4.1.1. Socio-Demographic Characteristics

Table 2 presents the demographic characteristics of women of childbearing.

Table 1. List of explanatory variables.

Explanatory variables	Definition and measures	Expected influence
Socio-demographic and economic characteristics of women:		
a) Age	Under 25 (Yes = 0; No = 1)	±
b) Place of residence	Rural (Yes = 1; No = 2)	±
c) Child survival	no child died (Yes = 1; No = 2)	±
d) Attitude towards [FP]	Approval (Yes = 0; No = 1)	±
e) Duration of the intergenic interval	Less than 2 years (Yes = 0; No = 1)	±
f) Religion	Muslim (Yes = 0; No = 1)	
g) Ethnic group	Senoufo (Yes = 0; No = 1)	
h) Level of education	Woman knowing how to read (Yes = 0; No = 1)	±
i) Access to information on [FP]	Access to information (Yes = 0; No = 11)	±

Source: Yattara, 2020.

Table 2. Women of childbearing age by selected demographic characteristics.

Characteristics	Workforce	%
a) Age: under 35 years		
Yes	259	65.7
No	135	34.3
Total	394	100
b) Child survival: no children died		
Yes	230	58.4
No	164	41.6
Total:	394	100
c) Women living in urban areas		
Yes	64	16.2
No	330	83.8
Total	394	100
d) Positive attitude towards family planning		
Yes	108	41.4
No	241	58.6
Total	261	100
e) Duration of last inter-genital interval = 2 years		
Yes	176	56.8
No	134	43.2
Total	310	100

Source: Yattara, 2020.

Analysis of this table shows that 65.7% of women of childbearing age are under 35. Most of them (83.8%) live in rural areas and 58.4% of them reported no deceased children. We note that 310 [WCA] out of a total of 394 provided information on the length of the interval (in years) between the penultimate and the last child. Of these, most of them (56.8%) reported at least a 2-year interval. Regarding the approval of [FP], 261 women out of 394 responded to the question, of which 41.4% were in favor and 58.6% opposed.

4.1.2. Cultural and Economic Characteristics

Table 3 presents the cultural and economic characteristics of the [WCA].

We note that 51.5% of the [WCA] belong to the Senufo ethnic group, and 97.7% of them declare themselves Muslim. The proportion of illiterate women is close to 58.9% and most of them (63.2%) say they have easy access to information on family planning.

In summary, in terms of socio-demographic characteristics, these women are young and predominantly rural. Many of them disapprove of [FP]. With regard to cultural and economic characteristics, we note that these women are mostly illiterate, Senufo and Muslim.

Table 3. Cultural and economic characteristics of [WCAs].

Characteristics	Workforce	%
f) Belonging to the Senufo ethnic group		
Yes	203	51.5
No	191	48.5
Total	394	100
g) Muslim woman		
Yes	385	97.7
No	9	2.3
Total:	394	100
h) Woman who can read		
Yes	162	41.1
No	232	58.9
Total	394	100
i) Easy access to information on [FP]		
Yes	249	63.2
No	145	36.8
Total	394	100

Source: Yattara, 2020.

4.2. Fertility Level

The level of fertility of women is captured in this study by the Total Fertility Rate. It is obtained from the total fertility rates by age group. It corresponds to the average number of children that a woman would give birth to at the end of her fertile life, if the fertility rates of the moment remained unchanged.

Figure 2 shows the distribution of women of childbearing age according to the number of children per woman (less than 4 children or 4 children and more).

The study revealed that most women in the sample (62.2%) have a [TFR] of less than 4 children per woman.

4.3. Bi-Variate Analysis

As a reminder, the Chi-square test is used to compare two proportions. It is significant when its probability (p) is less than 0.05 and the calculated value is higher than its theoretical value (3.84) for a degree of freedom = 1. The results of the Pearson Chi-square tests are shown in **Table 4**.

With regard to the demographic characteristics of the [PAF], it can be seen that all the demographic characteristics of the [PAF] are significantly associated with a [TFR] of less than 4 children per woman in the circle of Sikasso (**Table 4a-i**).

Figure 2. Distribution of [WCA] by average number of children per woman. Source: Yattara, 2020.

Table 4. Chi-square test results: [TFR] by and demographic, economic and cultural factors of [WCA].

Factor	Calculated Pearson Chi-square value	Pearson's Chi-square theoretical value	Number of degrees of freedom (nddl)	Probability (<i>p</i>) at the error threshold: 5%
Socio-demographic factor				
a) Age	5.854	3.84	1	$P = 0.02^{**}$
b) Child survival	44.548	3.84	1	$p = 0.000^{**}$
c) Place of residence	9.957	3.84	1	$p = 0.000^{**}$
d) Attitude towards [FP]	4.490	3.84	1	$p = 0.03^{**}$
e) Duration of last inter-genital interval	3.921	3.84	1	$p = 0.05^{**}$
Economic and cultural factor				
f) Level of education	7.843	3.84	1	$P = 0.01^{**}$
g) Access to information on [FP]	4.489	3.84	1	$p = 0.03^{**}$
h) Ethnic group	0.614	3.84	1	$P = 0.43$ ns
i) Religion	0.079	3.84	1	$p = 0.078$ ns

******: significant influence at the 5% level. **Ns** = non-significant influence at the 5% level. Source: Yattara, 2020.

The age of women is significantly associated with a [TFR] of less than 4 children per woman at the 5% threshold. The results of the chi-square test give a number of degrees of freedom (ddl) equal to 1 and the “two-sided asymptotic

significance” or probability (p) is 0.02 less than 0.05. We also note that the calculated value of the chi-square (5.854) is clearly higher than its theoretical value (3.84). We therefore accept the hypothesis of an association between the two variables (**Table 4a**).

The association between women’s fertility level and child survival is significant at the 5% level. Women who have had no deceased children are more likely to have a [TFR] of less than 4 children per woman than those who have had at least one deceased child. Thus, the calculated chi-square value (44.584) is significantly higher than its theoretical value (3.84) and the probability of the chi-square ($p = 0.000$) is less than 0.05. We, therefore, accept the hypothesis of a statistically significant association between fertility level and child survival (**Table 4b**).

The place of residence is significantly related to the level of fertility of women at the 5% threshold. The chi-square test at the 5% threshold reveals that its calculated value (4.490) is higher than its theoretical value (3.84) and its probability ($p = 0.05$) is equal to 0.05. Therefore, we accept the hypothesis of a statistically significant link between fertility level and child survival (**Table 4c**).

As for women’s attitude towards family planning, the results of the chi-square test show that it is statically related to women’s fertility level. In other words, with a $ddl = 1$, the calculated chi-square value (4.490) is significantly higher than its theoretical value (3.84). Moreover, its probability $p = 0.03$ is lower than 0.05 (the threshold). Therefore, we accept the hypothesis of a statistically significant link between the two variables (**Table 4d**).

For its part, the Inter-generational interval (between the last two births) directly influences the level of fertility of women. According to the results of the chi-square test, there is a statistically significant link between the two variables at the 5% threshold. With a number of degrees of freedom ($ddl = 1$), the calculated chi-square value (3.921) is higher than its theoretical value (3.84) and its “two-sided asymptotic significance” or probability (p) is equal to the 0.05 threshold. Therefore, we accept the hypothesis of a link between the two variables (**Table 4e**).

In terms of economic and cultural variables, two variables are not statistically significantly linked to the level of fertility. These are ethnicity (**Table 4h**) and religion (**Table 4i**). The results of the chi-square test indicate calculated chi-square values (0.614 for ethnicity and 0.079 for religion) lower than the theoretical value (3.84) for a $ddl = 1$. Also their probabilities: $p = 0.43$ and $p = 0.078$ respectively for ethnicity and religion are greater than 0.05. Therefore, we reject the hypothesis of linkage and accept the hypothesis of independence between the level of fertility and these two independent variables. However, two variables are statistically significantly related to the level of fertility. These are level of education (**Table 4f**) and ease of access to family planning information (**Table 4g**). For the level of education, for a number of degrees of freedom ($ddl = 1$), the “two-sided asymptotic significance” or probability (p) is 0.01. This is below the

0.05 threshold. It can also be seen that the calculated chi-square value (7.843) is clearly higher than its theoretical value (3.843). Therefore, we accept the hypothesis of a link between the level of education and the level of fertility (**Table 5i**). And for ease of access to information, we note that the Chi-square test is positive because its calculated value (7.843) is clearly higher than its theoretical value (3.84) for a $ddl = 1$, but also, its probability $p = 0.01$ is lower than 0.05. Therefore, we accept the hypothesis of a statistically significant link between the variables in question.

4.4. Multivariate Analysis

In multivariate analysis, the results of this research did not reveal a statistically significant relationship between the [TFR] and women's independent variables such as age, residence and [WCA] attitude towards [FP]. Indeed, the probability values 0.356; 0.410; 0.134 respectively for age, residence and attitude towards family planning are all >0.05 (at the 5% threshold): **Table 5** below

Table 5. Results of the multivariate analysis, at the 5% level, of the influence of women's independent variables on the level of fertility.

Variables	Adjusted Odds Ratios (ORaj)	$p > Z $	$\alpha = 5\%$
a) Child survival: no children died			
Yes	reference	reference	reference
No	0.21	0.000	**
b) Durée du dernier intervalle inter-génésique: au moins 2 ans			
Yes	reference	reference	reference
No	2.46	0.005	**
c) Woman who can read			
Yes	reference	reference	reference
No	1.80	0.031	**
d) Age: under 35 years			
Yes	reference	reference	reference
No	1.36	0.356	Ns
e) Women living in urban areas			
Yes	reference	reference	reference
No	1.46	0.410	Ns
f) Positive attitude towards family planning			
Yes	reference	reference	reference
No	1.620	0.134	Ns

** : Significant influence at the 5% level. Ns = non-significant influence at the 5% level.
Source: Yattara, 2020.

In contrast, the other factors (child survival, length of the last intergenerational interval and education level) showed statistically significant associations with the probability of women having a [TFR] of less than 4 children per woman. Thus, women who had recorded at least one deceased child were 79% less likely to have a TFR of less than 4 children per woman than those who had not recorded a deceased child, and this was statistically significant (ORaj = 0.21; CI (95%). Also, women who did not observe an intergestational interval of at least 2 years were 2.46 times more likely to have a TFR of less than 4 children per woman than those who observed at least 2 years, and this was statistically significant (OR = 2.46; CI (95%)). Women who could not read were found to be 1.8 times more likely to have a synthetic index of less than 4 children per woman than those who could read, and this was statistically significant (ORaj = 1.80; CI (95%).

5. Discussion

In bivariate analysis, the results of this research revealed non-statistically significant relationships between the total fertility rate and variables such as ethnicity and ethnicity. In other words, in the cercle of Sikasso, the social value of the child does not depend on ethnicity or religion. In this respect, according to M. Allarabaye (2008: pp. 111-114), these results can be explained in two ways: migrants adapt their fertility behaviour to that of the host societies, or they conform to the norms and values on fertility that they internalised during their childhood in their societies of origin.

Also in bivariate analysis, the study revealed statistically significant relationships between the total fertility rate and socio-demographic variables such as age groups, place of residence, attitude towards [FP] and reproductive interval length. In this regard, according to the results of the *Institut National de la Statistique du Mali* (2019: pp. 159, 131, 133), the highest level of fertility is in the 20 - 24 age group (278 ‰). From the age of 25 onwards, the fertility rate tends to decrease to a much lower level at 40 - 44 (97 ‰). Urban women have a lower level of fertility than rural women (4.9 children versus 6.5 children per woman). This difference in fertility levels between urban and rural areas is observed in all age groups. The use of contraception helps to avoid unwanted or unplanned pregnancies and prevents high-risk pregnancies. Contraception also contributes to the improvement of maternal and child health. Thus, Bankole (2015: pp. 225-229) presented primary conclusions from the data he presented. Although fertility remains high in sub-Saharan Africa and overall contraceptive use is low, it is clear that modern contraceptive use, in particular, has played an important role in preventing rates from being even higher. A woman's favourable attitude towards [FP] was found to be positively correlated with this [TFR]. Their effects are fully in line with what was expected and this confirms the thesis of Bongaarts (1978: pp. 105-132).

Both in bivariate and multivariate analysis, the results of this research revealed

statistically significant relationships between the total fertility rate and variables such as child survival, the length of the reproductive interval and the educational level of the [TFR]. In this regard, *Institut National de la Statistique (INSTAT) du Mali* (2009: pp. 5, 6, 93, 135, 137) pointed out that the number of children a woman has depends on the interval between births and her reproductive capacity. The average number of children per woman decreases with increasing educational attainment. It decreases from 6.8 among those with no education to 5.9 among those with primary education and to 4.5 among those with secondary or higher education.

6. Conclusion

The study was limited because the data collected was largely based on self-reporting by the women surveyed, a situation that could lead to observational bias despite the investigators' efforts to minimize this source of error.

The methodological approach was based on a literature search, a questionnaire survey on a sample of at least 370 [WCA] and bivariate and multivariate analysis.

The study revealed that most women in the sample (62.2%) have a [TFR] of at least 4 children per woman. It indicated a significant effect of variables such as age, area of residence, attitude towards [FP], length of the reproductive interval and access to information on [FP] on the total fertility rate of at least 4 children per woman in bivariate analysis (but their effect was insignificant in multivariate analysis). In multivariate analysis, the results of this research revealed statistically significant associations between the total fertility rate and variables such as child survival, length of the reproductive interval and the educational level of the [PAF]. However, variables such as ethnicity and religion are not associated with this [TFR]. These results confirm the working hypothesis that "socio-demographic, cultural and economic factors are variously and significantly associated with this [TFR]". The results of this research will make it possible to set up fertility control programs in this district of Mali.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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