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Determinants of Childbirth Choice in Rural Senegal: Mixed-Methods Analysis Using Data from the Niakhar Demographic Surveillance System

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Abstract

Background: Faced with high rates of home births and maternal mortality, the Senegalese government has made enormous efforts to improve the provision of care. However, the use of health facilities for home births remains a challenge.

Methods: The study used a mixed-methods approach. Data from women who gave birth in the Niakhar observatory area between 1983 and 2020 were used, and chi-square tests and qualitative analyses were performed.

Results: The results show that all variables are significant at the 0.5% level. Women giving birth at home were those who were married, griottes, poor, uneducated, aged 35-49, had given birth more than four times and had had fewer than two antenatal consultations. Qualitative results showed that physical condition, lack of understanding, privacy concerns of older women and economic barriers all contributed to the increase in the phenomenon.

Conclusion: Health problems in rural areas are complex and require a more integrated approach. Determinants can counter public policies. Therefore, when developing health policies, it is essential to integrate measures adapted to the type of population.

Keywords: Maternity, home delivery, health determinants, Niakhar

Introduction

In rural Africa, access to care during maternity is subject to several complex factors that guide the choice of birthplace over and above the quantity and quality of care offered. Today, if maternal mortality worldwide in 2020 is 800 women per day, 95% of these deaths occur in low- and middle-income countries (World Health Organization [WHO], 2023). Indeed, this North/South imbalance is the product of a set of mechanisms linked, on the one hand, to the supply of care dictated by public health policies that are still unsatisfactory and, on the other hand, to the complexity of the structural determinants of health that influence the use of care during pregnancy or childbirth. In Senegal, healthcare provision is structured in the form of a pyramid, with each level having responsibility commensurate

with its rank and integrated services. The top level comprises level 3 public health establishments, the middle level 2 establishments, and the peripheral level comprises health posts and health centers. This healthcare system structure is modeled on territorial architecture, where each healthcare facility corresponds to a territorial level and, therefore, to a well-defined area of responsibility.

Despite the disparities between urban centers and rural areas, and the inadequacy of healthcare provision in relation to WHO standards, Senegal's health map has improved considerably over the last ten years. In 2022, the country had 2,197 health huts, 1,584 health posts, 74 type 1 health centers, 40 type 2 health centers, 9 EPS 1, 18 EPS 2 and 13 EPS 3. However, the availability of health structures is not always accompanied by access to care, particularly during pregnancy and childbirth, especially in rural areas. In the Kédougou region, a study by Malick Kanté and Gilles Pison on the impact of the creation of a modern hospital on people's behavior revealed that, despite the availability of health infrastructures, people's behavior had not changed. Hospital attendance for prenatal visits and deliveries remains low and maternal mortality is high.

So, what are the determinants of the use of health facilities for childbirth in rural areas? In the Niakhar demographic and health monitoring system, located in the Fatick region of Senegal, care is provided by four health posts, all of which have maternity wards, serving a population estimated at 52,700 as of January 1,

2021 (Delaunay et al., 2020). Although mortality has decreased considerably in this area of 30 villages, home deliveries are still frequent. Which structural factors continue to influence the decision to give birth at home in rural areas? This study analyzes the choice of place of birth from the perspective of structural determinants of health.

Theoretical Framework of the Study and Operational Definition of Variables

The health determinants used in this study were drawn from the WHO (2010) conceptual framework, as presented in the Conceptual Framework for Action on the Social Determinants of Health documents. The variables used in our analysis were related to marital status, prenatal consultations, age, parity, women's economic situation, level of education, and caste.

Marital Status and Social Norms. Marital status is defined as a person's legal or socially recognized status: single, married, widowed, divorced, cohabiting, etc. Marital status provides insight into autonomy in accessing healthcare and highlights the vulnerability of unmarried women, especially in societies where pregnancy outside marriage is socially stigmatized. This stigma can lead some women to avoid healthcare facilities during pregnancy because of fear of judgment or discrimination (Duong, 2004).

Impact of Prenatal Consultations. Prenatal consultations are medical visits conducted during pregnancy to ensure

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proper progression and to monitor the health of both the mother and fetus. In many studies, the number of antenatal care visits (ANCs) is a variable that explains the occurrence of home births. Some studies have shown that the relative risk of home birth decreases as the number of ANCs increases.

Age and Parity. Age and parity are closely linked, as the number of children is generally proportional to a woman's age. Both factors strongly influence the use of maternal health care services. Older women, often multiparous, accumulate experience in maternity and healthcare service use (Burgard, 2004). This experience provides them with greater confidence in deciding which care to seek. Consequently, some women may perceive prenatal consultations or assisted childbirth as less necessary and may be more likely to avoid healthcare services than younger or primiparous women, who tend to seek medical support more readily (Navaneetham, 2022; Magadi, 2007).

Economic Vulnerability. This variable reflects socioeconomic position or power, which is a key determinant of health. This is important because it indicates an individual's place within the social hierarchy (Mackenbach, Gunning-Schepers, 1997). In some studies, economic position is proxied by occupation, which often reflects social status, income, and knowledge (Galobardes et al., 2006).

Education Level and Health Literacy. Education is a widely used indicator in epidemiology and public health, as it informs not only the individual's

background but also the socioeconomic characteristics of their parents (Jong-wook, 2005; Tarlov, 1996; Graham, 2004). It reflects the material and intellectual resources, knowledge, and skills acquired through formal education.

Caste and Socio-cultural Hierarchy. Caste refers to social rather than biological categories. Caste, race, and ethnicity denote social groups that share cultural heritage passed down through generations (Krieger, 2001). Differences based on race, caste, or ethnicity may underlie discriminatory practices in many countries. Belonging to these groups may lead to exclusion or marginalization, affecting an individual's social status, opportunities, and life and treatment trajectories (UNDP, 2005; Dedman, 2001).

Materials and Methods

This study was conducted at the Niakhar Demographic and Health Observatory, a former scientific and technical research facility in Senegal located in the central part of the country (see Figure 1), with a population whose relevant migration, education, demographic, and population health indicators are monitored over a very long period. The observatory provides longitudinal data in rural areas, making it possible to accurately observe and calculate the evolution of trends in demographics, health, the economy and among other things.

This research adopted a mixed research design that combined quantitative and qualitative approaches. This method provides a more comprehensive answer
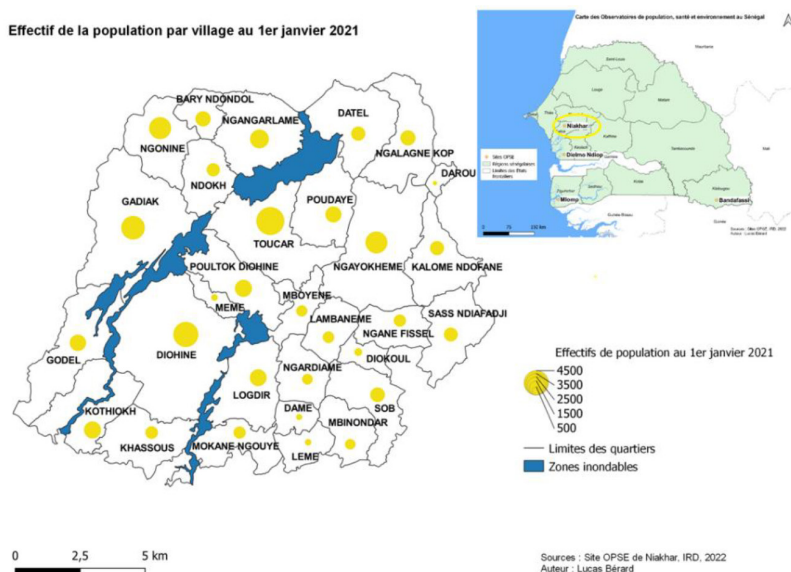
to the research question being addressed (Creswell et al., 2017). The qualitative study was carried out to clarify and improve the results obtained in the quantitative study. A mixed sequential explanatory model (Fortin, 2010) was adopted. The selection of quantitative variables and qualitative themes was guided by the WHO's (2010) conceptual framework on social determinants of health. The mixed sequential explanatory design allowed for a comprehensive understanding of how these structural factors influence women's choices and behaviors regarding their place of birth in the rural Niakhar context. We used the Niakhar Demographic and Health Surveillance System birth database, which began registering all births in 1983. The database we used runs from 1983 to 2020.

Pearson chi-square tests were conducted on all the variables available in the observatory database and relating to women who have given birth at least once. These variables are the woman's economic situation, age, parity achieved, level of education, marital status, number of prenatal consultations carried out, and socio-cultural category. The variables significant in this test were the target of the qualitative survey. Individual interviews were conducted using a guide submitted to the women who had recently given birth at home. Qualitative data collection took place 15 days after birth to avoid disrupting christening festivities. A total of 46 interviews were conducted. Data were collected in the local language (Serrer) (Becker et al.,1999) and transcribed into French. The interviews were then coded, and thematic analyses were carried out on the data, focusing on factors blocking women's use of healthcare during pregnancy or childbirth by targeting the variables listed above.

Figure 1

Location of the Niakhar Observatory

Results

The number of women who have given birth at least once showed an uneven distribution across different variables. Married women accounted for 84.99% of those who had given birth in the marital status category. 80.43% had attended three or fewer prenatal consultations during pregnancy. The 20-34 age group accounted for 65.65% of deliveries. Women with four or more children accounted for 59.43% of the population. Poor women accounted for 70.39%, those with no schooling for 69.50%, and farmers for 89.28% (Table 1).

Variables	*Workforce*
Marital status %	
Single	618 (14.85 %)
Divorced	6 (0.14 %)
Married	3535 (84.99 %)
Number of prenatal consultations %	
> 2	963 (19.56 %)
<= 3	3959 (80.43 %)
Age group %	
[<=20]	590 (12.03 %)
[20-34]	3219 (65.65 %)
[35-49]	1094 (22.31 %)
Parity achieved %	
1	689 (14.97 %)
[2-3]	1178 (25.59)
[4 and +]	2735 (59.43 %)
Economic well-being %	
Poor	3535 (70.39 %)
Medium	619 (12.32 %)
Rich	868 (17.28)
Level of education %	
Primary	781 (15.89 %)
Middle Secondary	537 (10.93 %)
Koranic	163 (3.31 %)
University	17 (0.34 %)
No schooling	3415 (69.50 %)
Women's socio-cultural category %	
Farmers	4143 (89.28 %)
"Tiedo"	235 (5.06 %)
"Griotte"	201 (4.33 %)
Artisan	26 (0.56 %)
No "Sereer"	35 (0.75 %)

Structural Determinants of Health in the Choice of Place of Birth

To highlight the structural determinants of the choice of place of birth, a Pearson's chi-square test was applied between the variables retained as determinants and the woman's place of birth variable (delivery at the health post or home). Bivariate analysis showed that all variables retained in the analyses were significant at the 0.5% level, with a p-value of <0.001 (Table 2).

The Influence of Socio-Demographic Determinants

Several sociodemographic factors significantly influenced women's choice of place of birth in the Niakhar Demographic Surveillance System. Marital status, for instance, showed that married women had a higher percentage

of home births (31.26%) compared to single and divorced women. Qualitative interviews revealed that this difference is linked to the physical fitness that married women tend to maintain through household activities during pregnancy, enabling them to give birth at home more easily. In contrast, single women often prefer health facilities for childbirth to avoid the risks associated with unassisted deliveries, especially as they may lack spousal support. One respondent noted, "*Single women often give birth at the health post because they do not want to take the risk, as unassisted childbirth is very complicated for a pregnant woman who does not live with her husband. In the 'Sereer' tradition, housewives who become pregnant can easily give birth at home, as long as they were working during the pregnancy. Working during pregnancy enables them to maintain a sufficient level of physical fitness to give birth quietly at home, unlike single women who don't really have any household chores to do (50 years, 8 home births)*."

Age also plays a crucial role in the choice of birthplace. Older women, especially those aged 35–49 years, had the highest proportion of home births (37.20%) compared with younger age groups. The interviews suggested that older women face social and psychological barriers related to their age when attending health facilities. Given that nurses at health posts tend to be younger and most pregnant women are aged 20-34, older pregnant women reported feeling uncomfortable attending prenatal visits or giving birth in such settings, fearing judgment, or loss of privacy. One participant explained, "*We have a complex about going to the health post because of our age. For example, a woman our age who becomes pregnant runs the risk of being pregnant at the same time as women in her neighborhood who may even be the same age as her children. As a result, she certainly won't want to go to the health post for prenatal visits or for childbirth at the risk of running into them, or even of being treated by younger midwives, because you know that in the Serer environment, women are very concerned about their image and their privacy (47 years old, multiparous, 5 home births)*."

Education level is another important determinant. Women with no schooling had the highest rates of home births (34.46%), followed by those with Koranic education (31.28%). The qualitative data supported the notion that education increases awareness of the risks of home births and the benefits of assisted delivery. This knowledge, acquired through formal schooling, appears to encourage women to give birth to healthcare facilities. One interviewee stated, "*I prefer to give birth at the health post because there the nurses and midwives do what is necessary for our well-being. For example, at the health post, we are prescribed many medicines that protect us and our newborn, whereas here at home, we have no assistance beyond the old mothers with their traditional plants and roots with medicinal virtues, of dubious effectiveness (32 years, 7 home births)*."

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The Influence of Determinants Linked to the Care Experience

Experience and perceptions of healthcare play a significant role in the choice of place of birth. An important factor was the number of prenatal consultations attended. Women who had attended fewer than three antenatal clinics were more likely to give birth at home (54.51%) than those who had attended three or more clinics. Qualitative data indicate that prenatal consultations are beneficial for women who understand their importance, and these women tend to choose health facilities for childbirth. As one woman explained, "*The consultations help us a lot to know where we stand with our pregnancy. Whether our baby is doing well, and sometimes even the exact week of our delivery. Generally speaking, if we don't do the consultations properly, the nurses can refuse to welcome you for the birth (34 years old, multiparous, no home birth)*."

Parity and prior childbirth experience also influence birthplace decisions. Multiparous women, who had given birth four or more times, showed the highest rates of home births (36.12%) compared to women with fewer births. The qualitative findings suggest that women who are more experienced and older often find it inconvenient or unnecessary to visit health facilities, especially when assisted by younger professionals. One participant shared, *"My last two deliveries were at home, and I did not have any major problems, because each time, right after the birth, I was taken to the nearest health post for treatment. Giving birth at a health post and at home does not make much difference. On the contrary, in the health post, the nurse can be unpleasant with you, depending on her mood. In any case, our mothers and grandmothers didn't give birth in healthcare institutions (33 years old, multiparous, 2 home births)."*

Factors Associated with Socio-Cultural and Economic Characteristics

Economic vulnerability plays a central role in the decision to give birth at home. Women classified as economically poor were more likely to have home births (33.91%) than those with average or higher levels of economic well-being. Qualitative findings revealed that this economic fragility, particularly prevalent in rural areas where women have limited income-generating opportunities, significantly constrains their access to institutional care. As childbirth services are often not free, the financial inability to afford care pushes many women to resort to home births as a default option. As one participant noted: "It's my husband who supports me for all my needs, but often I'm forced to manage my healthcare needs on my own for lack of household resources, and that's the main cause of my many home births (35 years old, multiparous, uneducated, 5 home births)." Beyond economics, cultural and caste-based hierarchies also shape birth practices. In the Niakhar system, reflective of broader Serer social structures, caste affiliation influenced both social standing and access to resources. Home birth rates were notably high among peasant women (31.71%) and griots (31.34%). These groups often have

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limited access to health infrastructure and rely on traditional norms. In some communities, reliance on traditional birth attendants remains the norm, either due to trust, habit, or restricted mobility. As one griotte woman explained, "*We are not in the habit of going to give birth because we can easily give birth with the help of a* *traditional birth attendant (41 years old, 'griotte' woman, multiparous, 7 home births)."*

Table 2

Bivariate Analysis of Maternity Location According to Selected Variables.

Variables	Delivery at the health center	Home delivery	P-value
Marital Status			
Single	493 (79.77 %)	125 (20.22 %)	
Divorced	5 (83.33 %)	1 (16.66 %)	<0.001
Married	2558 (67.94 %)	1177 (31.26 %)	
Number of prenatal consultations %			
> 2	438 (12.85 %)	525 (54.51 %)	<0.001
<= 3	2968 (74.96 %)	991 (25.03 %)	
Age group %			
[<=20]	483 (81.86 %)	107 (18.13 %)	
[20-34]	2223 (69.65 %)	996 (30.94 %)	<0.001
[35-49]	687 (62.79 %)	407 (37.20 %)	
Parity achieved %			
1	566 (82.14 %)	123 (17.85 %)	
[2-3]	818 (69.43 %)	360 (30.56 %)	<0.001
[4 et +]	1747 (63.85 %)	988 (36.12 %)	
Economic well-being %			
Poor	2270 (66.08 %)	1165 (33.91 %)	
Medium	479 (77.38 %)	140 (22.61 %)	<0.001
Rich	657 (75.69 %)	211 (24.30 %)	
Level of education %			
Primary	569 (75.41 %)	212 (27.14 %)	
Middle secondary	464 (86.40 %)	73 (13.59 %)	
Koranic	112 (68.71 %)	51 (31.28 %)	<0.001
University	14 (82.35 %)	3 (17.64 %)	
No schooling	2238 (65.53 %)	1177 (34.46 %)	
Socio-cultural category of women			
Farmers	2829 (68.28 %)	1314 (31.71 %)	
"Tiedo"	193 (82.12 %)	42 (17.87 %)	
"Griotte"	138 (68.65 %)	63 (31.34 %)	<0.001
Artisan	20 (76.92 %)	6 (23.07 %)	
No "Sereer"	30 (85.71 %)	5 (14.28 %)	

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Table 3

Integrated Summary of Quantitative and Qualitative Results on the Determinants of Choice of Place of Birth

Variable	Quantitative results	Qualitative results	Interpretative integration
Marital status	Married women have a higher rate of home births (31.26%) than single or divorced women.	Married women, who are often more physically active, feel able to give birth at home. Single women prefer health centres to avoid the risks associated with a lack of support.	Marital status influences the place of birth, combining perceived physical condition with social norms. Married women, supported by traditions that value robustness, opt for home births.
Prenatal consultations	Women who attended more than 2 antenatal visits were more likely to give birth at home (54.51%) than those who attended 3 or more.	Prenatal consultations are seen as a useful way of monitoring pregnancy. However, an insufficient number of consultations can lead to refusal of admission for childbirth in health centres.	The frequency of antenatal visits influences the place of birth. Regular attendance favours delivery in a health facility, while limited attendance can lead to home births. This is due to the level of knowledge of the state of pregnancy and the valuable advice given by health workers to women who attend all their consultations.
Age	Women aged 35 to 49 have the highest rate of home births (37.20%).	Older women feel uncomfortable visiting health centres, fearing that they will meet younger women or be treated by younger midwives.	Age influences the place of birth due to social considerations and personal perceptions. Older women often prefer to give birth at home to avoid situations perceived as uncomfortable or embarrassing, especially if the midwives in charge of them are very young.
Parity	Women with four or more children had the highest rate of home births (36.12%).	Multiparous women feel experienced and have little interest in giving birth in health institutions, preferring the familiarity of giving birth at home.	Previous childbirth experience increases multiparous women's confidence in their ability to give birth at home, thereby reducing their reliance on health facilities.
Economic situation	Poor women have a higher rate of home births (33.91%) than those of average or high economic status.	Financial constraints limit access to healthcare, forcing some women to give birth at home because they do not have the means to cover the costs of institutional delivery.	Economic vulnerability is a determining factor in the choice of place of delivery, as the costs associated with health services are prohibitive for some women.
Level of education	Women with no formal education had the highest rate of home births (34.46%), followed by those with a Koranic education (31.28%).	Education leads to a better understanding of the risks associated with home birth and the benefits of professional care, encouraging educated women to prefer healthcare facilities.	Level of education influences decision-making about where to give birth, with educated women more likely to choose health facilities due to a better understanding of maternal health issues.
Socio-cultural category	Farm women had a home birth rate of 31.71%, followed by griotes with 31.34%.	Cultural norms and traditions influence the choice of place of delivery, with some socio-cultural groups favouring home births with the help of traditional matrons.	Socio-cultural affiliations shape childbirth practices, with some communities favouring traditional methods and home births because of specific cultural values and social structures.

Discussion

In the Niakhar demographic and health monitoring system, the issue of health has been a longstanding concern. In fact, the establishment of this research infrastructure with the succession of community health projects meant that awareness, particularly of health aspects, was considered very early in the observatory. However, care provision has evolved rapidly over time. The observatory was served by four health posts, two of which (private and public) are in the village of Diohine, one in Ngayokhème and one in Toucar. These health posts are very old. The oldest post is Toucar, created in 1953, followed by the private post in Diohine (1957), that is, before independence, Ngayokhème (1983), and finally, the public post in Diohine, inaugurated in 2014 (Diallo, (2022). This provision, which has evolved timidly, has faced challenges over time linked to the dilapidated state of the infrastructure and the difficulty of having qualified nurses on-site, particularly in Ngayokhème. However, it should be noted that the first three health posts were rehabilitated.

The Toucar post was rehabilitated by villagers living in France, and the Diohine private post by the Catholic congregation '*The Daughters of the Holy Heart of Mary*' (Diallo, 2022). These refurbishments have given these health posts much greater operational capacity, with maternity wards that can accommodate many more patients. The rehabilitation of these health posts and the establishment of the Diohine Health

Post have significantly contributed to improving healthcare provision in the area, which comprises 30 villages and a population of 52,700 as of 2021. However, although the home delivery rate has gradually fallen from 74% in 2003-2007 to 49% in 2013-2017, we found that 2017, analyzed in isolation, shows that the home delivery rate has remained at 43%. It should also be noted that the average number of children per woman fell from 8 in 1984 to 4.5 in 2020, and the average rate of home births remained steady at 20%. However, these figures mask disparities in the use of maternity facilities for childbirth, with rates varying widely from village to village, with the highest rate of 53%. In addition, although the long-standing research program in Niakhar and improvements in health care have helped reduce maternal mortality and unattended births, many structural determinants remain an obstacle. Moreover, our results are similar to those of a study carried out in Cameroon, where the authors questioned the relevance of explaining healthcare utilization by geographical accessibility (Beninguisse, 2003).

Similarly, in Burundi, research aimed at analyzing home births, despite the availability of free care, showed that such births were linked to the perception of risk, the traditional midwife's role in rural areas, and the woman's lack of autonomy (Nkurunziza, 2015). Several studies have highlighted the influence of cultural and religious factors on the use of healthcare services, particularly during maternity. Indeed, women attached to their cultural

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values are reluctant to use the services of health institutions during childbirth, whose practices are far removed from their cultural values. Therefore, the use of healthcare facilities would be at odds with respect to the customs and ceremonies surrounding childbirth. In particular, the symbolism associated with the return of the remains of childbirth, burial of the placenta, and respect for the privacy of the woman giving birth is very marked in rural areas, where the level of schooling remains very low (Kabakian-Khasholian et al., 2000; Diallo, 2022).

In Senegal, a study in Malicounda showed that women's living environments and social positions influence their experience of motherhood and their use of healthcare (Faye, 2008). In the Niakhar Demographic and Health Surveillance System (SSDS), a study on the use of health services by the general population showed that the main factors determining care use are cost, availability, social structure, community beliefs, and cultural perspectives, which also exert a determining influence on care-related decisions and behaviors (Sandberg et al., 2019). An anthropological and medico-social study of health in developing countries argued that community patterns of health service use are the product of predisposing individual, economic, and social factors (Jewkes et al., 1998). In summary, these findings suggest that efforts to analyze maternity, particularly in rural areas, should focus on the determinants of antenatal care utilization beyond the simple factor of care availability. This study, carried out in rural Senegal, in the Niakhar demographic and health surveillance system, on a population estimated at 52,700 inhabitants on January 1, 2021, shows, in general, trends in the use of care during maternity in rural Senegal, which are far removed from the standards set by the WHO. This study provides a basis for understanding maternity-related issues and the variables influencing women's maternity care behavior.

Conclusion

Maternal and child health are prominent in the implementation of public policies in Senegal. Thus, the 2019-2028 national health development plan aims to achieve quality curative, preventive, and promotional care accessible to all strata of society without any form of exclusion and where an economically and socially productive level of health is guaranteed. However, these efforts do not consider the structural determinants of health, which, in rural areas, condition people's experiences and which, coupled with traditional healthcare provision, still stand up as an alternative and undermine the efforts made. In this context, the introduction of free care related to pregnancy and childbirth appears to be imperative for reducing the number of home births. In fact, in generally poor rural areas, free care, accompanied by effective awareness-raising about the consequences of home births, would help break down the barriers linked to these structural determinants and would be a major asset. Future research into maternal and child healthcare should focus on the impact of a health insurance system

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compared with the mere presence of a healthcare institution.

Limitations of the Study

The main limitation of this study is that it remains descriptive in many respects. The distribution of home births over the years gives an idea of temporal dynamics, and the qualitative data, coupled with statistical tests, provide a solid basis for identifying the determinants of these births. However, as mentioned above, the results remain descriptive. A more in-depth analysis using regression models would be a relevant follow-up to better assess the factors associated with home births in rural Senegal.

Conflicts of interest: None

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