



Determinants of Childbearing Age Women's Reliance on Skilled Birth in Benin: Secondary Data Analysis Based on the Fifth Demographic and Health SurveyA

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Abstract: Recourse to skilled birth attendance is known for contributing to a better outcome of pregnancy and childbirth. The purpose of this study was to examine the determinants of skilled birth attendance in Benin. This was a cross-sectional study that involved performing a secondary analysis using data from the fifth Demographic and Health Survey. The study population was women of childbearing age successfully surveyed, usually residing in the households visited, and having had at least one live birth in the five years preceding the survey. The dependent variable was the assistance of a skilled attendant for the last delivery (Yes vs. No). Woman, household, and environmental characteristics were also entered. Multivariate logistic regression was performed to identify the factors that determine births attended by skilled professionals. Overall, 8,816 women were included in the study. Of the women surveyed, 79.39% (95% CI = 77.25-81.38) had delivered with the assistance of a skilled attendant at the end of their last pregnancy. Women aged 30-39 years (aOR = 1.33; 95% CI = 1.09-1.62), with secondary education and above (aOR = 1.34; 95% CI = 1.03-1.75), single (aOR = 1.35; 95% CI = 1.02-1.78), Christian (aOR = 1.97; 95% CI = 1.50-2.58), and professionally active (aOR = 1.27; 95% CI = 1.00-1.60) were more likely to give birth assisted by skilled attendants than, respectively, women aged 40-49 years, with no formal education, in couples, with no religion, and with no work activity, respectively. Similarly, primiparous women (aOR = 1.35; 95% CI = 1.04-1.74) and those who observed antenatal consultations (aOR = 1.83, 95% CI = 1.50-2.23) were more likely to have skilled attendants at delivery than multiparous women and those who did not observe antenatal consultations, respectively. The odds of delivering with skilled attendance were significantly higher for women living in households of 1-5 persons (aOR = 1.22; 95% CI = 1.03-1.44) and wealthy (aOR = 4.79; 95% CI = 2.93-7.85) compared to women living in households of more than five persons and poor, respectively. In addition, disparities related to county of residence were observed. Interventions targeting older women, strengthening education, information and communication, antenatal consultation compliance, women's economic empowerment, and poverty reduction, including addressing geographic disparities, are needed to increase the use of skilled birth attendance by pregnant women.

Keywords: Skilled Birth, Determinants, Childbearing Age Women, Benin

1. Introduction

The past two decades have seen substantial strides in

maternal health globally. According to the World Health Organization (WHO), from 2000 to 2017, the maternal mortality ratio decreased by 38 percentage points, from 342 to 211 deaths per 100,000 live births [1]. Nevertheless, the rate of

maternal mortality remains relatively high, with about 830 women dying every day worldwide from birth-related complications [2]. Behind the global figures, there are regional disparities. From 2000 to 2017, while Sub-Saharan Africa had one of the largest reductions (-38%), the latest estimates put the maternal mortality ratio at 542 deaths per 100,000 live births, more than twice as high as the global average and 45 times higher than in Europe and North America [1]. As a result, sub-Saharan Africa accounted for about two-thirds of estimated global maternal deaths in 2017 [1]. In Benin, an analysis of progress suggests that the country has not made significant progress in reducing maternal mortality over the past two decades. Across the country, the absolute number of maternal deaths did not change between 1996 and 2014, at about 1,500 deaths each year [3, 4]. The ratio has fallen from 498 deaths per 100,000 live births in 1996 to 397 in 2006, then to 347 in 2014, with an expected MDG 5 target of 125 in 2015 [3, 4]. In 2017-2018, the ratio was 433 deaths per 100,000 live births [5]; which is still higher than in other African countries [1].

There are evidence that regional and national disparities in maternal mortality are the result of differences in access to and use of maternal health care and services [2, 6, 7]. Thus, as part of the prevention of maternal mortality, it is recommended to strengthen the use of health care and services before, during and after pregnancy or childbirth [2]. In particular, seeking out skilled professional assistance during childbirth has been known to enhance pregnancy and childbirth outcomes [8, 9]. Well-trained health professionals refer to midwives, nurses, or doctors with skills to manage pregnancy, childbirth, and the postpartum period; able to identify, manage, and refer women and newborns in case of complications [10]. Studies have found a significant negative correlation between assisted births and maternal mortality rates [11, 12]. A multicenter study compiling data from 20 countries in sub-Saharan Africa found that skilled attendance at delivery was associated with a 16% reduction in neonatal mortality [13].

The proportion of births attended by skilled personnel was one of the indicators defined for monitoring the level of achievement of the Millennium Development Goals (MDGs) targets; and renewed for the Sustainable Development Goals (SDGs) [14, 15]. Globally, it was estimated with regional disparities that 84% of births are practiced by skilled attendants [16]. In Sub-Saharan Africa, the proportion of births attended by qualified professionals is estimated at 64% compared to 98% in Europe [16]. In Benin, more than one in five births is not assisted by a qualified provider [5, 16]. With more than 400,000 live births expected each year, it is deduced that thousands of births take place in Benin without the assistance of a midwife, nurse or doctor [17, 18].

Benin's National Health Development Plan and the Operational Plan for the Reduction of Maternal and Neonatal Mortality 2018-2022 were adopted in 2018, aiming, among other things, to increase the percentage of births attended by skilled attendants [4, 19]. Understanding the determinants of skilled attendance at childbirth among pregnant women is critical to adopt the best strategies to reach the above goal.

Several studies have been initiated in Africa and Asia and have contributed to an increased understanding of the predictors of skilled birth attendance. Overall, these studies have highlighted the multifactorial nature of the phenomenon and have noted the effects of women's, household, and environmental factors on compliance with assisted delivery [20–27]. In addition, contradictory results may be found, that is to say that the factors returned significant according to some studies and non-significant according to other work, including the opposite results. [20–27]. Such differences could be attributed to the local contexts in which these studies were conducted. Although these works provide insights into potential factors to consider in promoting the use of skilled birth attendants, the specific contexts in which they were conducted may limit their extrapolation to a country like Benin. In Benin, a literature review suggests that little is known about the issue. Considering the increase in the use of skilled birth attendants as a key intervention to reduce maternal deaths, this research proposes to study the underlying factors using data from the fifth Demographic and Health Survey (DHS-V).

2. Methods

2.1. Study Setting

Benin is a West African country covering an area of 114,763 km². It is bordered to the south by the Atlantic Ocean, to the west by Togo, to the north by Burkina Faso and Niger and to the east by Nigeria. From an administrative point of view, Benin has 12 departments according to the law N° 97-028 of January 15, 1999 on the organization of the territorial administration of the Republic of Benin [28]. These are: Alibori, Atacora, Atlantic, Borgou, Collines, Couffo, Donga, Littoral, Mono, Ouémé, Plateau and Zou. Projections by the National Institute of Statistics and Demography (INStAD, formerly the National Institute of Statistics and Economic Analysis) indicate a population of 12,535,929 inhabitants in 2021 [18]. The population age pyramid in Benin has a broad base that tapers rapidly, which is typical of populations with high fertility and mortality [5]. Slightly less than half of the population (47%) is under 15 years of age and about 3% is 65 years of age or older. [18]. Women of childbearing age represent about 23.58% of Benin's population [18]. The fertility level in Benin is estimated at 5.7 children per woman with a difference between urban and rural areas [5].

2.2. Study Types and Data Sources

This was a cross-sectional study consisting of secondary analyses using data from the DHS-V in Benin in 2017-2018. The DHS-V was organized by INStAD in tight collaboration with the Ministry of Health and technical assistance from ICF through the international DHS program. The main objective of the DHS-V was to produce demographic and health indicators from a nationally representative sample of children under five, women aged 15-49, and men aged 15-64 [5].

After a request sent via <https://dhsprogram.com/>, the survey databases were downloaded, in particular the one concerning women of childbearing age (BJIR71FL.DTA).

2.3. Study Population

All women of childbearing age (15-49 years) were successfully surveyed, usually residing in the visited households, and had had at least one live birth in the five years prior to the survey.

2.4. Sampling

Details on the DHS-V sampling methods and techniques in Benin are presented in the full survey report [5]. To summarize, DHS-V is based on a nationally representative sample of the Beninese population obtained through a two-stage stratified survey. Each of the twelve departments had been stratified into urban and rural, except the Littoral; which is the only municipality of Cotonou with an entire urban stratum. This stratification resulted in a total of 23 strata. In each stratum, a specific number of Primary Survey Units (PSUs) had been at first taken by systematic drawing with probability proportional to size. This was made using the list of enumeration areas (EAs) established during the Fourth General Census of Population and Dwelling (RGPH-IV). As a second step, a sample of 26 households was selected from each of the selected PSU by a systematic equal probability draw. Beforehand, a list of households in each of the selected PSUs was compiled and used as a sampling frame. During DHS-V, of the 14,156 households visited, 16,233 women aged 15-49 were eligible for the individual interview, which was successfully completed for 15,928, for a response rate of 98%. A total of 6,934 of the women interviewed had not had a live birth in the five years prior to the interview, with 178 who were not usual residents of the households visited.

Ultimately, the analyses involved 8,816 women.

2.5. Variables

The dependent variable was delivery by skilled attendants. It was operationalized on the basis of women's responses to the question: "Who assisted you during the delivery of (NAME)?" regarding the most recent birth. The variable was coded 1, if the delivery was assisted by a skilled attendant and 0 otherwise. A birth is attended by a skilled professional when it was assisted by doctors, nurses, or midwives.

In addition, the independent variables considered were related to the woman, the household, and the environment. The variables related to the woman included: age (15-19, 20-29, 30-39, 40-49), education level (non-educated, primary, secondary and above), marital status (single, partnered), religion (Traditional and other, Islam, Christianity and No religion), occupation (yes, no), exposure to newspapers/magazines (not at all, less than once a week and at least once a week), exposure to radio (not at all, less than once a week, and at least once a week), exposure to TV (not at all, less than once a week, and at

least once a week), health insurance coverage (yes, no), type of pregnancy (singleton, twin), parity (1, 2, 3, 4, and more), and antenatal care compliance (yes, no). A woman observed prenatal visits if she made at least four of them, the first of which was during the first trimester of pregnancy. Household-related variables include: gender of household head (male, female), household size (≤ 5 , > 5), and affluence level. To assess the level of household wealth, households are assigned scores based on the number and type of consumer goods owned using principal component analysis [29, 30]. As a result, quintiles of economic well-being are constructed by dividing the distribution of scores into five equal categories, each representing 20% of the household population. The environmental variables are: environment (urban, rural) and department of residence. These independent variables were chosen following a review of the literature and taking into account those available in the DHS-V databases [20-27]. A measure of the distance (in km) between the household and the nearest health facility was available in the used database. However, due to the relatively high number of missing data (more than 10%), it was not included in the study.

2.6. Data Analysis

All the analyses took into account the sampling design. Details on the polling probabilities and weights are available in the full DHS-V report [5]. The data analysis consisted of two steps. In the first step, the independent and dependent variables were described by calculating the numbers and weighted percentages of their terms. A comparison of the proportion of women who delivered with the assistance of a skilled attendant was performed according to the independent variables, using a Chi-2 test. In particular, the spatial distribution of the percentage of births assisted by skilled personnel was described. In the second step, a multivariate logistic regression was performed to identify the factors that determine births attended by skilled professionals. Beforehand, the potential factors were selected at the 20% threshold using simple logistic regression [31]. Afterwards, they were entered into a multivariate simple logistic regression model with a stepwise top-down strategy to get adjusted estimates. The significance level was set at 5%. The outputs were presented as Odds Ratios (OR) with their 95% confidence intervals (95% CI). The Hosmer-Lemeshow test was used to verify the adequacy of the final model. Data analysis was performed using Stata 15 and QGIS 3.26.2.

2.7. Ethical Concerns

The launching of the DHS-V data collection required the approval of the National Statistical Council to obtain the statistical visa of opportunity and conformity. Moreover, a binding scientific and ethical statement of the survey was sought through the National Committee of Ethics for Health Research. Additional details on the ethical aspects are available in the DHS-V final report [5].

3. Results

3.1. Basic Characteristics of the Study Population

Table 1 presents the baseline characteristics of the study population. A total of 8,816 women (weighted population: 8,843) were included. They were mostly between 20 and 39 years of age (84.98%), had no formal education (64.50%), were in couples (92.60%) and were Christians (50.37%). Among the women surveyed, 83.24% declared a professional activity. Besides, in most cases, women were not exposed to newspapers/magazines (94.24%), radio (44.27) or television (65.45%). Health insurance coverage was observed in less than one percent of participants. Eight out of ten women were multiparous (80.93%). For 2.85% of the respondents, the last pregnancy was a twin. Nearly four out of ten women had had at least four antenatal consultations, the first of which was in the first trimester. Men headed the majority of households (83.52%) with six or more people. Six out of ten women lived in rural areas. In terms of county of residence, women from Alibori (13.61%), Atlantic (11.45%) and Borgou (12.85%) were the most represented.

Table 1. Basic characteristics of the study population.

Variables	n	%
Total	8843	100.00
Age		
15-19	474	5.37
20-29	4363	49.34
30-39	3151	35.64
40-49	854	9.65
Level of education		
Uninstructed	5704	64.50
Primary	1612	18.23
Secondary and above	1526	17.26
Marital status		
Single	654	7.40
In a relationship	8188	92.60
Religion		
Traditional and other	942	10.65
Islam	2951	33.37
Christianity	4454	50.37
No religion	496	5.61
Professional activity		
No	1482	16.76
Yes	7361	83.24
Exposure to the newspaper		
Not at all	8334	94.24
Less than once a week	302	3.42
At least once a week	207	2.34
Exposure to radio		
Not at all	3914	44.27
Less than once a week	1874	21.19
At least once a week	3055	34.55
Exposure to TV		
Not at all	5787	65.45
Less than once a week	1447	16.36
At least once a week	1609	18.19
Health insurance		
No	8766	99.13
Yes	77	0.87
Parity		
1	1686	19.07
2	1599	18.08

Variables	n	%
3	1464	16.55
4 and more	4094	46.30
Type of pregnancy		
Singleton	8591	97.15
Twin	252	2.85
Antenatal consultations		
No	5474	61.90
Yes	3369	38.10
Gender of the head of household		
Male	7385	83.52
Female	1458	16.48
Size of household		
1-5	3536	39.98
6+	5307	60.02
Affluence level		
Very poor	1784	20.18
Poor	1784	20.17
Intermediate	1801	20.36
Rich	1819	20.57
Extremely wealthy	1655	18.72
Area		
Urban	3460	39.12
Rural	5383	60.88
County		
Alibori	1204	13.61
AtacaOR	769	8.69
Atlantique	1013	11.45
Borgou	1137	12.85
Collines	592	6.69
Couffo	579	6.54
Donga	592	6.69
LittaORI	399	4.51
Mono	390	4.41
Ouémé	795	8.99
Plateau	537	6.07
Zou	838	9.48

3.2. Skilled Birth Attendance

Among the women surveyed, 79.39% (95% CI = 77.25-81.38) had given birth with the help of a skilled health professional after their most recent pregnancy. In more than 90% of cases, women were assisted by midwives (Figure 1).

Childbirth assisted by a skilled attendant was less frequent among women over 40 years of age (73.2% vs. 78.81% vs. 79.39% vs. 81.15%), without formal education (73.52% vs. 88.33% vs. 91.91%), in a relationship (87.43% vs. 78.75%) and without professional activity (80.92% vs. 71.80%) ($p < 0.05$). Women not exposed to newspapers/magazines (78.74% vs. 91.86%), radio (73.55% vs. 84.05%) and television (75.44% vs. 89.81%) had been less frequently attended by a skilled health professional during their last delivery ($p < 0.05$). About 90% of the women having observed antenatal consultations had given birth assisted by a qualified agent against 73.39% for the others ($p < 0.05$). In addition, 91.76% of the respondents covered by health insurance had given birth in the presence of a skilled attendant, compared to 79.29% of those who were not covered ($p < 0.05$). On the other hand, the percentage of births attended by skilled agents was higher in households headed by women (84.99% vs. 78.29%), with fewer than six persons (87.01% vs. 74.32%), wealthy (95.03% vs. 57.93%) and in urban areas (86.15% vs. 75.05%).

($p < 0.05$). The type of pregnancy was not significantly associated with the use of qualified staff for delivery ($p = 0.282$).

Overall, we observe a lower percentage of deliveries assisted by a skilled attendant in the north than in the south or the center (Figure 2). In contrast, the highest proportions were

recorded in Ouémé (97.48%), Atlantique (94.48%), Collines (93.61%), Littoral (92.97%) and Plateau (92.02%), where more than nine out of ten women had given birth with the assistance of a skilled attendant at the end of their last pregnancy ($p < 0.05$). In Alibori, about half of the women gave birth with the assistance of a qualified agent.

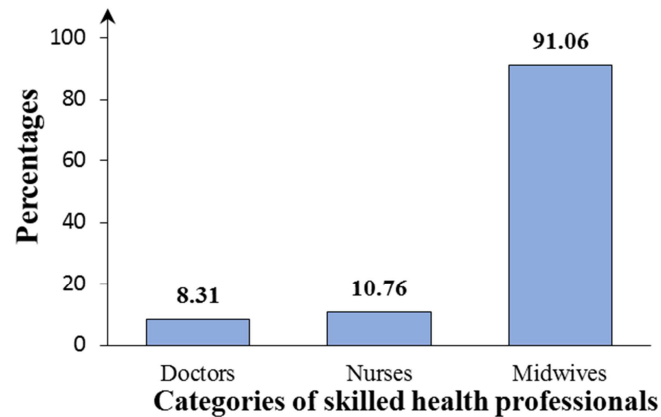


Figure 1. Distribution of skilled attendants assisting pregnant women during delivery in Benin, 2017-2018.

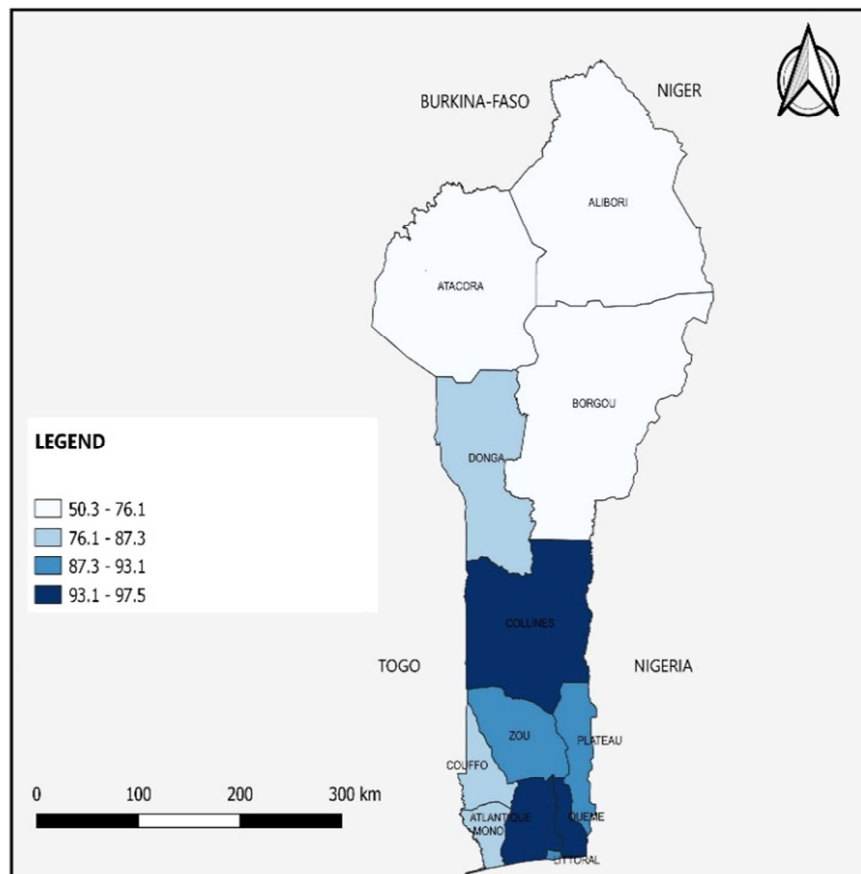


Figure 2. Percentage of women using skilled attendance at last delivery by county of residence in Benin, 2017-2018.

3.3. Factors Associated with Skilled Birth Attendance

Adjusting for potential confounders, the factors associated with assisted delivery are presented in Tables 2 and 3.

Women aged 30-39 years were 1.33 (95% CI = 1.09-1.62) times more likely to give birth with the assistance of a skilled attendant than those aged 40-49 years. Women with secondary education and above were 34% more likely (AOR = 1.34; 95% CI = 1.03-1.75) to give birth with the assistance

of a skilled attendant than those with no formal education. Unmarried women were 1.35 (95% CI = 1.02-1.78) times more likely to give birth with the assistance of a skilled attendant compared to women in couples. Christian women were 1.97 (95% CI = 1.50-2.58) times more likely to give birth with the assistance of a skilled attendant than women of no religion. The odds of women giving birth with the support of a skilled attendant were 27% higher (aOR = 1.27; 95% CI = 1.00-1.60) in women with a professional occupation than in those without. When compared with women who had four or more children, primiparous women had a 35% higher probability (aOR = 1.35; 95% CI = 1.04-1.74) of delivering

with the assistance of a skilled attendant. Women observing antenatal consultations were 1.83 (95% CI = 1.50-2.23) times more likely to give birth with a skilled attendant than those who did not. The probability of delivering with skilled attendants was 22% higher (aOR = 1.22; 95% CI = 1.03-1.44) among women living in households of 1-5 persons compared to those living in households of six persons or more. Wealthier women were 4.79 (95% CI = 2.93-7.85) times more likely to give birth with the assistance of a skilled attendant compared to poorer women. The odds of women giving birth with skilled attendants were 13.34 (95% CI = 7.09-25.10) times higher in Ouémé than in Alibori.

Table 2. Basic characteristics of the study population. Univariate analysis of factors associated with skilled birth attendance in Benin, 2017-2018.

Variables	Skilled births		p	Univariate analysis				p
	n	%		OR	95% CI			
Age			<0.001					
15-19	374	78.81		1.36	1.01	-	1.82	0.040
20-29	3464	79.39		1.41	1.18	-	1.68	<0.001
30-39	2557	81.15		1.57	1.32	-	1.88	<0.001
40-49	625	73.23		1.00				
Level of education			<0.001					
Uninstructed	4193	73.52		1.00				
Primary	1424	88.33		2.73	2.23	-	3.34	<0.001
Secondary and above	1403	91.91		4.09	3.18	-	5.27	<0.001
Marital status			<0.001					
Single	572	87.43		1.88	1.44	-	2.45	<0.001
In a relationship	6448	78.75		1.00				
Religion			<0.001					
Traditional and other	732	77.70		1.82	1.32	-	2.50	<0.001
Islam	1924	65.20		0.98	0.72	-	1.34	0.895
Christianity	4039	90.68		5.09	3.83	-	6.76	<0.001
No religion	326	65.68		1.00				
Professional activity			<0.001					
No	1064	71.80		1.00				
Yes	5957	80.92		1.67	1.34	-	2.08	<0.001
Exposure to the newspaper			<0.001					
Not at all	6562	78.74		1.00				
Less than once a week	269	88.97		2.18	1.46	-	3.26	<0.001
At least once a week	190	91.86		3.05	1.78	-	5.21	<0.001
Radio exposure			<0.001					
Not at all	2879	73.55		1.00				
Less than once a week	1574	84.01		1.89	1.51	-	2.36	<0.001
At least once a week	2568	84.05		1.90	1.53	-	2.34	<0.001
Television exposure			<0.001					
Not at all	4366	75.44		1.00				
Less than once a week	1210	83.64		1.66	1.34	-	2.07	<0.001
At least once a week	1445	89.81		2.87	2.10	-	3.92	<0.001
Health insurance			<0.001					
No	6950	79.29		1.00				
Yes	70	91.76		2.91	1.17	-	7.21	0.021
Parity			<0.001					
1	1423	84.42		1.68	1.43	-	1.97	<0.001
2	1296	81.04		1.32	1.12	-	1.57	0.001
3	1176	80.34		1.27	1.08	-	1.49	0.005
4 and more	3126	76.34		1.00				
Type of pregnancy			0.282					
Singleton	6814	79.32		1.00				
Twin	207	82.03		1.19	0.87	-	1.64	0.28
Antenatal consultations			<0.001					
No	4017	73.39		1.00				
Yes	3003	89.15		2.98	2.40	-	3.71	<0.001
Gender of the head of household			<0.001					
Male	5782	78.29		1.00				
Female	1239	84.99		1.57	1.27	-	1.94	<0.001

Variables	Skilled births			Univariate analysis				
	n	%	p	OR	95% CI		p	
Size of household			<0.001					
1-5	3076	87.01		2.31	1.96	-	2.73	<0.001
6+	3944	74.32		1.00				
Affluence level			<0.001					
Very poor	1033	57.93		1.00				
Poor	1330	74.53		2.13	1.73	-	2.61	<0.001
Intermediate	1450	80.54		3.01	2.35	-	3.84	<0.001
Rich	1634	89.85		6.43	4.75	-	8.70	<0.001
Extremely wealthy	1573	95.03		13.90	8.88	-	21.75	<0.001
Area			<0.001					
Urban	2981	86.15		2.07	1.54	-	2.78	<0.001
Rural	4040	75.05		1.00				
County			<0.001					
Alibori	605	50.27		1.00				
Atacora	517	67.20		2.03	1.30	-	3.17	0.002
Atlantique	957	94.48		16.94	10.38	-	27.65	<0.001
Borgou	735	64.66		1.81	1.20	-	2.74	0.005
Collines	554	93.61		14.48	6.95	-	30.16	<0.001
Couffo	457	79.02		3.72	2.38	-	5.84	<0.001
Donga	474	80.16		4.00	2.22	-	7.20	<0.001
Littoral	371	92.97		13.07	6.46	-	26.44	<0.001
Mono	333	85.31		5.74	3.12	-	10.57	<0.001
Ouémé	775	97.48		38.23	21.67	-	67.44	<0.001
Plateau	494	92.02		11.41	6.43	-	20.26	<0.001
Zou	749	89.38		8.33	4.86	-	14.26	<0.001

Table 3. Basic characteristics of the study population. Multivariate analysis of factors associated with skilled birth attendance in Benin, 2017-2018.

Variables	Skilled births			Multivariate analysis				
	n	%	p	aOR	95% CI		p	
Age			<0.001					
15-19	374	78.81		1.32	0.89	-	1.95	0.169
20-29	3464	79.39		1.17	0.93	-	1.48	0.187
30-39	2557	81.15		1.33	1.09	-	1.62	0.005
40-49	625	73.23		1.00				
Level of education			<0.001					
Uninstructed	4193	73.52		1.00				
Primary	1424	88.33		1.10	0.90	-	1.33	0.351
Secondary and above	1403	91.91		1.34	1.03	-	1.75	0.029
Marital status			<0.001					
Single	572	87.43		1.35	1.02	-	1.78	0.038
In a relationship	6448	78.75		1.00				
Religion			<0.001					
Traditional and other	732	77.70		1.17	0.86	-	1.60	0.313
Islam	1924	65.20		1.15	0.81	-	1.64	0.442
Christianity	4039	90.68		1.97	1.50	-	2.58	<0.001
No religion	326	65.68		1.00				
Professional activity			<0.001					
No	1064	71.80		1.00				
Yes	5957	80.92		1.27	1.00	-	1.60	0.049
Parity			<0.001					
1	1423	84.42		1.35	1.04	-	1.74	0.023
2	1296	81.04		1.01	0.81	-	1.26	0.923
3	1176	80.34		1.01	0.82	-	1.23	0.945
4 and more	3126	76.34		1.00				
Antenatal consultations			<0.001					
No	4017	73.39		1.00				
Yes	3003	89.15		1.83	1.50	-	2.23	<0.001
Size of household			<0.001					
1-5	3076	87.01		1.22	1.03	-	1.44	0.023
6+	3944	74.32		1.00				
Affluence level			<0.001					
Very poor	1033	57.93		1.00				
Poor	1330	74.53		1.60	1.31	-	1.95	<0.001
Intermediate	1450	80.54		1.94	1.52	-	2.47	<0.001
Rich	1634	89.85		3.13	2.38	-	4.12	<0.001

Variables	Skilled births		p	Multivariate analysis				p
	n	%		aOR	95% CI			
Extremely wealthy	1573	95.03	<0.001	4.79	2.93	-	7.85	<0.001
County								
Alibori	605	50.27		1.00				
Atacora	517	67.20		2.19	1.39	-	3.47	0.001
Atlantique	957	94.48		6.63	4.01	-	10.96	<0.001
Borgou	735	64.66		1.79	1.27	-	2.53	0.001
Collines	554	93.61		7.71	3.85	-	15.44	<0.001
Couffo	457	79.02		2.47	1.55	-	3.93	<0.001
Donga	474	80.16		3.16	1.92	-	5.19	<0.001
Littoral	371	92.97		2.31	1.05	-	5.09	0.037
Mono	333	85.31		3.07	1.58	-	5.96	0.001
Ouémé	775	97.48		13.34	7.09	-	25.10	<0.001
Plateau	494	92.02		6.83	3.98	-	11.70	<0.001
Zou	749	89.38		3.65	2.07	-	6.45	<0.001

4. Discussion

This study sought to investigate the determinants of women's use of skilled attendance at childbirth. The key strength of this study was the availability of recent, nationally representative data on women aged 15-49 years. Findings from this study can be used to reorient currently implemented interventions and design new strategies to increase pregnant women's use of skilled attendance at birth.

We found that among the women surveyed, 79.39% had been assisted by qualified professionals during their last delivery. This result is higher than what is reported overall for the Sub-Saharan African region and in some countries in the sub-region. The latest estimates suggest that in Sub-Saharan Africa, 64% of births are attended by skilled attendants [16].

For countries in the West African subregion, the following proportions are noted: 43.3% in Nigeria (2018), 43.6% in Niger (2021), 53.8% in Guinea-Bissau (2019), 55.3% in Guinea (2018), 67.3% in Mali (2018), 69.3% in Mauritania (2015), 69.4% in Togo (2017), 73.6% in Ivory Coast (2016), 74.5% in Senegal (2019), 78.9% in Ghana (2018), 79.8% in Burkina Faso (2015), 83.8% in Gambia (2020), 84.4% in Liberia (2020), 86.9% in Sierra Leone (2019) and 97.3% in Cape Verde (2018) [16]. In West Africa, Benin is part of the best-positioned countries in terms of the recourse of pregnant women to the use of skilled birth attendance during childbirth. It should be noted that the ratio calculated in this study only took into account the last live births. The above percentages generally included all births that occurred in the two to five years prior to the surveys. In fact, the DHS-V report for Benin indicated that the percentage of births in the last five years prior to the survey that were attended by a skilled provider was 78 percent, slightly lower than the value found in this study. The various household survey reports in Benin suggest that the percentage of births attended by a skilled attendant has changed little from 73% in 2001, to 77.7% in 2006 and 77.2% in 2014 [32–34].

We found that women under 40 years of age were more likely to give birth with a skilled attendant present, a significant relationship being observed for 30–39-year-old. This result corroborates the findings of a study in Niger in

2020 [23]. According to the authors, older women may be discouraged by providers' behaviors in case of negative experiences in the past; unlike younger women whose first pregnancies are their first contacts with the health system, especially with maternal health services [23, 35]. Opposite results have been reported in other investigations, with greater odds of skilled birth attendance in older women [21, 27]. Older women are reported to have increased awareness of the availability, accessibility and benefits of using maternal health care and services [21, 27].

A positive and significant relationship was found between women's level of education and their chances of giving birth with the assistance of a trained worker. This corroborates the findings of other studies. [20, 23, 24, 27]. This may be the result of greater knowledge and awareness of the importance of assisted delivery. A significant difference was observed between women with secondary education and those with no formal education. Women with secondary education and above were 34% more likely to give birth with the assistance of a skilled attendant than those with no formal education. In some studies, a significant difference was only observed from a higher level of education [24] while other studies recorded a significant difference as early as primary school [20, 21, 23, 27]. Awareness-raising, education, and communication campaigns about the benefits of using skilled birth attendance could help reduce educational disparities.

Single women were more likely to deliver with the assistance of a skilled attendant compared to women in couples. This could be due to the fact that single women would have more decision-making power and agency than women in relationships.

The present study also highlighted the role of religious beliefs and practices in the use of maternal health services. Skilled attendance at birth was significantly higher among women of Christian faith. In a study in Cameroon in 2021, religion was also found to be a factor in the use of skilled attendants at delivery [22]. Further research is needed to improve our understanding of the role of this factor in the use of maternal health care, other services and skilled attendance at birth in particular.

Compared with women who had had at least four children, primiparous women were more likely to have a skilled birth

attendant at delivery. This result supports the findings of other studies [20–22, 24, 27]. The adverse association between childbearing and the use of skilled attendance during delivery may be related to the emphasis on first births. In addition, it is reported that women of higher parity may not use prenatal care as recommended because of their greater self-confidence due to the experience of previous pregnancy and childbirth [22, 36, 37].

As with skilled birth attendance, other studies have found that antenatal consultations have a positive effect on maternal and neonatal health [38–40]. Antenatal consultations help monitor the pregnancy to identify possible risks and improve the vital prognosis of the mother and child [41]. In the present study, a woman had antenatal consultations if she had attended at least four, the first of which was in the first trimester of pregnancy. The various comprehensive DHS reports distinguish between the percentage of pregnant women who completed at least four antenatal consultations and those for whom the first was completed in the first trimester. From 2001 to 2017–2018, the percentage of women who made their first visit at less than four months of pregnancy increased from 37% to 51% [5]. On the other hand, in the same period, we note that the percentage of women who have made at least four antenatal visits has decreased since 2001, from 62% in 2001 to 52% in 2017–2018. [5]. However, the latest WHO recommendations call on women to have at least eight antenatal consultations. [41]. Women who complied with antenatal consultations in this study were more likely to give birth with the assistance of a skilled health professional. Compliance was found to be high among women who were accustomed to attending health services and who were aware and informed of the benefits associated with good pregnancy care. The relationship between compliance with antenatal consultations and delivery assisted by qualified professionals has been observed in other studies [20, 22–24, 27].

Women who were working were more likely to seek skilled birth attendance. Working could provide greater financial autonomy for pregnant women to meet the various costs (transportation, delivery services, etc.) associated with seeking skilled attendance at delivery. The opposite result was found in Ethiopia and Bangladesh, indicating that women who were not working delivered more with the assistance of skilled attendants than those who were working [21, 24].

A positive and significant relationship was observed between the level of wealth of the households in which the surveyed women lived and the use of skilled birth attendants. Wealthier women were more likely to give birth with the assistance of skilled attendants compared to poorer women. This is consistent with the findings of other studies [20–24, 27]. Wealth is a major determinant of health which affects many aspects of living conditions. Wealthy women have more material, financial, and informational resources to access the health care and services they need.

A negative relationship was observed between the size of the households in which the participants lived and the probability of giving birth with the assistance of qualified agents. Women living in households of 1–5 persons were 22%

more likely to have a skilled attendant than those living in households of six or more persons. Larger households are more prevalent in rural areas, where access to health care and services is less than in urban areas [5, 25]. It is also reported that large households have, on average, a lower socio-economic status [42, 43].

In the present study, residence (urban vs. rural) was not a factor associated with the use of skilled birth attendance. Other studies have found that the use of assisted delivery was higher in urban than in rural areas [20–24, 27]. This would be due to the difference in both urban and rural access to health care and services, generally in favor of the urban setting. In the present study, the difference in residence was related to department. The likelihood of being assisted by skilled attendants during delivery was lower in the departments of Alibori and Borgou. These departments should therefore receive special attention. In addition to the fact that these two departments have the largest surface areas, the average theoretical radius (RMAT) of health facilities is also high. The RMAT is used to estimate the average distance between populations and a health facility. In Benin, the RMAT of health facilities is highest in Alibori and Borgou, at 9.6 and 8.9 km respectively, compared to a national average of 6.2 km. [18].

There are a few limitations to this study. Given its cross-sectional nature, no causality can be inferred from this study. As the data were provided by the participants themselves, the risk of information bias cannot be ruled out. Factors such as health system factors that could predict the use of skilled birth attendance were not included in the study.

5. Conclusion

This study contributes by confirming the multifactorial nature of the issue of skilled birth attendance in the literature about its determinants. Factors associated with skilled birth attendance were found to be related to the mother (age, education, marital status, religion, parity, occupation, antenatal consultations), the household (size and wealth), and the county of residence. Interventions targeting older women, strengthening education, information and communication, antenatal consultation compliance, women's economic empowerment, and poverty reduction, including addressing geographic disparities, are needed to increase the use of skilled birth attendance.

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