Short birth interval in Ghana: Maternal socioeconomic predictors and child survival

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ABSTRACT

INTRODUCTION Short birth interval is a problem in second and third world countries, where statistics show that about 17% of women in marriage and reproductive age have unmet family planning needs. The aim of the study was to identify the socioeconomic factors that predict short birth spacing among married women in Ghana.

METHODS This study was an analytic cross-sectional study relying on secondary data analysis from cross-sectional Ghana Multiple Indicator Cluster Survey (MICS) 2017–2018. The analysis was done using SPSS version 20 (IBM Corp., 2011, and NY). Bivariate analysis was done using chi-squared and predictor variables identified using binary logistic regression. The level of significance was set at $p<0.05$.

RESULTS The study's prevalence of short birth intervals was 49.7%. Child survival was 44% less likely in children with a short birth interval than those without a short birth interval (OR= 0.56; 95% CI: 0.51–0.62). Factors with significant relationships with the birth interval at the two variable analysis stage were further modelled with a binary logistic regression model in multiple variables analysis to identify predictors of short birth interval. The sociodemographic factors that predicted short birth intervals included lower maternal age, high education level, rural, from central region, having no health insurance, Mole Dagbani tribe, poorest wealth index, and high parity position ($p<0.05$).

CONCLUSIONS This study recorded a high prevalence of short birth intervals. Predictors of short birth interval included: lower maternal age and high parity position of the current birth. Child survival was less likely for babies from a short birth interval.

INTRODUCTION

It is estimated that each year about 2 million deaths of children aged <5 years out of 11 million deaths can be avoided by preventing birth intervals less than 24 months[1]. A short birth interval is a problem in second and third world countries, where 17% of women in marriage and of reproductive age have unmet family planning needs[2]. More than one-third (36%) of inter-pregnancy pregnancies happen earlier than 24 months in Ghana, and women's unmet family planning need before 23 months post-birth is 77%[3].

Trends in the Ghana demographic and health survey (GDHS, 1993), indicate that nearly 40% of married women reported unmet family planning needs, and by 2014, the GDHS reported an unmet need of 30%. Indicating the transformation within the two decades has been slower than expected[4].

The World Health Organization reports that the most appropriate birth spacing between the last birth and the subsequent pregnancy is 24 months, and the interval between the previous birth and the next birth is 33 months[5]. Sufficient birth spacing between the last birth and next pregnancy helps the woman recover well from the last birth, either short or long birth interval can cause adverse maternal effects, neonatal, and poor child health outcomes[6]. A pooled study reportedthatbirth problems such as preterm, low birth weight, and small for gestational age are related to short (<18 months) and long (>59 months) birth intervals[6]. In another pooled study, there was a significant relation between birth spacing less than 24 months and infant mortality[7]. Also, other similar studies have indicated a relationship between short

birth spacing and schizophrenia in offspring[8]. In pregnancy, a study has equally indicated a significant relationship between shorter inter-pregnancy spacing and pregnancy problems such as premature membrane rupture, placenta abruption, uterine rupture, and placenta previa[9]. Also, pre-eclampsia is associated with long birth spacing[10].

A published pooled study in 2012 suggested possible mechanisms for the adverse concerns of short birth spacing, and some of them are inadequate maternal nutritional status with folate depletion, poor optimization of lactation for newborn babies, insufficient cervix, infections, poor uterine healing after birth, sibling rivalry, and poor remodeling of the endometrial blood vessel. Short birth spacing can also limit the chances for women's economic growth and their relations[11,12].

Many studies have examined birth spacing effects for the mother and baby[10-12]. However, little is known about the socioeconomic determinants of short birth interval, especially in Ghana. Knowledge of the factors associated with short birth spacing is important to help address the problem in Ghana and other developing countries, hence this study aimed to identify socioeconomic factors that predict small birth spacing among married women in Ghana.

METHODS

This study was a secondary data analysis of the cross-sectional Ghana Multiple Indicator Cluster Survey (MICS) 2017–2018. The Ghana Statistical Service conducted this survey from October 2017 to January 2018 in collaboration with the Ministry of Health, Ministry of Education, Ministry of Sanitation and Water Resources, Ministry of Gender, Children and Social Protection, Ghana Health Service, and the Ghana Education Service, as part of the Global MICS Program. Technical support was provided by the United Nations Children's Fund (UNICEF), with government funding and financial support of UNICEF, KOICA, UNDP, USAID, and the World Bank through the Statistics for Results Facility – Catalytic Fund (SRF-CF).

The sampling frame assumed was from the Ghana 2010 Population and Housing Census (PHC). This encompassed all women (34595) aged 15–49 years with a history of childbirth who were permanent occupants of selected households or visitors who stayed in households chosen the night before the survey. Only women (24838) with two or more birth histories were further used for birth interval analysis.

Ethical considerations

The MICS team of UNICEF approved the protocol for using the Ghana Multiple Indicator Cluster Survey 2017–2018 dataset for this study. Institutions in charge of ordering, funding, or supervising the surveys were held accountable for ethical procedures. Each participant provided verbal agreement, and adolescents aged 15–17 years were interviewed individually after adult approval was obtained in advance from their parents or caregivers. All participants were informed that their participation was entirely optional and that their data would be kept confidential and anonymous. Respondents were also told that they could refuse to answer any or all of the questions, and that they could end the interview at any time.

Study variables

Dependent variables

The primary outcome variables of this study were small or short birth intervals and child survival. A short birth interval was considered when the gap between current and previous birth was less than two years. With child survival, children of last birth at the time of the survey were considered alive or dead for child survival.

Independent variables

The study's independent variables were the socioeconomic characteristics, demographic characteristics, and household well status.

Statistical analysis

Statistical analysis was accomplished using SPSS version 20 (IBM Corp., 2011, and NY). Categorical variables results are presented using frequencies and percentages. The birth interval was classified as a small interval when the time duration of the current birth date from the previous birth date was less than two years. The association between dependent and independent variables was done using chi-squared tests. A binary logistic regression model was used to identify predictor variables of short birth intervals. Statistical significance was set at $p<0.05$.

RESULTS

Respondents' socioeconomic factors

Most (69.8%) of the mothers were aged 20–34 years, and pre-primary or none was dominant (40.3%) in terms of the mother's educational level. About 60.3% were from rural areas. Even though most (53.4%) of the respondents had health insurance, the majority (30.5%) were the poorest in terms of the wealth index quintile (Table 1).

Factors associated with birth interval

The prevalence of short birth intervals in the study was 49.7%. Chi-squared analysis revealed a significant relationship between birth interval and mother's age, mother's educational level, area of residence, region, and household ethnicity(Table 2). Other associated socioeconomic factors were the health insurance status of the mother, wealth index quintile, and childbirth order ($p<0.001$). However, the functional difficulties level of the mother was not significantly associated with birth interval ($p>0.541$) (age 18–49 years) (Table 3).

Predictors of short birth interval

Factors with significant relationships with the birth interval at the two variable analysis stage were further modelled in the

Table 1. Demographic characteristics of the study participants, Ghana 2017–2018(N=34595)

Characteristics	n	%
Mother's age at birth (years)		
<20	6744	19.5
20–34	24164	69.8
≥35	3687	10.7
Mother's educational level		
Pre-primary or none	13929	40.3
Primary	6975	20.2
JSS/JHS/Middle	10432	30.2
SSS/SHS/ Secondary	2337	6.8
Higher	916	2.6
Area		
Urban	13718	39.7
Rural	20877	60.3
Region		
Western	3160	9.1
Central	3072	8.9
Greater Accra	3099	9.0
Volta	3002	8.7
Eastern	3455	10.0
Ashanti	4433	12.8
Brong Ahafo	3252	9.4
Northern	4569	13.2
Upper East	2928	8.5
Upper West	3625	10.5
Household ethnicity		
Akan	12257	35.5
GA/Damgme	2357	6.8
Ewe	3769	10.9
Guan	1315	3.8
Gruma	1721	5.0
Mole Dagbani	8625	24.9
Grusi	1542	4.5
Mande	164	0.5
Other	2823	8.2
Functional difficulties (age 18–49 years)		
Has functional difficulty	4075	11.8
Has no functional difficulty	30416	88.2
Health insurance		
Yes	18460	53.4
No	16135	46.6
Wealth index quintile		
Poorest	10566	30.5
Second	6894	19.9
Middle	6307	18.2
Fourth	5715	16.5
Richest	5113	14.8
Birth order		
1	9614	27.8
2–3	13563	39.2
4–6	9296	26.9
≥7	2122	6.1

Frequency distribution test was done. Source: MICS field survey (2018).

binary logistic regression model to identify the predictors of short birth interval. Maternal age >20 years protected against short birth interval, 20–34 years (AOR=0.27; 95% CI:0.24–0.31), ≥35years (AOR=0.10; 95% CI:0.85–0.133), another protective predictor variable was maternal educational level, JSS/JHS/Middle educational level was protective against short birth interval (AOR=0.88; 95% CI: 0.82–0.95), but higher maternal education associated with short birth interval (AOR=1.52; 95% CI: 1.24–1.86). Those in rural areas were more likely to report a short birth interval than those in urban areas (AOR=1.13; 95% CI: 1.05–1.21) (Table 4).

When it comes to regional prediction, using the Western region as the reference, those from the Central region were 14% more likely to report a short birth interval (AOR=1.14; 95% CI: 1.01–1.29), but those in Upper East Region of the north less likely (AOR=0.64; 95% CI: 0.55–0.75). Also, comparing Akan to other ethnic groups, women of Mole Dagbani were 18% more likely to report small birth spacing (AOR=1.18; 95% CI: 1.02–1.38). Grusi women were 21% less likely to engage in short birth interval (AOR=0.79; 95% CI: 0.71–0.88). Women of the Mende tribe were also 15% less to engage in short birth interval (AOR=0.85; 95% CI: 0.73–0.99). Mothers without health insurance were 10% more likely to engage in short birth interval compared to those with insurance (AOR=1.10; 95% CI: 1.05–1.16). Increased in wealth status predicted short birth interval among women using poorest wealth status as reference; second (AOR=0.87; 95% CI: 0.80–0.94), third (AOR=0.78; 95%, CI: 0.72–0.85), fourth (AOR=0.76; 95% CI: 0.69–0.84) and richest (AOR=0.67; 95% CI: 0.60–0.76). Finally, birth order of a child, using order of 2–3 as the reference: those with a childbirth order of 4 and above were more likely to report short birth interval, 4–6 (AOR=1.3; 95% CI: 1.22–1.37) and ≥7 (AOR=2.40; 95% CI: 2.14–2.68). The logistic regression model appropriately explained the outcome variable (short birth interval) since the Hosmer-Lemeshow goodness-of-fit test p-value was >0.05[$\chi^2(8)=13.610$, p=0.093], hence the model fits the study data (Table 4).

Birth spacing and child survival

The analysis further revealed that child survival is 44% less likely in children with short birth intervals than those without short birth intervals (OR=0.56; 95% CI: 0.51–0.62).

Table 2. Chi-squared analysis of the relationship between participants' demographic characteristics and birth interval, Ghana 2017–2018 (N=24838)

Variable	Short birth interval		χ^2	df	p
	Yes	No			
Mother's age at birth (years)					
<20	1456	447	932.845	2	0.001
20–34	9670	9636			
≥35	1213	2416			
Mother's educational level					
Pre-primary or none	5607	5349	56.243	4	0.001
Primary	2651	2464			
JSS/JHS/Middle	3270	3734			
SSS/SHS/ Secondary	571	702			
Higher	239	246			
Area					
Urban	4242	5092	107.087	1	0.001
Rural	8097	7407			
Region					
Western	1140	1087	93.513	9	0.001
Central	1181	1002			
Greater Accra	961	1081			
Volta	989	1090			
Eastern	1262	1226			
Ashanti	1617	1517			
Brong-Ahafo	1153	1190			
Northern	1795	1717			
Upper East	890	1250			
Upper West	1351	1339			
Household ethnicity					
Akan	4381	4206	115.338	8	0.001
GA/Dangme	793	829			
Ewe	1234	1355			
Guan	500	463			
Gruma	790	539			
Mole Dagbani	2916	3467			
Grusi	543	591			
Mande	66	56			
Other	1107	985			

Chi-squared analysis was done for association. Source: MICS field survey (2018).

Table 3. Chi-squared analysis of the relationship between other studied factors and birth interval, Ghana 2017–2018(N=24838)

Variable		Short birth interval		χ^2	df	p
		Yes	No			
Functional difficulties (age 18–49 years)	Has functional difficulty	1520	1572	0.374	1	0.541
	Has no functional difficulty	10816	10926			
Health insurance	Yes	6094	6790	60.604	1	0.001
	No	6245	5709			
Wealth index quintile	Poorest	4293	3752	133.084	4	0.001
	Second	2662	2456			
	Middle	2149	2326			
	Fourth	1832	2109			
	Richest	1403	1856			
Child birth order	2–3	6650	6770	26.060	2	0.001
	4–6	4526	4770			
	≥7	1163	959			

Chi-squared analysis was done for association. Source: MICS field survey (2018).

Table 4. Binary logistic regression for predictors' short birth interval, Ghana 2017–2018 (N=24838)

Variable	Sig.	AOR	95%CI	
			Lower	Upper
<20	**0.000**			
20–34	**0.000**	**0.274**	**0.244**	**0.306**
≥35years	**0.000**	**0.098**	**0.085**	**0.113**
Pre-primary or none	0.000			
Primary	0.493	0.974	0.904	1.050
JSS/JHS/Middle	**0.001**	**0.881**	**0.816**	**0.952**
SSS/SHS/ Secondary	0.835	1.014	0.889	1.156
Higher	**0.000**	**1.518**	**1.240**	**1.857**
Area(rural/urban)	**0.001**	**1.126**	**1.052**	**1.206**
Western	0.000			
Central	**0.032**	**1.144**	**1.012**	**1.293**
Greater Accra	0.187	1.097	0.956	1.257
Volta	0.172	0.899	0.771	1.048
Eastern	0.579	0.966	0.855	1.092
Ashanti	0.153	1.087	0.970	1.218
Brong-Ahafo	0.103	0.902	0.796	1.021
Northern	0.084	0.888	0.777	1.016
Upper East	**0.000**	**0.643**	**0.553**	**0.747**
Upper West	0.184	0.907	0.786	1.047
Akan	0.000			
GA/Dangme	0.633	1.028	0.918	1.150
Ewe	0.191	0.906	0.782	1.050
Guan	0.122	0.893	0.773	1.031

Continued

Table 4. Continued

Variable	Sig.	AOR	95%CI	
			Lower	Upper
Gruma	0.618	1.044	0.882	1.234
Mole Dagbani	**0.027**	**1.184**	**1.019**	**1.375**
Grusi	**0.000**	**0.792**	**0.710**	**0.883**
Mande	**0.037**	**0.849**	**0.728**	**0.990**
Other	0.882	0.972	0.664	1.421
Health insurance(no/yes)	**0.000**	**1.104**	**1.046**	**1.164**
Poorest	**0.000**			
Second	**0.000**	**0.866**	**0.802**	**0.936**
Middle	**0.000**	**0.782**	**0.716**	**0.854**
Fourth	**0.000**	**0.759**	**0.687**	**0.839**
Richest	**0.000**	**0.673**	**0.600**	**0.756**
2–3	**0.000**			
4–6	**0.000**	**1.288**	**1.215**	**1.365**
≥7	**0.000**	**2.395**	**2.141**	**2.679**
Constant	0.000	3.943		

Hosmer-Lemeshow goodness-of-fit test:χ^2 (8)=13.610, p=0.093.Short birth interval dummy coded: 0 for No and 1 for Yes. Binary logistic regression was applied for predication. The model controlled for ethnicity and region of orientation. Source: MICS field survey (2018).

DISCUSSION

More than one-third (36%) of inter-pregnancy pregnancies happen earlier than 24 months in Ghana, and women's unmet family planning need for 23 months post-birth was 77%[3]. The prevalence of short birth intervals is higher (49.7%) in this current study than the previously reported prevalence of 36%. Meanwhile, another study in Ghana reported a short birth interval prevalence to be 80.0%[13].

In terms of child survival, the analysis further revealed that child survival is 44% less likely in children with a short birth interval. In addition, a similar study in Bangladesh, short birth interval predicted poor baby survival[14]. In another pooled research, there was a significant relation between birth spacing less than 24 months and infant mortality[7]. The clinical significance of this finding is that reducing short birth intervals can help reduce infant mortality in Ghana.

The main aim of this study was to identify maternal socioeconomic factors as predictors of short birth intervals in Ghana. Factors with significant relationships with a birth interval at the two variable analysis stage were further modelled with binary logistic regression model in multiple variables analysis to identify predictors of short birth interval.

Higher maternal age was identified as a lower risk for short birth intervals. Mothers of age 20–34 years were 73% less likely to have babies with the short birth interval than those aged <20 years, and those aged >34 years were 90% less likely to have babies with the short birth interval compared to those aged <20 years. This study finding is not consistent with the results of Ngianga-Bakwin and Stones[15]. However, this was consistent with other similar studies[16,17].

In addition, the birth order of a child predicted short birth intervals. Children in birth order 4 were more likely to experience short birth interval compared to those in birth order 2–3, and this is not in line with an earlier study in which increased parity position of a child protected against short birth interval[14,16]. However, in another African study, the expanded parity position of a child predicted a short birth interval[18]. A study reported that women of a younger age at first marriage were less likely to engage in small birth spacing for their first birth interval[19].

Another protector variable was mother educational level; a mother with JSS/JHS/Middle educational level was 22% less likely to engage in the short birth interval compared to those with pre-primary or no education, and this study finding is not different when compared with other similar studies in Africa[12,15,16]. However, those with higher educational level were 52% more likely to engage in the short birth interval when compared with those with pre-primary education or none. This is in line with a previous study that reported increased education status as protection against short birth intervals[12,15,16].

A study in Uganda reported a short birth interval prevalence of 52.4% among rural women[20]. In this current

study, rural women were more likely to engage in a short birth interval when compared to urban women. Also, a study in Sub-Saharan Africa by Ngianga-Bakwin and Stones[15] reported that urban women were less likely to engage in the short birth interval than those in rural areas. Also, in terms of regional prediction, those from the Central region in southern Ghana were more likely to engage in the short birth interval compared to those from the Western region in south Ghana. Those in the Upper East region of northern Ghana were less likely to engage in the short birth interval than those from the Western region in southern Ghana.

Furthermore, ethnicity had a significant relation with birth interval. Women of the Mole Dagbani ethnic group were 18% more likely to engage in the short birth interval than women of the Akan ethnic group. Women of the Grusi ethnic group were 20% less likely to engage in the short birth interval than those of the Akan ethnic group, and people of the Mande tribe were less likely to engage in small birth spacing. In Ghana, the ethnic variation of the birth interval is associated with sexual taboos. For instance, some ethnic groups have a shorter delay in returning to sex after birth, while some have a long wait in resuming sexual intercourse[21].

Finally, concerning economic factors, increased wealth status was a protector of the short birth interval among women. Women of second, middle, fourth, and most affluent of the wealth index quintile were less likely to engage in the short birth interval than women of the poorest quintile. The trend of analysis indicates that improvement in women's wealth index quintile leads to a decreased chance of short birth interval, and this is the same for other earlier studies in Africa[12,15]. Furthermore, the study revealed that women without health insurance coverage were more likely to engage in small birth spacing than women with health insurance coverage.

Limitations

This study was not without limitations; not all variables including religion, contraceptive use, duration of breastfeeding, were assessed, which, if explored, will help to shed more light on the research question. In addition, misclassification of inter-birth interval could have resulted from preterm births. Finally, recall of information can result in recall bias.

CONCLUSIONS

The prevalence of short birth intervals recorded by this study was high, and the sociodemographic factors that predicted short birth intervals included: increasing maternal age, high education level, rural residence, living in the Central region, not having health insurance, poorest wealth index, and high parity position. Finally, survival was lower for those with a small birth interval.

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CONFLICTS OF INTEREST
The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none was reported.

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There was no source of funding for this research.

ETHICAL APPROVAL AND INFORMED CONSENT
The study protocol for using the Ghana Multiple Indicator Cluster Survey 2017–2018 existing data was approved by the MICS team of UNICEF. Institutions in charge of ordering, funding, or supervising the surveys were held accountable for ethical procedures. All participants provided verbal informed consent.

DATA AVAILABILITY
The data supporting this research are available from the the Multiple Indicator Cluster Survey (MICS) website upon request: https://mics.unicef.org/surveys

PROVENANCE AND PEER REVIEW
Not commissioned; externally peer reviewed.