

SUPPLEMENTARY FILE 4 – Subgroup analysis: women with stillbirths (N=290)

Similar to women with SBVEND, a subgroup analysis was performed in women with stillbirths. Women with very early neonatal deaths were excluded from bivariate and multivariable logistic regression.

Bivariate logistic regressions provided crude odds ratios (cOR) for each independent variables' category compared to a reference category. If five or fewer women per cell were observed, categories were collapsed.

Subsequently, multivariable logistic regression was used to identify risk factors for CS in women with stillbirth. The multivariable analysis included independent variables based on statistical significance in bivariate logistic regression. Instead of p-values below 0.05, variables with Wald F tests' p-values below 0.25 in bivariate analysis were considered statistically significant. Pearson correlations above 0.8 or Variance Inflation Factors higher than 4 were used to detect collinearity.

The following independent variables were included: residence, wealth index, exposure to mass media, religion, current marital status, educational status, multiple pregnancy, number of antenatal visits, antenatal care quality score, presence of peripartum complications and prolonged or obstructed labour. To reduce overfitting, we used backward elimination based on p-values to include six independent variables in the final model, having a minimum of ten caesarean sections per included variable. Adjusted ORs were provided (aOR). In bivariate and multivariable analyses, independent variables with an OR having a CI not containing the value 1 were considered statistically significant.

To assess effect modification by birth outcome (stillbirth or live birth) of household's wealth quintiles and maternal educational level on CS rates, we compared cORs using multivariable logistic regression with interaction terms. cORs were calculated for both independent variables' categories compared to a reference category in women with live births who survived the first day. These cORs were compared to cORs in women with live births using multivariable logistic regression with interaction terms. Adjusted ORs were provided as an effect size. Wald F tests of model effects were performed and p-values below 0.05 indicated statistical significance.

Bivariate and multivariable logistic regression of variables associated with caesarean section in women with stillbirth (N=290)(weighted). Ghana Maternal Health Survey 2007 and 2017

CS = caesarean section, VB = vaginal birth, OR = crude odds ratio, aOR = adjusted odds ratio, CI = confidence interval

* Factors associated with CS in women having stillbirths and very early neonatal deaths with a Wald F-test p-value <0.25

	Stillbirths (N=290)			
	CS (N=63)	VB (N=227)	OR (95% CI)	aOR (95% CI)
Year of survey				
2007	24	106	1	
2017	39	121	1.4 (0.7 – 3.0)	
Ethnicity				
Akan	37	126	1	
Ewe	7	24	1.0 (0.3 – 3.0)	
Mole-Dagbani	7	31	0.8 (0.3 – 2.2)	
Other	12	46	0.9 (0.3 – 2.3)	
Region				
Coastal	26	68	1	
Middle	29	129	0.6 (0.3 – 1.3)	
Northern	7	30	0.6 (0.2 – 1.7)	
Residence*				
Rural	25	120	1	
Urban	37	108	1.6 (0.8 – 3.4)	
Household's wealth index*				
Poor	13	96	1	
Middle	15	46	2.4 (1.0 – 5.7)	
Rich	34	86	2.9 (1.2 – 7.0)	
Exposure to mass media*				
Little exposed	7	42	1	1
Moderately exposed	19	101	1.2 (0.4 – 3.3)	1.4 (0.4 – 4.2)
Highly exposed	37	84	2.8 (1.1 – 7.5)	2.5 (0.8 – 7.3)
Maternal age				
<35	44	149	1	
≥35	19	79	0.8 (0.4 – 1.7)	
Religion*				
Christian	43	188	1	1
Muslim, other religions, areligious	19	50	1.6 (0.8 – 3.4)	2.5 (1.0 – 6.5)
Current marital status*				
Married or living together	51	180	1	1
Not married or living together	12	47	0.9 (0.4 – 2.1)	0.4 (0.2 – 1.2)
Maternal educational status*				
None	8	57	1	1
Primary	15	44	2.3 (0.8 – 7.0)	2.9 (0.9 – 9.9)
Middle	25	99	1.8 (0.8 – 4.2)	2.3 (0.7 – 7.3)
Secondary or higher	14	28	3.6 (1.2 – 10.5)	4.1 (1.1 – 15.4)
Parity				
0	9	58	1	
1-4	35	113	2.0 (0.8 – 4.9)	
≥5	19	57	2.2 (0.8 – 6.0)	
History of perinatal death				
No	51	189	1	
Yes	12	38	1.2 (0.5 – 2.9)	
Multiple pregnancy*				
No	51	208	1	1
Yes	12	19	2.5 (0.9 – 6.8)	3.6 (1.6 – 8.4)
Number of antenatal visits*				
<4	6	67	1	1
≥4	57	160	3.9 (1.2 – 13.2)	3.9 (1.3 – 11.8)
Antenatal care quality score*				
Low (0-7)	16	98	1	
High (8-9)	47	129	2.2 (1.0 – 4.6)	
Peripartum complications*				
No	30	136	1	
Yes	33	91	1.6 (0.8 – 3.3)	
Prolonged or obstructed labour*				
No	51	208	1	
Yes	11	19	2.3 (0.8 – 6.4)	

Reduced fetal movements				
No	56	213	1	
Yes	7	14	1.9 (0.5 – 6.8)	

Multivariable logistic regression with interaction terms assessing effect modification by birth outcome of household's wealth status and maternal educational level on caesarean section rates (N=17.138)(weighted). Ghana Maternal Health Survey 2007 and 2017

CS = caesarean section, VB = vaginal birth, OR = crude odds ratio, aOR = adjusted odds ratio, CI = confidence interval

* Wald F p-value serving as a measure of statistical significance. P-value <0.05 is considered statistically significant.

** aOR and 95% confidence intervals serve as a measure of effect size of effect modification by birth outcome.

	Stillbirths (N=290)			Live births (N=16,848)			Wald F* and aOR (95% CI)**
	CS (N=63)	VB (N=227)	OR (95% CI)	CS (N=1,626)	VB (N=15,222)	OR (95% CI)	
Household's wealth index							0.36
Poor	13	96	1	346	6,873	1	
Middle	15	46	2.4 (1.0 – 5.7)	268	3,116	1.7 (1.4 – 2.1)	1.4 (0.6 – 3.4)
Rich	34	86	2.9 (1.2 – 7.0)	1,012	5,233	3.8 (3.3 – 4.5)	0.8 (0.3 – 1.8)
Maternal educational status							0.53
None	8	57	1	223	4,610	1	
Primary	15	44	2.3 (0.8 – 7.0)	252	3,071	1.7 (1.3 – 2.2)	1.4 (0.6 – 3.5)
Middle	25	99	1.8 (0.8 – 4.2)	710	5,736	2.6 (2.1 – 3.1)	0.7 (0.2 – 2.2)
Secondary or higher	14	28	3.6 (1.2 – 10.5)	441	1,805	5.0 (4.1 – 6.3)	1.4 (0.5 – 4.2)