

Supplementary material

Caesarean Section in Sierra Leone: A Nationwide Study of Operative Rates and Mortality

Supplementary table 1. Facilities performing caesarean sections. Facility type, in-facility deliveries and in-hospital deaths.

		No maternal death in MDSR	≥1 maternal death in MDSR	≥1 identified caesarean section death	Cross-validated hospitals**	In-facility caesarean section mortality rate (cross-validated hospitals)			
						0	>0-2	>2-4	>4
Number of facilities	36	12	24	15	29	14	6	5	4
District hospital	30	11	19	11	23	12	3	4	4
Referral hospital	6	1	5	4	6	2	3	1	0
In-facility deliveries	31 614	4 529	27 085	20 756	27 716	6 960	11 747	6 038	2 971
Caesarean sections	7 357	763	6 594	5 071	6 748	1 677	3 351	1 167	553
Caesarean section rate	23%	17%	24%	24%	24%	24%	29%	19%	19%
In-facility deaths									
All deaths*	435	NA	435	408	435	27	247	76	85
Maternal mortality rate	1.4%	NA	1.6%	2.0%	1.6%	0.4%	2.1%	1.3%	2.9%
Deaths with caesarean section	99	NA	99	99	99	NA	40	28	31
In-facility caesarean section mortality rate	1.3%	NA	1.5%	2.0%	1.5%	NA	1.2%	2.4%	5.6%

* An additional 102 in-facility deaths occurred in primary health care facilities that did not perform caesarean sections; ** This excludes seven hospitals which had one or more maternal deaths in logbooks, but no deaths reported through the MDSR system

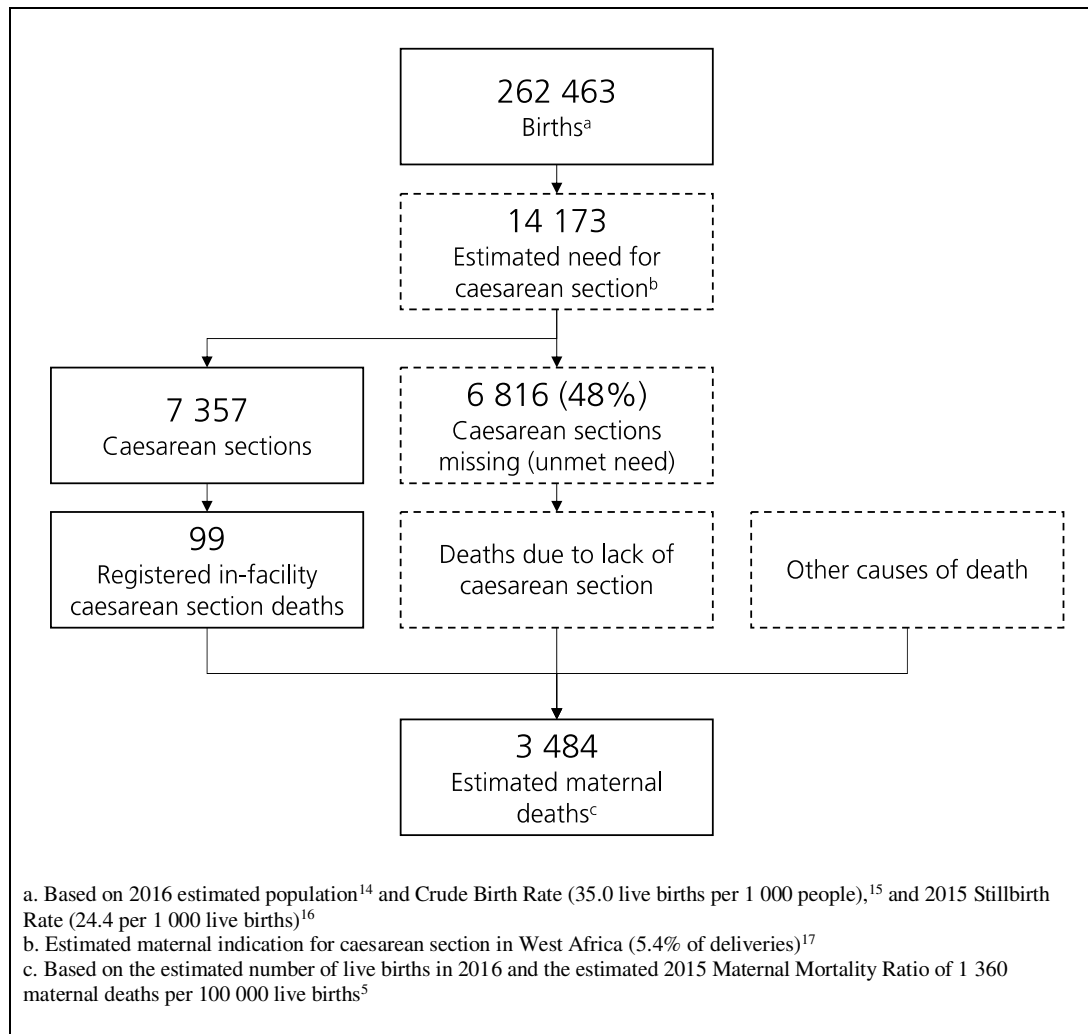
Supplementary table 2. Patient characteristics, clinical management, and secondary outcomes among maternal deaths with caesarean section in Sierra Leone in 2016, with comparisons between three levels of in-facility caesarean section mortality rates (n=99)

	All	In-facility caesarean section mortality rate			p-value
		<2%	2-4%	>4%	
PATIENT CHARACTERISTICS	n=99	n=40	n=28	n=31	
Age					
Median [IQR]	27 [20 – 32]	26 [22 – 33]	29 [21 – 32]	27 [20 – 30]	0.38 ^a
Unknown	0	0	0	0	
Gravidity					
Median [IQR]	3 [1 – 5]	3 [2 – 5]	3 [2 – 5]	3 [1 – 5]	0.92 ^a
Unknown	2 (2%)	1 (3%)	1 (4%)	0	
Parity					
Median [IQR]	2 [0 – 4]	2 [1 – 3]	2 [1 – 3]	2 [0 – 4]	0.83 ^a
Unknown	3 (3%)	2 (5%)	1 (4%)	0	
Number of antenatal care visits					
Median [IQR]	3 [2 – 3]	3 [3 – 4]	3 [2 – 3]	2 [1 – 3]	0.06 ^a
Unknown	43 (43%)	27 (68%)	3 (11%)	13 (42%)	
Referred from					0.10 ^b
Other hospital	2 (2%)	2 (5%)	0	0	
Primary Healthcare Unit	51 (56%)	18 (45%)	15 (54%)	18 (75%)	
Home	39 (43%)	20 (50%)	13 (46%)	6 (25%)	
Unknown	7 (7%)	0	0	7 (23%)	
Pre-operative haemoglobin level					
Median [IQR], g/dL	9.0 [7.4 – 10.5]	8.5 [5.3 – 10.5]	9.6 [7.2 – 11.5]	9.0 [8.0 – 9.8]	0.60 ^a
Unknown	50 (51%)	32 (80%)	4 (10%)	14 (45%)	

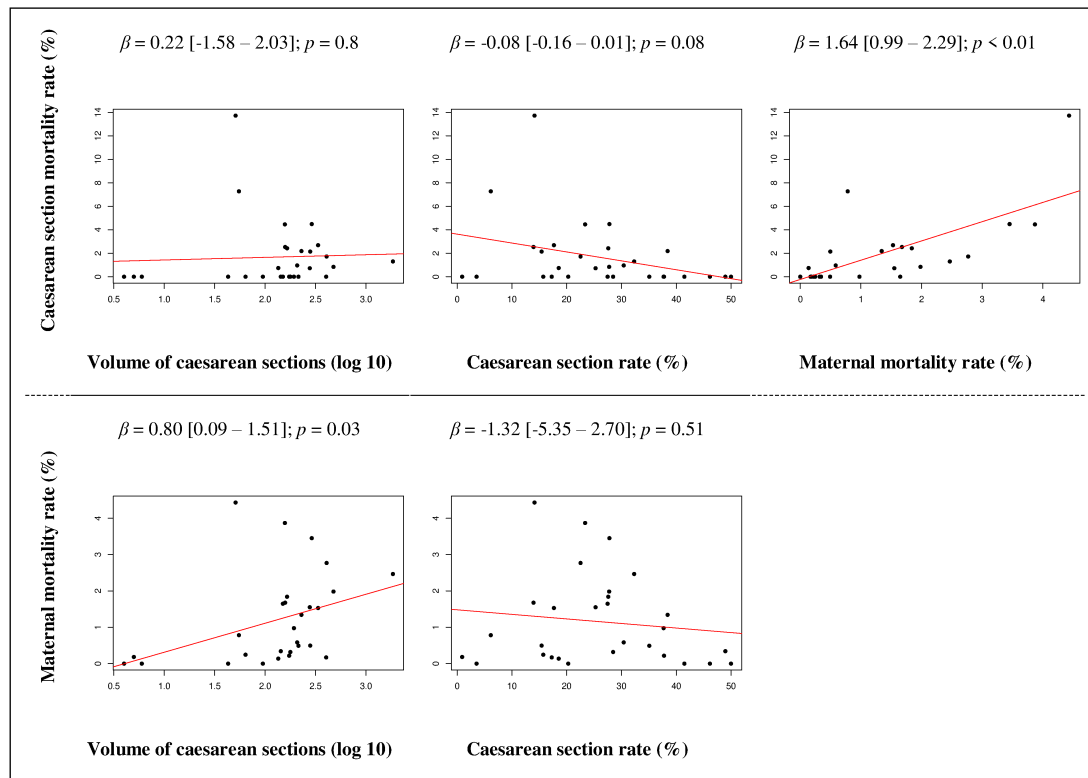
CLINICAL MANAGEMENT	n=99	n=40	n=28	n=31	
Indication for Caesarean					
Obstructed labour	42 (42%)	15 (38%)	9 (32%)	18 (58%)	0.11 ^b
Pre-eclampsia/Eclampsia	25 (25%)	9 (22%)	9 (33%)	7 (23%)	0.67 ^b
Haemorrhage	22 (22%)	13 (32%)	6 (21%)	3 (10%)	0.07 ^b
Placental abruption	10 (10%)	8 (20%)	2 (7%)	0	0.01 ^b
Malpresentation	9 (9%)	3 (8%)	2 (7%)	4 (12%)	0.75 ^b
Cranio-pelvic disproportion	7 (7%)	2 (5%)	1 (4%)	4 (13%)	0.41 ^b
Twins/triplets	7 (7%)	0	4 (14%)	3 (10%)	0.03 ^b
Uterine rupture	7 (7%)	1 (3%)	2 (7%)	4 (13%)	0.25 ^b
Previous CS	6 (6%)	2 (5%)	2 (7%)	2 (6%)	1.00 ^b
Type of provider					
Medical officer	53 (55%)	14 (35%)	19 (66%)	20 (69%)	<0.01 ^b
Surgical Training Programme student	13 (13%)	9 (23%)	4 (14%)	0 (0%)	
Surgical Assistant Community Health Officer	11 (11%)	5 (13%)	3 (10%)	3 (13%)	
Specialist obstetrician	8 (8%)	8 (20%)	0	0	
House officer	7 (7%)	4 (10%)	0	3 (10%)	
Other associate clinician	5 (5%)	0	2 (7%)	3 (10%)	
Unknown	2 (2%)	0	0	2 (6%)	
Time from admission to start of operation					
Median [IQR], hours	5.8 [2.0 – 21.3]	5.8 [1.9 – 16.5]	3.5 [1.9 – 14.3]	15.4 [4.3 – 26.3]	0.10 ^a
Unknown	14 (14%)	3 (8%)	2 (7%)	9 (29%)	
Operation length					
Median [IQR], minutes	49 [33 – 69]	40 [28 – 52]	47 [33 – 59]	78 [64 – 103]	<0.01 ^a
Unknown	32 (32%)	9 (23%)	6 (21%)	17 (55%)	
Additional procedures registered					
Hysterectomy	14 (14%)	8 (20%)	3 (11%)	3 (10%)	0.47 ^b
B Lynch procedure	3 (3%)	3 (8%)	0	0	0.11 ^b
Blood transfusion					
Patients transfused (proportion)	74 (75%)	29 (74%)	22 (79%)	21 (75%)	0.95 ^b
Unknown	4 (4%)	1 (3%)	0	3 (10%)	

Number of units transfused					
Median [IQR]	1 [1 – 2]	1 [1 – 2]	1.5 [1 – 2]	2 [0.8 – 2]	0.88 ^a
<i>Unknown</i>	6 (6%)	3 (8%)	0	3 (10%)	
Type of anaesthesia					
General	72 (75%)	27 (68%)	21 (78%)	24 (83%)	0.32 ^b
Spinal	19 (20%)	10 (25%)	6 (22%)	3 (10%)	
Spinal and general	5 (5%)	3 (8%)	0	2 (7%)	
<i>Unknown</i>	3 (3%)	0	1 (4%)	2 (6%)	
OUTCOMES	n=99	n=40	n=28	n=31	
Time from start of operation to death					
Median [IQR], hours	9.5 [4.4 – 81.5]	5.4 [3.1 – 16.8]	9.5 [4.9 – 62.6]	75 [7.6 – 156.9]	<0.01 ^a
<i>Unknown</i>	4 (4%)	1 (3%)	0	3 (10%)	
Cause of death^d					
Haemorrhage	64 (73%)	32 (84%)	18 (72%)	14 (56%)	0.05 ^b
Hypertensive disorders	20 (23%)	8 (21%)	7 (28%)	5 (20%)	0.81 ^b
Sepsis	12 (14%)	3 (8%)	2 (8%)	7 (28%)	0.07 ^b
Indirect causes	11 (13%)	3 (8%)	5 (20%)	3 (12%)	0.39 ^b
<i>Unknown</i>	11 (11%)	2 (5%)	3 (11%)	6 (19%)	
Intraoperative findings					
Uterine rupture	23 (23%)	7 (18%)	4 (14%)	12 (39%)	0.06 ^b
Placental abruption	11 (11%)	9 (23%)	2 (7%)	0	<0.01 ^b
Foetal death					
Number of stillbirths (proportion)	44 (59%)	15 (63%)	12 (52%)	17 (63%)	0.73 ^b
<i>Unknown</i>	25 (25%)	16 (40%)	5 (18%)	4 (13%)	

a. Kruskal-Wallis test; b. Fisher-Freeman-Halton test; d. Causes with <5 occurrences not presented



Supplementary figure 1. Estimated need for caesarean sections and relationship with maternal death in Sierra Leone in 2016



β : Beta coefficient with 95% confidence interval

Supplementary figure 2. Linear regression findings for 29 facilities performing caesarean section in 2016 (excluding seven facilities that had one or more deaths per logbooks but reported no maternal deaths in the MDSR database)