

Supplementary Table 1: Placental histology quality control results

Reader 1	Reader 2			Total
	No infection	Active infection	Past infection	
No infection	89	1	1	91
Active infection	0	24	1	25
Past infection	2	0	64	66
Total	91	25	66	182

Agreement	Kappa	p-value
97.25%	0.9542	<0.001

Two measures of reliability namely, percent agreement and Cohen's Kappa was used to assess the agreement between the two readers. Percent agreement defines the percentage of participants who were assigned to the same category by the two readers. Cohen's Kappa (K) on the other hand describes the strength of agreement between the two readers, taking into account agreement that could happen by chance. The stronger the agreement, the higher the value of Cohen's Kappa which ranges from -1 to +1.

The percentage Agreement between the two readers was calculated as $\left(\frac{89+24+64}{182}\right) \times 100\%=97.25\%$,

and was associated with a Cohen's Kappa of 0.954.

Supplementary Table 2: Characteristics of women with or without placental sample

Characteristic	With placental sample (N=1642)		Without placenta sample (N=284)	
	N	%	N	%
Study site				
Kintampo	1012	61.6	116	40.9
Dodowa	374	22.8	30	10.6
Navrongo	256	15.6	138	48.6
Age				
≤ 24 years	556	33.9	90	31.7
25 - 34 years	844	51.4	152	53.5
≥ 35 years	242	14.7	42	14.8
Level of education				
No education	354	21.6	71	25.0
Primary	271	16.5	36	12.7
Junior High	600	36.5	94	33.1
Secondary or higher	417	25.4	83	29.2
Marital status				
Married/Married before	1211	73.8	239	84.2
Living together with man, unmarried	245	14.9	18	6.3
Single, unmarried	186	11.3	27	9.5
Religious background				
Christian	1255	76.4	220	77.5
Muslim	337	20.5	52	18.3
Traditionalist	11	0.7	12	4.2
Other	39	2.4	-	-
Wealth index				
Poorest	310	18.9	76	26.8
more poor	327	19.9	58	20.4
Poor	336	20.5	49	17.3
less poor	341	20.8	44	15.5
least poor	328	20.0	57	20.1
Gravidity				
Primigravidae	357	21.7	77	27.1
Secundigravidae	408	24.9	67	23.6
Multigravidae	877	53.4	140	49.3
Bednet use				
Yes	1037	63.2	201	70.8
No	605	36.9	83	29.2

Supplementary Table 3: Socio-demographic and obstetric characteristics of pregnant women, by study area

Characteristic	Kintampo (N=1128)		Dodowa (N=404)		Navrongo (N=394)	
	N	%	N	%	N	%
Age						
Mean (SD)	27.29 (6.11)		29.51 (5.44)		26.96 (6.0)	
Age group						
≤ 24 years	419	37.15	73	18.07	155	39.34
25 - 34 years	553	49.02	259	64.11	183	46.45
≥ 35 years	156	13.83	72	17.82	56	14.21
Level of education						
No education	297	26.33	39	9.65	89	22.59
Primary	192	17.02	58	14.36	56	14.21
Junior High	373	33.07	205	50.74	117	29.70
Secondary or higher	266	23.58	102	25.25	132	33.50
Marital status						
Married/Married before	839	74.38	239	59.16	372	94.42
Living together with man, unmarried	113	10.02	148	36.63	2	0.51
Single, unmarried	176	15.60	17	4.21	20	5.08
Religious background						
Christian	798	70.74	339	83.91	338	85.79
Muslim	284	25.18	58	14.36	47	11.93
Traditionalist	5	0.44	1	0.25	5	1.27
Other	41	3.63	6	1.49	4	1.02
Wealth index						
Poorest	247	21.90	10	2.48	129	32.74
more poor	259	22.96	43	10.64	83	21.07
Poor	264	23.40	74	18.32	47	11.93
less poor	220	19.50	118	29.21	47	11.93
least poor	138	12.23	159	39.36	88	22.34
Gravidity						
Primigravidae	264	23.40	56	13.86	116	29.44
Secundigravidae	284	25.18	94	23.27	96	24.37
Multigravidae	580	51.42	254	62.87	182	46.19
ITN use						

Yes	717	63.56	210	51.98	315	79.95
No	411	36.44	194	48.02	79	20.05

Supplementary Table 4: Factors associated with active placental malaria parasitaemia at delivery

Factors	Active placental infection			Univariate analysis			Multivariate analysis		
	Total (N=1642) n	Present (N=46) n (%)	Absent (N=1,596) n (%)	COR	95% CI	p-value	AOR	95% CI	p-value
Age, years									
<25	556	27 (58.7)	529 (33.2)	2.84	1.58-5.13	0.001	1.74	0.81-3.73	0.15
≥25	1086	19 (41.3)	1067 (66.8)	1			1		
Education									
No education	354	10 (21.8)	344 (21.6)	1.18	0.50 - 2.82	0.80			
Primary	271	6 (13.0)	265 (16.6)	0.95	0.35 - 2.56				
Junior High	600	20 (43.5)	580 (36.3)	1.37	0.64 - 2.91				
High School or above	417	10 (21.7)	407 (25.5)	1					
Household SES									
Most poor	310	17 (37.0)	293 (18.4)	3.51	1.33 - 9.26	0.01	2.65	0.97-7.24	0.01
More poor	327	3 (6.5)	324 (20.3)	0.63	0.16 - 2.44		0.49	0.13-1.93	
Poor	336	13 (28.3)	323 (20.2)	2.45	0.90 - 6.69		2.03	0.73-5.65	
Less poor	341	8 (17.4)	333 (20.9)	1.50	0.51 - 4.43		1.30	0.44-3.88	
Least poor	328	5 (10.9)	323 (20.2)	1			1		
Marital status									
Married/Married before	1211	27 (58.7)	1184 (74.2)	1		0.02	1		0.42
Living together with man, unmarried	245	8 (17.4)	237 (14.8)	1.54	0.71 - 3.37		1.40	0.63-3.11	
Single, unmarried	186	11 (23.9)	175 (11.0)	2.82	1.39 - 5.72		1.64	0.75-3.60	
Gravidity									
Primigravidae	357	18 (39.1)	339 (21.2)	2.85	1.45 - 5.59	0.01	1.74	0.73-4.16	0.46
Secundigravidae	408	12 (26.1)	396 (24.8)	1.65	0.78 - 3.47		1.26	0.55-2.90	
Multigravidae	877	16 (34.8)	861 (54.0)	1			1		
ITN Use									
No	605	19 (41.3)	586 (36.7)	1.22	0.68 - 2.20	0.51			
Yes	1037	27 (58.7)	1010 (63.3)	1					
SP doses received									
≤1	87	6 (13.0)	81 (5.1)	3.48	1.35 - 8.94	0.03	2.80	1.06-7.37	0.19
2	316	13 (28.3)	303 (19.0)	1.94	0.92 - 4.07		1.48	0.69-3.18	
3	549	12 (26.1)	537 (33.7)	1.01	0.48 - 2.15		1.00	0.47-2.14	
≥4	690	15 (32.6)	675 (42.3)	1			1		
Malaria treatment in past 2 weeks									
No	1444	42 (91.3)	1402 (87.8)	1		0.59			
Yes	198	4 (8.7)	194 (12.2)	0.76	0.29 - 2.04				
Malaria treatment during pregnancy									
No	1129	27 (58.7)	1102 (69.1)	1		0.13			
Yes	513	19 (41.3)	494 (30.9)	1.58	0.88 - 2.85				

COR: Crude Odds Ratio; AOR: Adjusted Odds Ratio; ITN: Insecticide-treated bednet

Supplementary Table 5: Factors associated with maternal anaemia at delivery

Factors	Maternal anaemia			Univariate analysis			Multivariate analysis		
	Total (N=1747) n	Present (N= 598) n (%)	Absent (N= 1149) n (%)	COR	95% CI	p-value	AOR	95% CI	p-value
Age, years									
<25	589	200 (34.0)	389 (66.0)	0.98	0.80 - 1.21	0.86			
≥25	1158	398 (34.4)	760 (65.6)	1					
Education									
No education	377	145 (38.5)	232 (61.5)	1.30	0.98 - 1.74	0.26			
Primary	271	93 (34.3)	178 (65.7)	1.09	0.79 - 1.50				
Junior High	642	212 (33.0)	430 (67.0)	1.03	0.79 - 1.33				
High School or above	457	148 (32.4)	309 (67.6)	1					
Household SES									
Most poor	352	143 (40.6)	209 (59.4)	1.51	1.11 - 2.06	0.02	1.51	1.09 - 2.06	0.02
More poor	347	124 (35.7)	223 (64.3)	1.23	0.90 - 1.68		1.21	0.88 - 1.67	
Poor	343	102 (29.7)	241 (70.3)	0.93	0.68 - 1.29		0.90	0.65 - 1.25	
Less poor	349	118 (33.8)	231 (66.2)	1.13	0.82 - 1.55		1.09	0.79 - 1.50	
Least poor	356	111 (31.2)	245 (68.8)	1			1		
Marital status									
Married/Married before	1319	424 (32.2)	895 (67.8)	1		0.004	1		
Living together with man, unmarried	238	102 (42.9)	136 (57.1)	1.58	1.19 - 2.10		1.54	1.15 - 2.06	0.01
Single, unmarried	190	72 (37.9)	118 (62.1)	1.29	0.94 - 1.76		1.23	0.89 - 1.70	
Gravidity									
Primigravidae	398	138 (34.7)	260 (65.3)	1.07	0.84 - 1.37	0.55			
Secundigravidae	426	154 (36.2)	272 (63.8)	1.14	0.90 - 1.45				
Multigravidae	923	306 (33.2)	617 (66.8)	1					
ITN Use									
No	612	221 (36.1)	391 (63.9)	1.14	0.92 - 1.40	0.22			
Yes	1135	377 (33.2)	758 (66.8)	1					
SP doses received									
≤1	90	40 (44.4)	50 (55.6)	1.87	1.20 - 2.92	0.004	1.71	1.09 - 2.68	0.04
2	335	130 (38.8)	205 (61.2)	1.48	1.13 - 1.94		1.34	1.02 - 1.77	
3	581	206 (35.5)	375 (64.5)	1.28	1.01 - 1.62		1.24	0.99 - 1.56	
≥4	741	222 (30.0)	519 (70.0)	1			1		
Malaria treatment in past 2 weeks									
No	1548	531 (34.3)	1017 (65.7)	1		0.86			
Yes	199	67 (33.7)	132 (66.3)	0.97	0.71 - 1.33				
Malaria treatment during pregnancy									
No	1236	400 (32.4)	836 (67.6)	1		0.01	1		
Yes	511	198 (38.8)	313 (61.2)	1.32	1.07 - 1.64		1.24	0.99 - 1.55	0.06

COR: Crude Odds Ratio; AOR: Adjusted Odds Ratio; ITN: Insecticide-treated bednet