Supplementary Material

Table S1: Bivariate regression of the factors associated with haemoglobin concentration among rural Ghanaian schoolchildren stratified by age category

Predictors	Overall n=642			School-age children (6-9 y) n=323			Adolescents (10-17 y) n=319		
	β	SE (β)	*P-value*	β	SE (β)	*P-value*	β	SE (β)	*P-value*
Child characteristics									
Sex									
Female	Ref.	-		Ref.	-	-	Ref.	-	-
Male	0.75	1.03	0.468	-0.23	1.42	0.871	1.68	1.45	0.247
Age	1.25	0.23	<0.001	2.22	0.63	0.001	0.30	0.55	0.593
Child sick in the past 7 days									
No	Ref.	-	-	Ref.	-	-	Ref.	-	-
Yes	-0.50	1.32	0.703	-0.76	1.79	0.670	0.16	1.91	0.934
Child's birth order (continuous)	0.10	0.24	0.678	0.10	0.35	0.648	0.15	0.32	0.772
Child's school grade									
Lower Primary	Ref.	-	-	Ref.	-	-	Ref.	-	-
Upper primary and JHS	4.35	1.38	0.002	8.75	4.86	0.073	1.55	1.57	0.325
Ethnicity									
Akan	Ref.	-	-	Ref.	-	-	Ref.	-	-
Gurma	-2.60	1.30	0.046*	-2.44	1.77	0.170	-2.07	1.87	0.269
Mole-Dagbani	-2.58	1.48	0.081	-2.42	2.08	0.245	-2.69	2.04	0.188
Other[a]	-2.82	1.48	0.057	-1.71	2.06	0.408	-3.75	2.07	0.070
Number of days child bought food from school	0.47	0.24	0.052*	0.34	0.32	0.288	0.45	0.35	0.192
Household demographic and socioeconomic characteristics									
Dependency ratio	-2.74	2.78	0.324	-6.05	4.03	0.135	-0.16	3.73	0.967
Sex of household head									
Male	Ref.	-	-	Ref.	-	-	Ref.	-	-
Female	-0.05	1.15	0.966	-1.29	1.58	0.417	1.15	1.61	0.475
Age of household head	0.06	0.04	0.161	0.11	0.06	0.042	-0.01	0.05	0.917

Table S1: Cont.

Predictors	Overall n=642			School-age children (6-9 y) n=323			Adolescents (10-17 y) n=319		
	β	SE (β)	*P-value*	β	SE (β)	*P-value*	β	SE (β)	*P-value*
Household asset index									
Lower	Ref.	-		Ref.	-	-	Ref.	-	-
Middle	1.89	1.26	0.133	-0.11	1.73	0.950	3.72	1.78	0.160
Upper	0.17	1.26	0.891	-2.38	1.73	0.169	2.50	1.78	0.037
School years of father	0.11	0.08	0.175	0.16	0.11	0.154	0.04	0.11	0.701
School years of mother	-0.07	0.09	0.430	-0.24	0.13	0.073	0.02	0.13	0.881
Occupation of father (n=429)									
Famer	Ref	-	-	Ref	-	-	Ref	-	-
Other[b]	1.74	1.35	0.199	-1.02	2.05	0.618	2.46	1.81	0.176
Occupation of mother (n=596)									
Farmer	Ref.	-	-	Ref.	-	-	Ref.	-	-
Trader	1.14	1.14	0.316	1.39	1.55	0.371	0.42	1.62	0.797
Other[c]	-0.41	1.46	0.782	-0.13	1.97	0.947	-0.93	2.10	0.657
Household received some remittance in the past 1 year									
No	Ref.	-	-	Ref.	-	-	Ref.	-	-
Yes	-0.31	1.23	0.789	-1.44	1.58	0.364	0.34	1.56	0.827
Household food availability and diet diversity									
HDDS	0.55	0.27	0.044	0.54	0.38	0.157	0.50	0.38	0.183
HFVS	0.14	0.08	0.110	0.10	0.12	0.427	0.14	0.11	0.224
HAFC	0.89	0.43	0.036	1.03	0.66	0.119	0.77	0.68	0.254
Proportion of food consumed in the past month from own production[d]	0.19	0.31	0.541	0.88	0.45	0.052	-0.02	0.41	0.967
Number of months household consumed food from own production	0.04	0.12	0.732	0.19	0.18	0.310	0.08	0.16	0.604
Maize stock in household									
No	Ref.	-	-	Ref.	-	-	Ref.	-	-
Yes	0.89	1.22	0.467	3.16	1.64	0.055	-1.24	1.74	0.479
Farm diversity	0.33	0.20	0.103	0.86	0.27	0.002	-0.03	0.28	0.913
Household agriculture asset index									
Lower	Ref.	-	-	Ref.	-	-	Ref.	-	-
Middle	0.66	1.15	0.568	-0.82	1.60	0.611	2.28	1.61	0.157
Upper	1.62	1.42	0.257	2.20	1.91	0.250	1.47	2.07	0.479

Table S1: Cont.

Predictors	**Overall n=642**			**School-aged children (6-9 y) n=323**			**Adolescents (10-17 y) n=319**		
	β	**SE (β)**	***P-value***	**β**	**SE (β)**	***P-value***	**β**	**SE (β)**	***P-value***
Household owns land									
No	Ref.	-	-	Ref.	-	-	Ref.	-	-
Yes	0.29	1.25	0.814	1.69	1.84	0.360	0.03	1.67	0.986
Geographical location									
Ecological zone in Ghana									
Forest	Ref.	-	-		Ref.	-	Ref.	-	-
Northern Savannah	-8.08	1.21	<0.001	-6.17	1.60	<0.001	-9.57	1.77	<0.001
Coastal Savannah	-9.54	1.83	<0.001	-13.46	2.77	<0.001	-7.78	2.35	0.001
Transitional	-6.91	1.30	<0.001	-6.77	1.85	<0.001	-7.31	1.77	<0.001

β,regression coefficient ; SE (β), standard error of regression coefficient; ref, reference group; HDDS, household dietary diversity score; HFVS, household food variety score; HAFC, household animal foods consumption;

[a]Other includes Ga-Dangbe, Guan, Grusi, Mande, Ewe and other tribes originating from outside Ghana; [b]Other includes off-farm wage employment, business and unemployed; [c]Other includes off-farm wage employment, apprentice and unemployed; [d]Natural log-transformed variable of proportion of food consumed in the past month from own production;

Table S2: Univariate logistic regression of the factors associated with anaemia among rural Ghanaian schoolchildren stratified by age category

Predictors	Overall n=642		School-age children (6-9 y) n=323		Adolescents (10-17 y) n=319	
	POR (95% C.I)	*P*-value	POR (95% C.I)	*P*-value	POR (95% C.I)	*P*-value
Child characteristics						
Sex						
Female	Ref.		Ref.		Ref.	
Male	1.23 (0.90, 1.68)	0.190	1.00 (0.64, 1.55)	0.995	1.52 (0.98, 2.36)	0.065
Age	0.96 (0.89, 1.03)	0.271	0.77 (0.63, 0.95)	0.012	1.22 (1.03, 1.45)	0.023
Child sick in the past 7 days						
No	Ref.		Ref.		Ref.	
Yes	1.01 (0.68, 1.51)	0.954	1.16 (0.66, 2.01)	0.610	0.86 (0.48, 1.53)	0.610
Child's birth order (continuous)	0.98 (0.92, 1.06)	0.652	1.00 (0.91, 1.11)	0.984	0.96 (0.87, 1.07)	0.472
Child's school grade						
Lower	Ref.		Ref.		Ref.	
Upper primary and JHS	0.84 (0.55, 1.27)	0.398	0.32 (0.06, 1.67)	0.175	1.03 (0.64, 1.65)	0.911
Ethnicity		0.021		0.072		0.125
Akan	Ref.		Ref.		Ref.	
Gurma	1.72 (1.16, 2.55)		2.04 (1.17, 3.56)		1.39 (0.78, 2.45)	
Mole,Dagbani	1.38 (0.87, 2.16)		1.74 (0.91, 3.33)		1.12 (0.60, 2.08)	
Other[a]	1.75 (1.12, 2.75)		1.44 (0.76, 2.72)		2.13 (1.12, 4.06)	
Number of days child bought food from school	0.94 (0.87, 1.01)	0.074	0.93 (0.84, 1.03)	0.163	0.95 (0.85, 1.05)	0.319
Household demographic and socioeconomic characteristics						
Dependency ratio	1.54 (0.66, 3.55)	0.316	2.65 (0.75, 9.34)	0.132	1.00 (0.32, 3.09)	0.998
Sex of household head						
Male	Ref.		Ref.		Ref.	
Female	0.91 (0.64, 1.28)	0.573	0.96 (0.59, 1.57)	0.881	0.85 (0.52, 1.39)	0.522
Age of household head	0.99 (0.98, 1.00)	0.189	0.98 (0.97, 1.00)	0.062	1.00 (0.98, 1.02)	0.992
Household asset index		0.655		0.791		0.159
Lower	Ref.		Ref.		Ref.	
Middle	0.88 (0.61, 1.29)		1.18 (0.69, 2.01)		0.66 (0.38, 1.13)	
Upper	0.84 (0.58, 1.23)		1.16 (0.68, 1.98)		0.61 (0.36, 1.05)	
School years of father	0.98 (0.96, 1.01)	0.157	0.98 (0.95, 1.02)	0.339	0.98 (0.95, 1.02)	0.315
School years of mother	1.00 (0.97, 1.03)	0.996	1.01 (0.97, 1.05)	0.756	1.00 (0.96, 1.04)	0.873

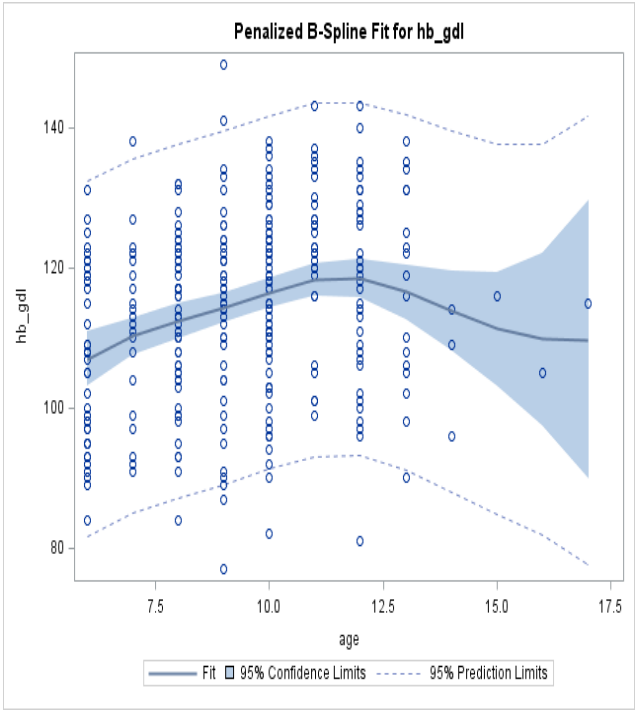
Table S2: Cont.

Predictors	Overall n=642		School-age children (6-9 y) n=323		Adolescents (10-17 y) n=319	
	POR (95% C.I)	***P*-value**	**POR (95% C.I)**	***P*-value**	**POR (95% C.I)**	***P*-value**
Occupation of father (n=429)						
Farmer	Ref.		Ref.		Ref.	
Other[b]	0.90 (0.60, 1.35)	0.605	1.29 (0.68, 2.43)	0.439	0.73 (0.42, 1.28)	0.267
Occupation of mother (n=596)		0.589		0.622		0.921
Farmer	Ref.		Ref.		Ref.	
Trader	0.83 (0.58, 1.18)		0.78 (0.47, 1.30)		0.99 (0.52, 1.88)	
Other[c]	0.92 (0.58, 1.44)		0.86 (0.45, 1.64)		0.91 (0.55, 1.49)	
Household received some remittance in the past 1 year		0.608		0.881		0.626
No	Ref.		Ref.		Ref.	
Yes	0.92 (0.65, 1.28)		0.96 (0.59, 1.57)		0.89 (0.56, 1.42)	
Household food availability and diet diversity						
HDDS	0.92 (0.85, 1.00)	0.055	0.89 (0.78, 0.99)	0.047	0.96 (0.86, 1.08)	0.485
HFVS	0.98 (0.96, 1.01)	0.187	0.97 (0.94, 1.01)	0.178	0.99 (0.96, 1.03)	0.635
HAFC	0.91 (0.79, 1.05)	0.205	0.91 (0.74, 1.11)	0.351	0.92 (0.75, 1.13)	0.442
Proportion of food consumed in the past month from own production[d]	1.02 (0.93, 1.12)	0.717	0.96 (0.83, 1.10)	0.553	1.05 (0.93, 1.19)	0.443
Number of months household consumed food from own production	1.00 (0.96, 1.04)	0.920	0.99 (0.94, 1.05)	0.800	1.00 (0.95, 1.05)	0.848
Maize stock available in household						
No	Ref.		Ref.		Ref.	
Yes	0.79 (0.55, 1.13)	0.197	0.59 (0.35, 0.98)	0.040	1.06 (0.63, 1.80)	0.822
Agriculture and farm diversity						
Farm diversity	0.98 (0.93, 1.04)	0.581	0.90 (0.82, 0.99)	0.024	1.06 (0.97, 1.15)	0.197
Household agriculture asset index		0.139		0.126		0.318
Lower	Ref.		Ref.		Ref.	
Middle	1.01 (0.71, 1.43)		1.31 (0.79, 2.16)		0.78 (0.48, 1.27)	
Upper	0.67 (0.43, 1.02)		0.69 (0.38, 1.24)		0.64 (0.34, 1.20)	
Household owns land						
No	Ref.		Ref.		Ref.	
Yes	1.14 (0.79, 1.67)	0.484	1.04 (0.59, 1.83)	0.900	1.19 (0.72, 1.98)	0.499

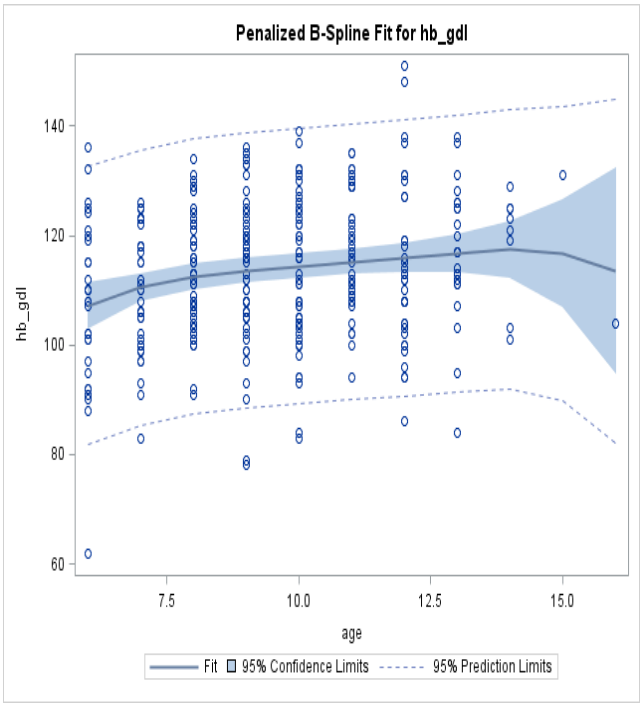
Table S2: Cont.

Predictors	Overall n=642		School-age children (6-9 y) n=323		Adolescents (10-17 y) n=319	
	POR (95% C.I)	***P*-value**	**POR (95% C.I)**	***P*-value**	**POR (95% C.I)**	***P*-value**
Geographical location						
Ecological zone in Ghana		<0.001		<0.001		<0.001
Forest	Ref.		Ref.		Ref.	
Northern Savannah	2.99 (2.02, 4.43)		2.50 (1.47, 4.24)		3.64 (2.02, 6.58)	
Coastal Savannah	3.07 (1.70, 5.57)		3.48 (1.33, 9.08)		3.00 (1.39, 6.49)	
Transitional	2.68 (1.76, 4.08)		2.98 (1.60, 5.53)		2.51 (1.41, 4.48)	

n=sample size; POR, prevalence odds ratio ;95% C.I, 95% confidence interval ; ref, reference group; HDDS, household dietary diversity score; HFVS, household food variety score; HAFC, household animal foods consumption; [a]Other includes Ga-Dangbe, Guan, Grusi, Mande, Ewe and other tribes originating from outside Ghana; [b]Other includes off-farm wage employment, business and unemployed; [c]Other includes off-farm wage employment, apprentice and unemployed; [d]Natural log-transformed variable of proportion of food consumed in the past month from own production.



a



b

Figure S1: A smoothed scatter plot of the haemoglobin concentration(hb_gdl) of the school age children and adolescents by sex; *females (a) and males (b); interpret with caution as sample size from 14-17 years were small (14 y, n=11; 15 y, n=2; 16 y, n=2 and 17 y, n=1)*

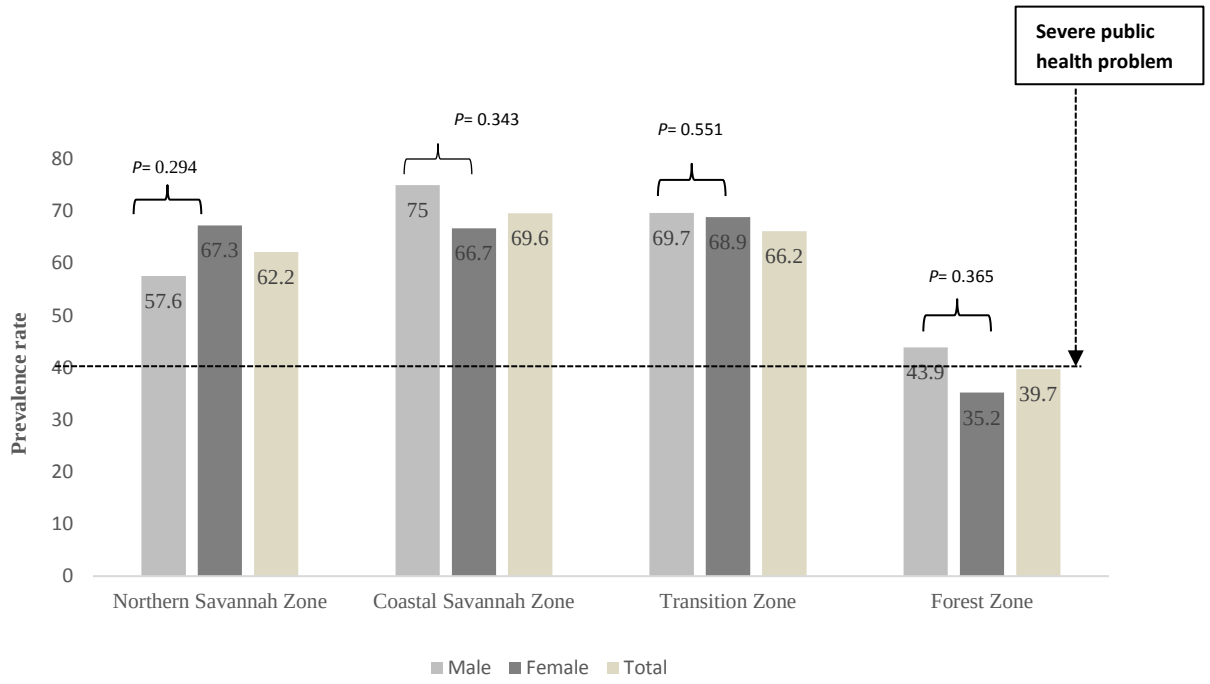


Figure S2: Prevalence of anaemia among school-age children by agro-ecological zone and sex

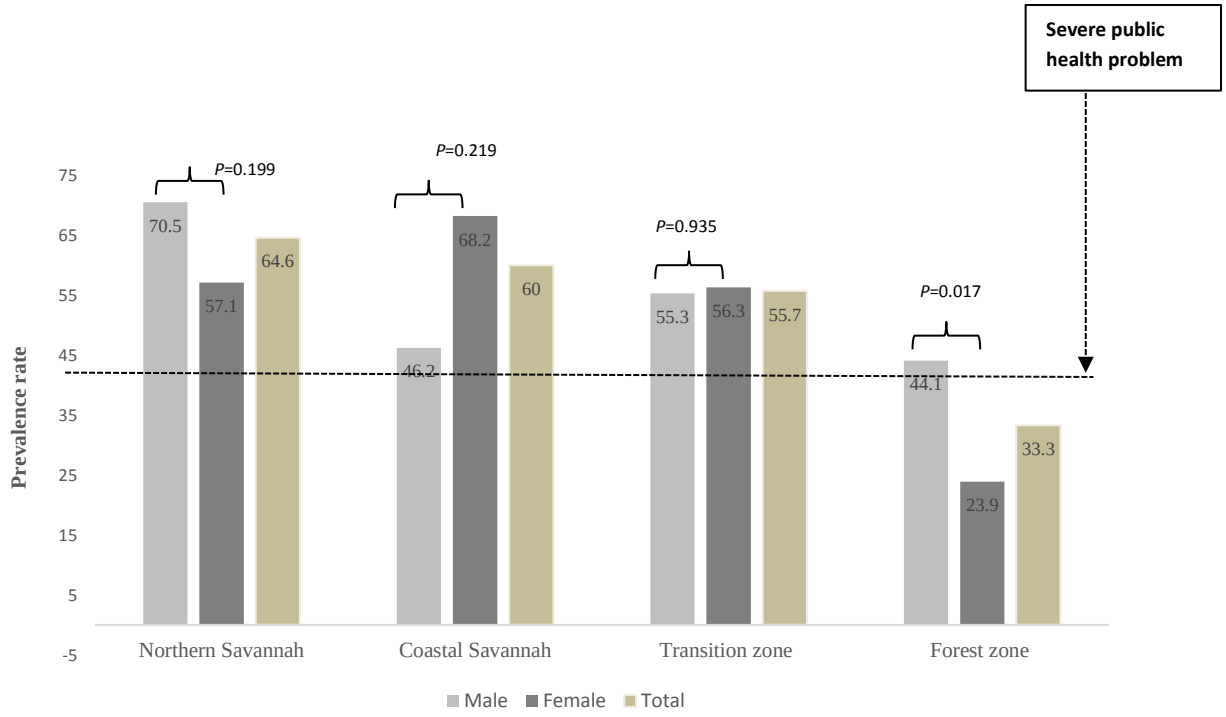


Figure S3: Prevalence of anaemia among adolescents by agro-ecological zone and sex