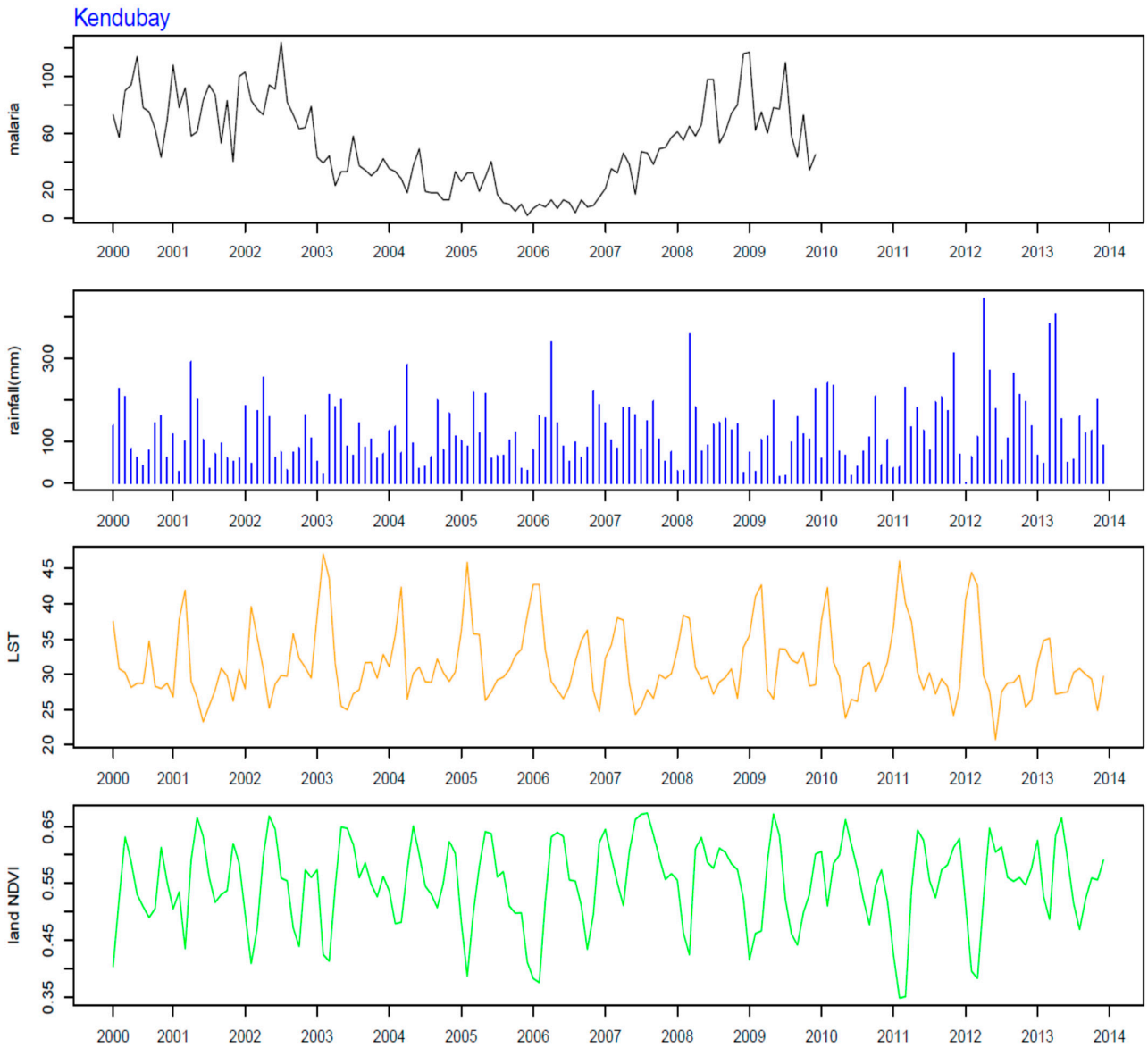
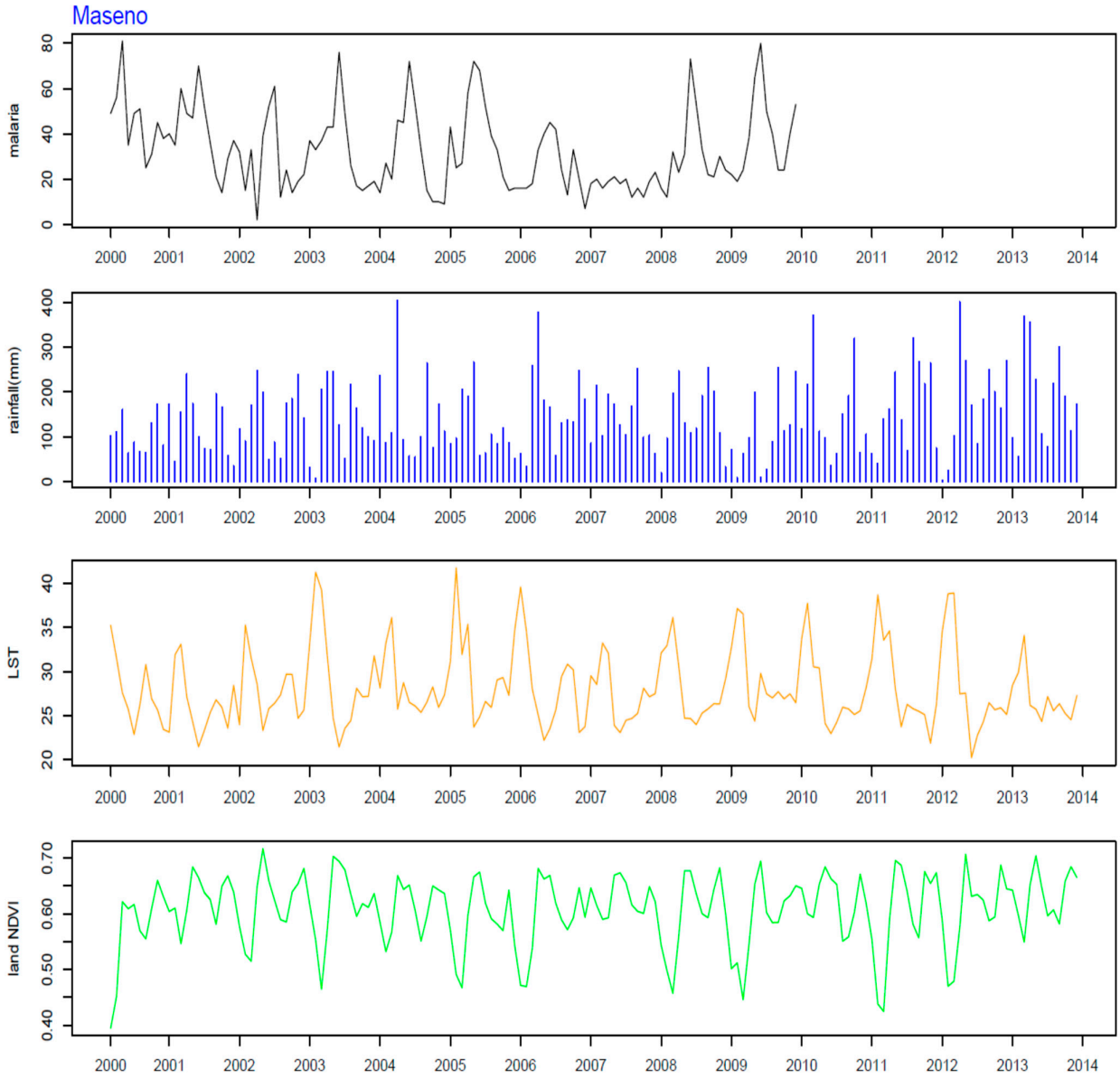
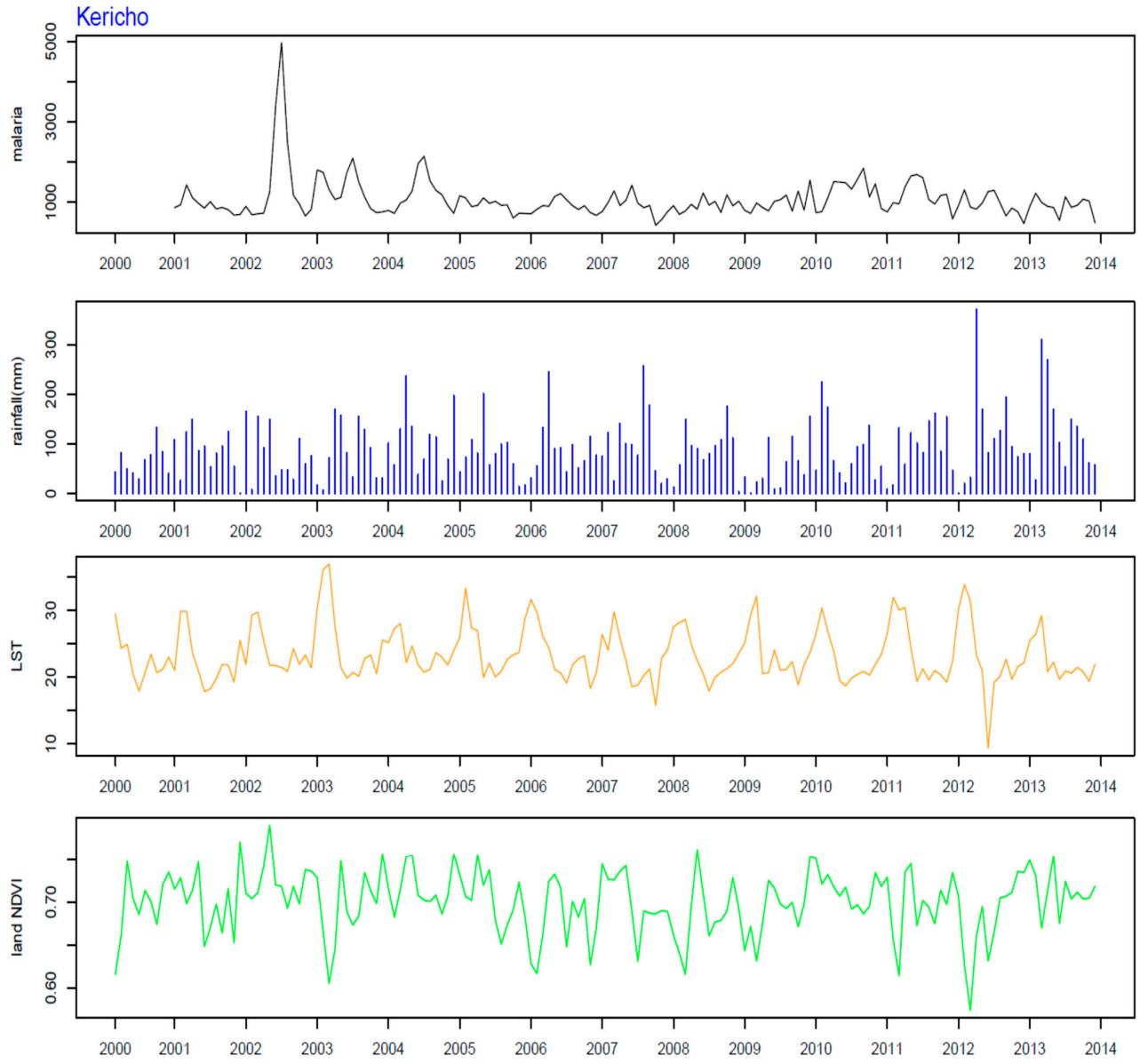
Supplementary Materials

Differences of rainfall-malaria associations in lowland and highland in Western Kenya

Figure S1 monthly time series plots of the other hospitals (Kendu Bay, Maseno, Kericho and Kapsabet)




Maseno
malaria
0
20
40
60
80
rainfall(mm)
0
100
200
300
400
LST
20
25
30
35
40
land NDVI
0.40
0.50
0.60
0.70
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014


Kericho
malaria
1000
3000
5000
rainfall(mm)
0
100
200
300
LST
10
20
30
land NDVI
0.60
0.70
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014

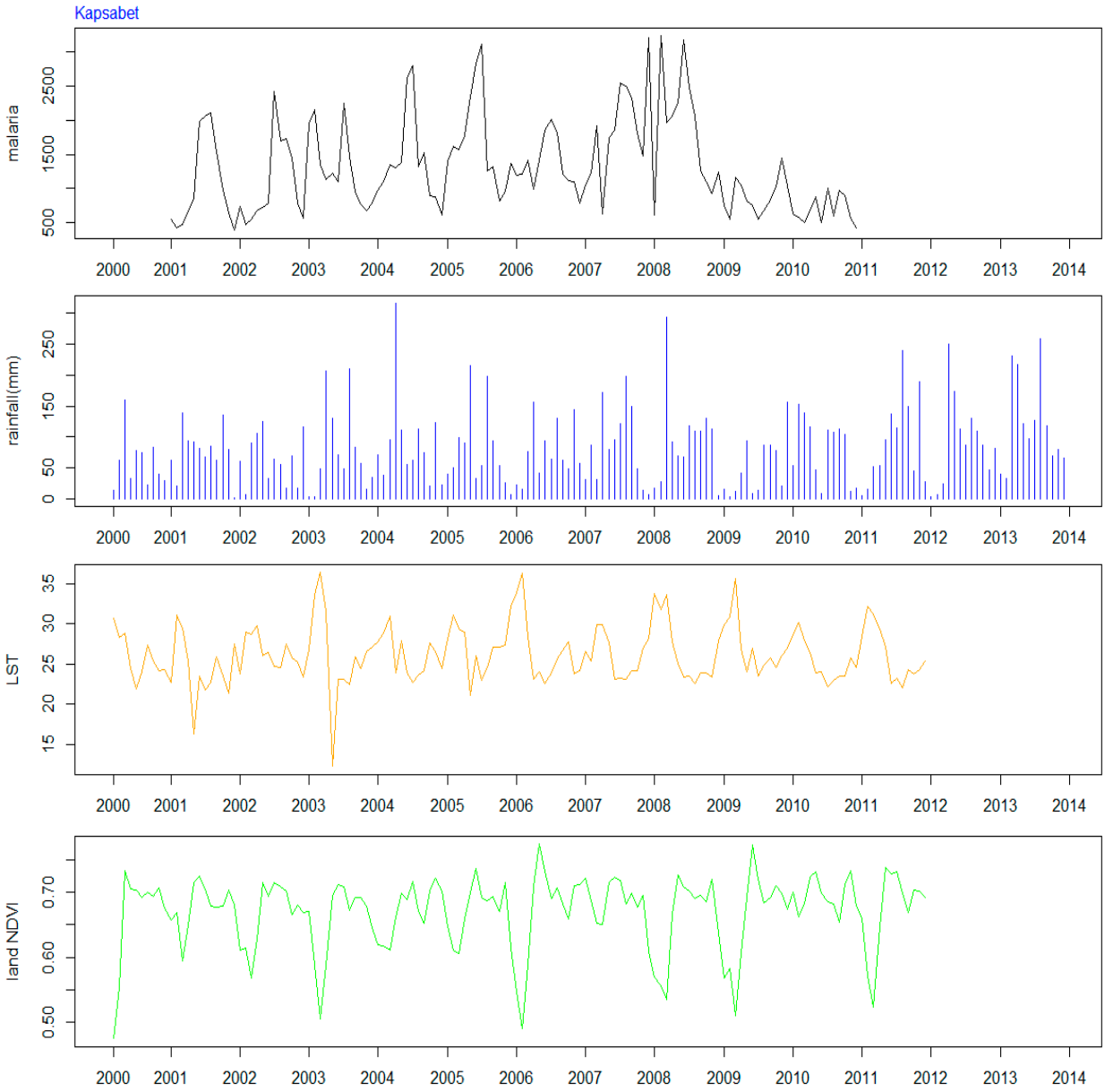
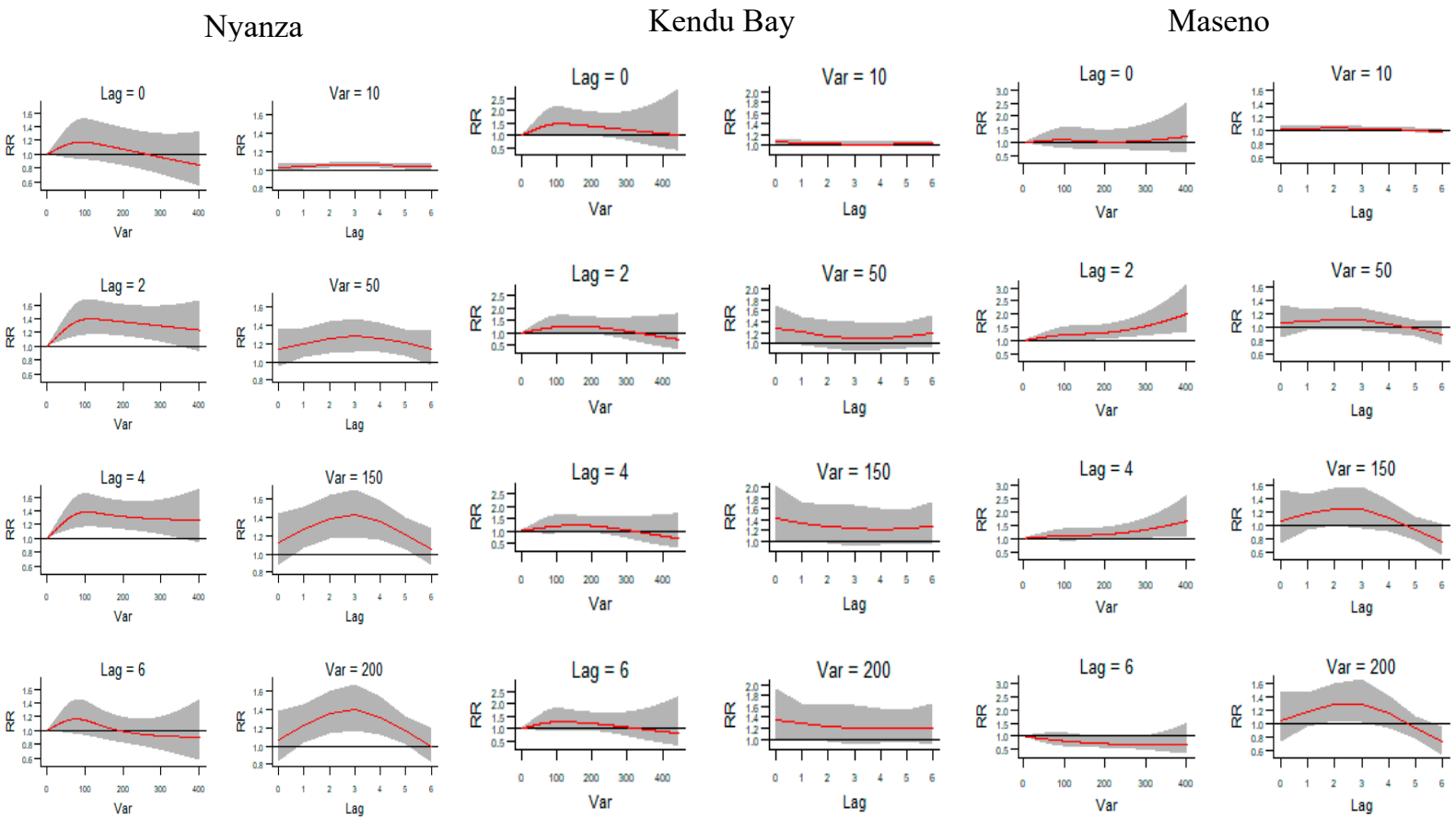
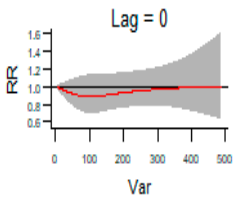
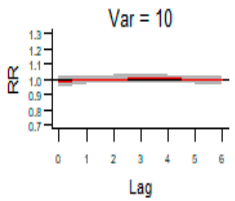

Kapsabet
malaria
500
1500
2500
rainfall(mm)
0
50
150
250
LST
15
20
25
30
35
land NDVI
0.50
0.60
0.70
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014

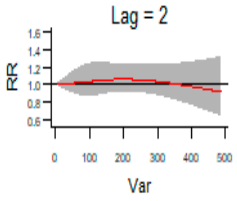
Figure S2 Associations between rainfall and monthly number of malaria cases in each hospital

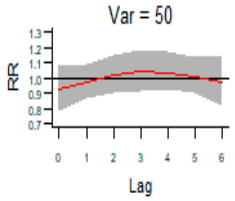


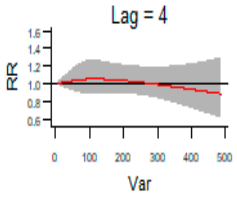
Kisii

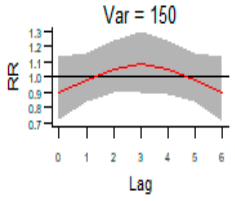


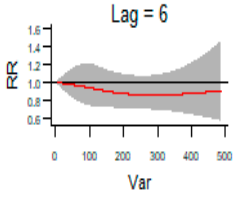


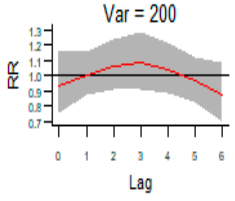




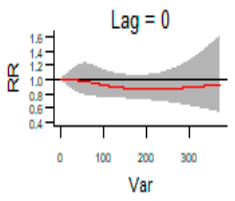


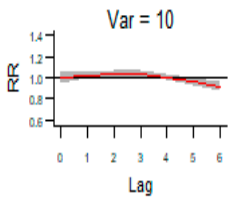


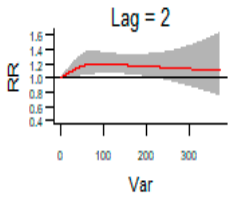


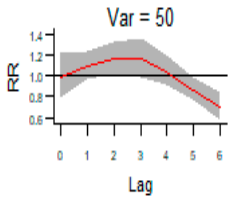


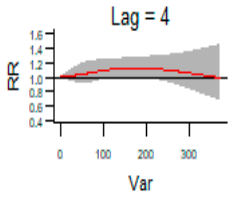
Kericho

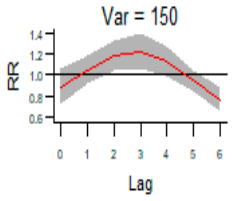


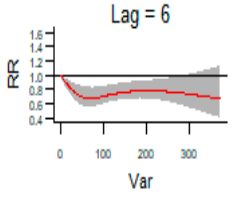


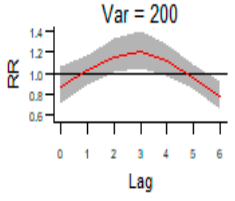




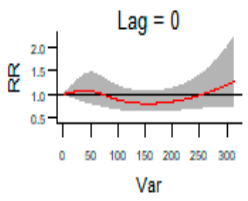


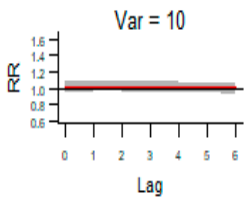


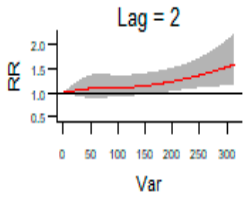


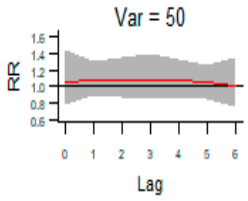


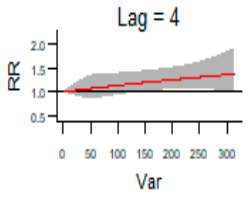
Kapsabet

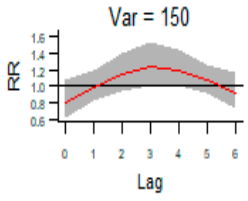


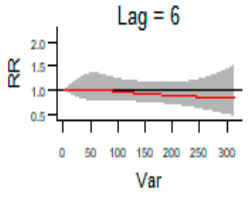












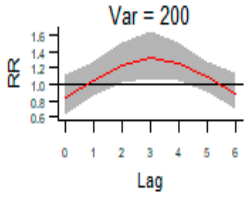
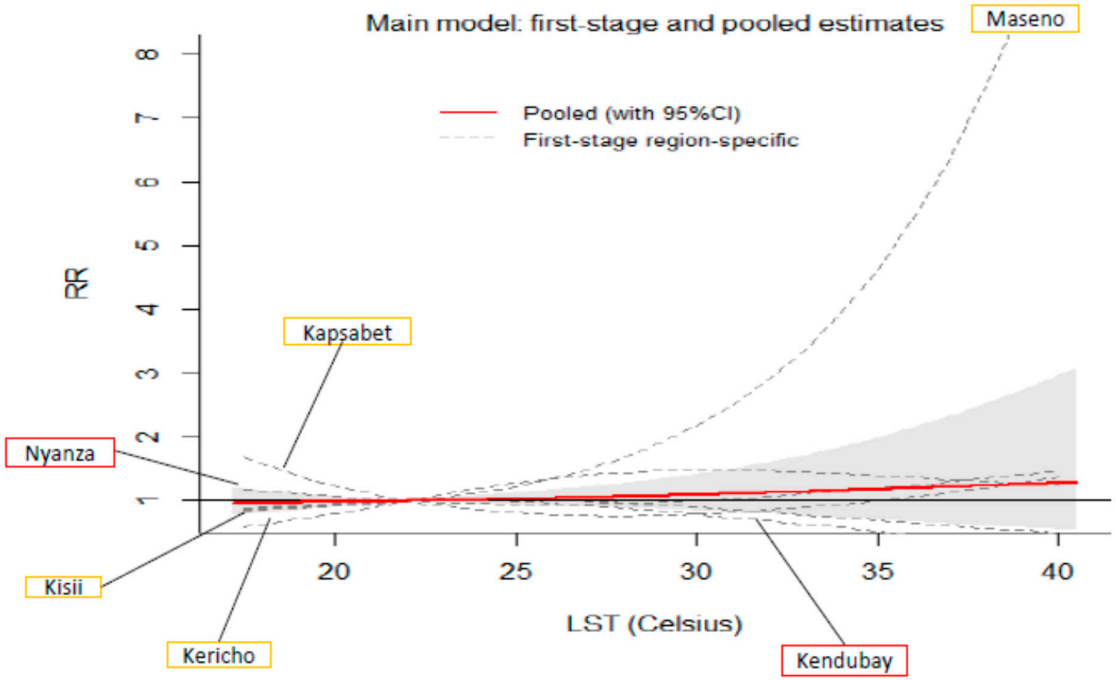


Figure S3 Associations between LST and monthly number of malaria cases

(A) Pooled overall cumulative LST-malaria association



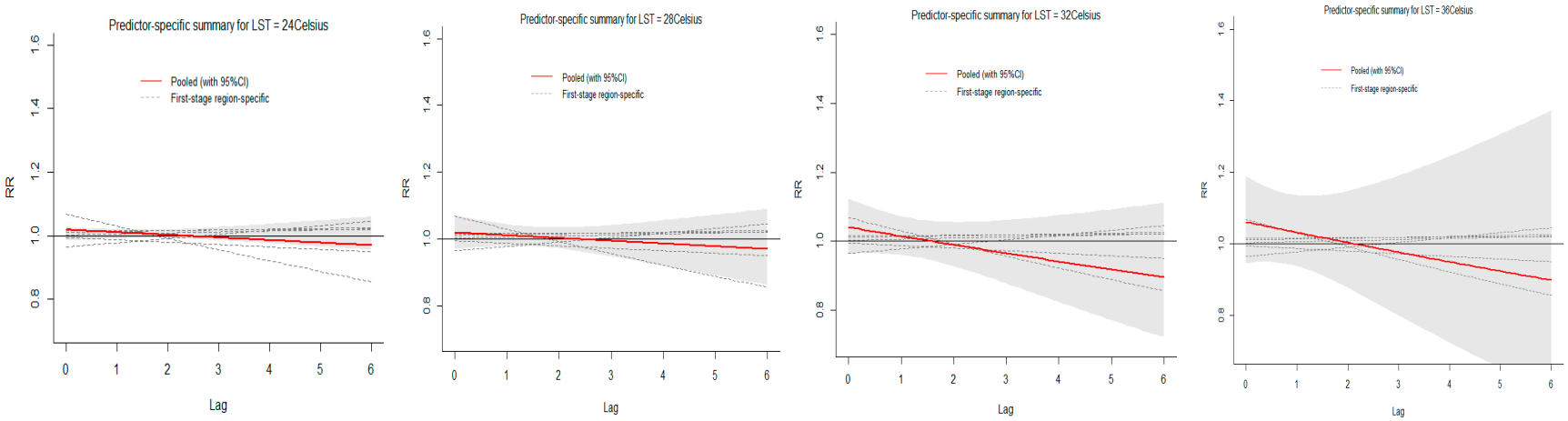
21

22 (B) Pooled predictor-specific LST-malaria association

23

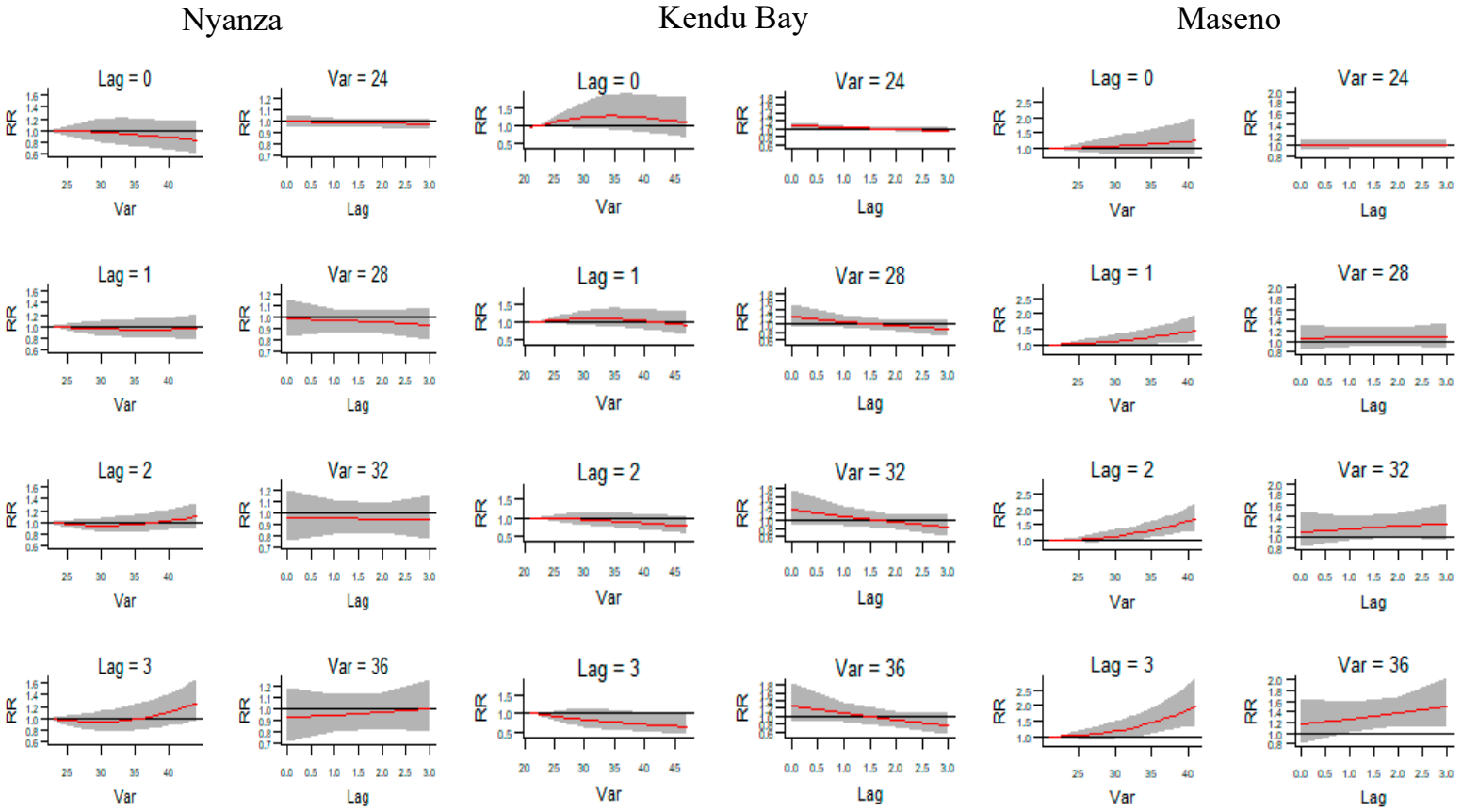
LST=24°C LST=28°C LST=32°C LST=36°C

24

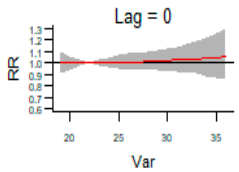


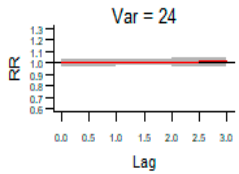
reference=22°C

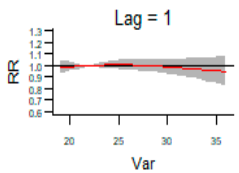
(C) LST-malaria association in each hospital

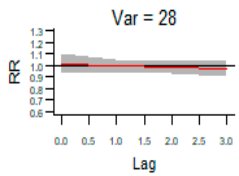


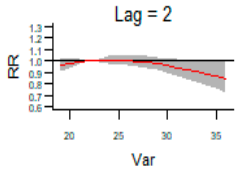
Kisii

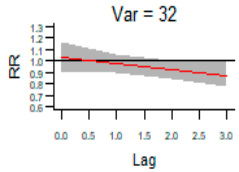


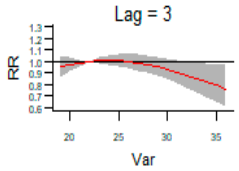


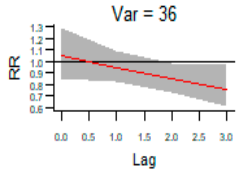




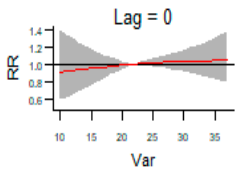


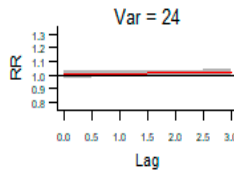


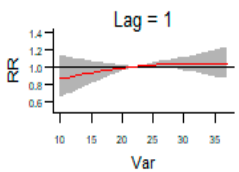


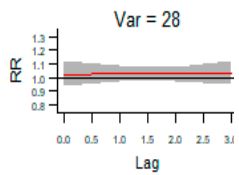


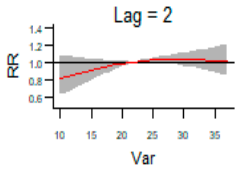
Kericho

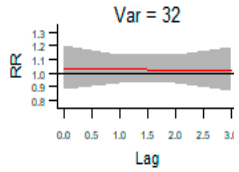


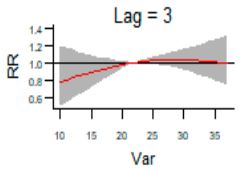


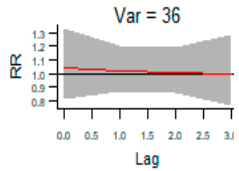




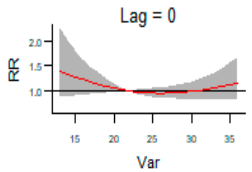


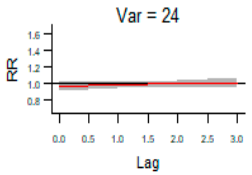


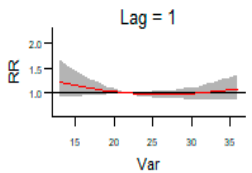


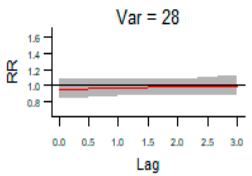


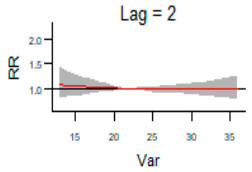
Kapsabet

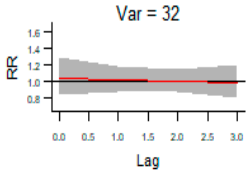


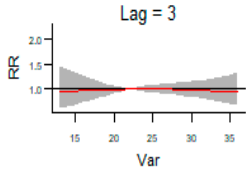












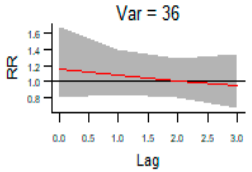
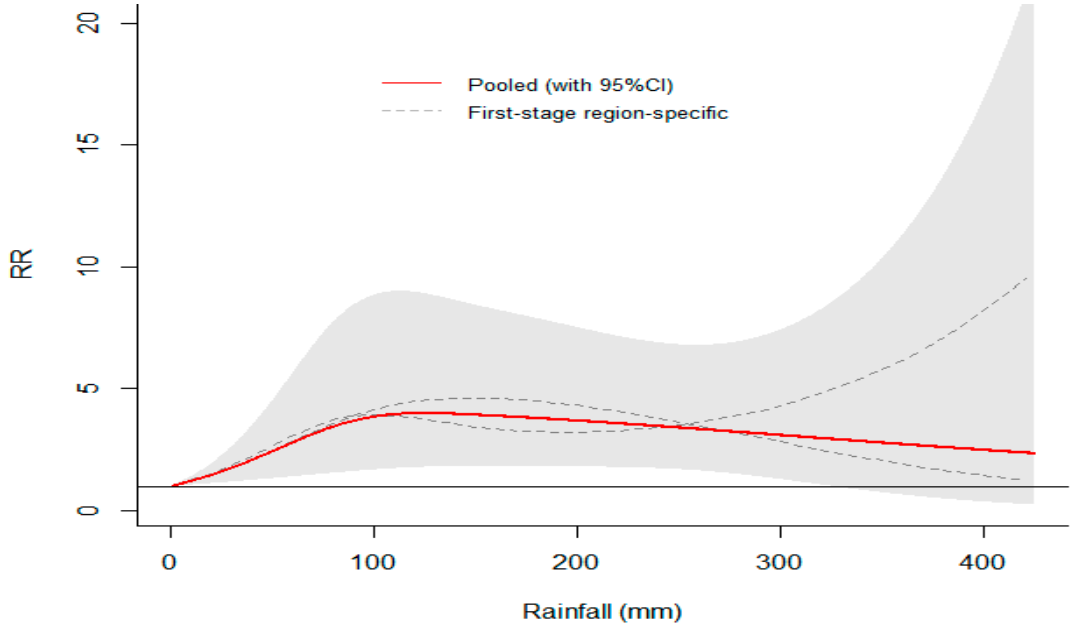


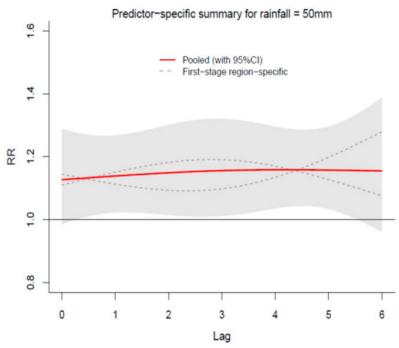
Figure S4 Associations between rain and monthly number of malaria cases in lowland applying for Model 2 (the submodel)

(A) Pooled overall cumulative rainfall-malaria association

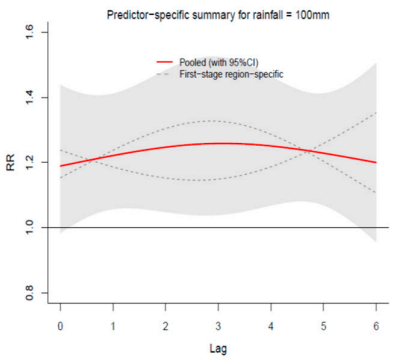


(B) Pooled predictor-specific rainfall-malaria association

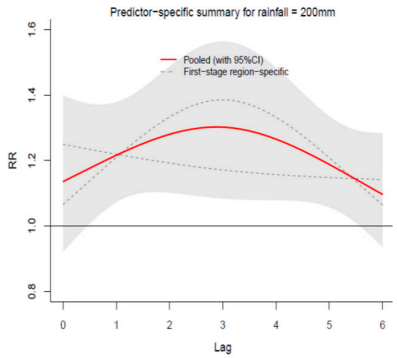
Rainfall=50mm



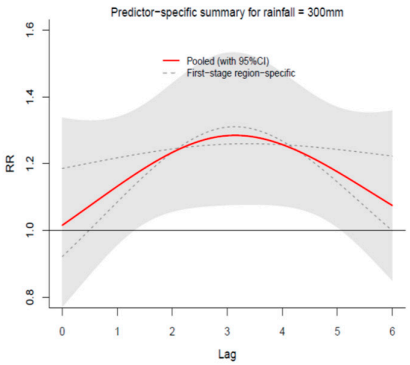
Rainfall=100mm



Rainfall=200mm



Rainfall=300mm



reference=0mm

(C) rainfall-malaria association in each hospital

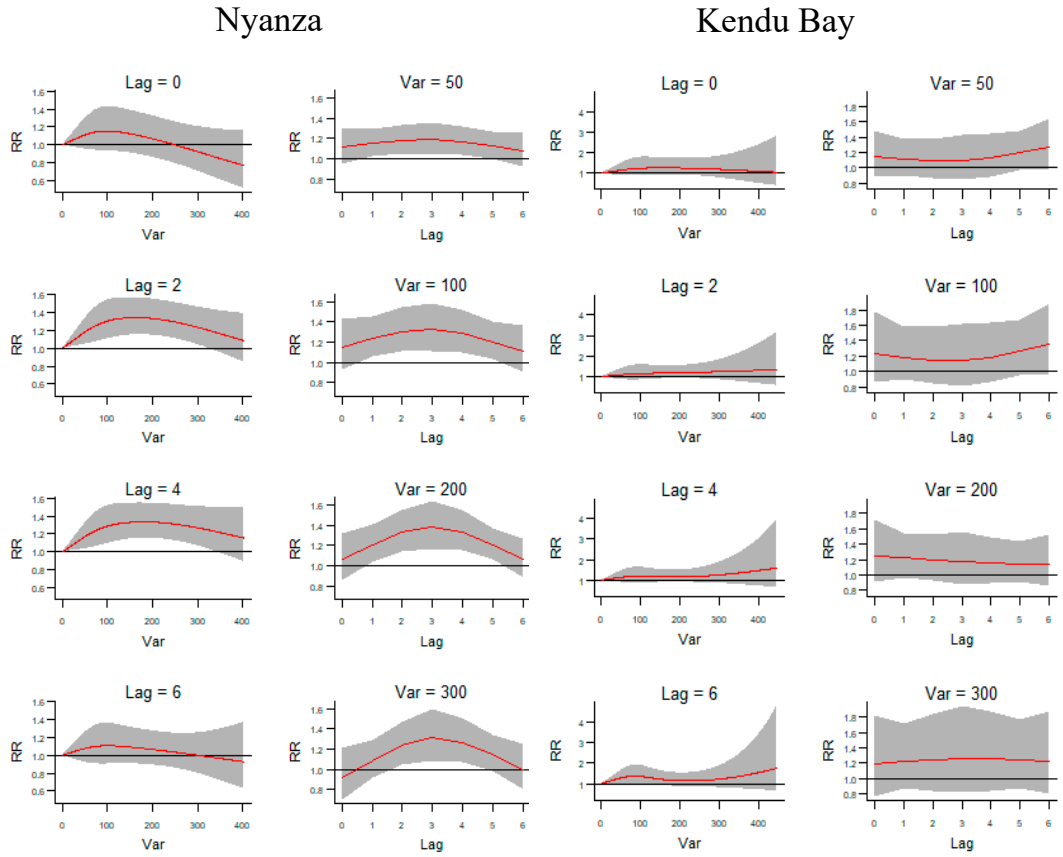
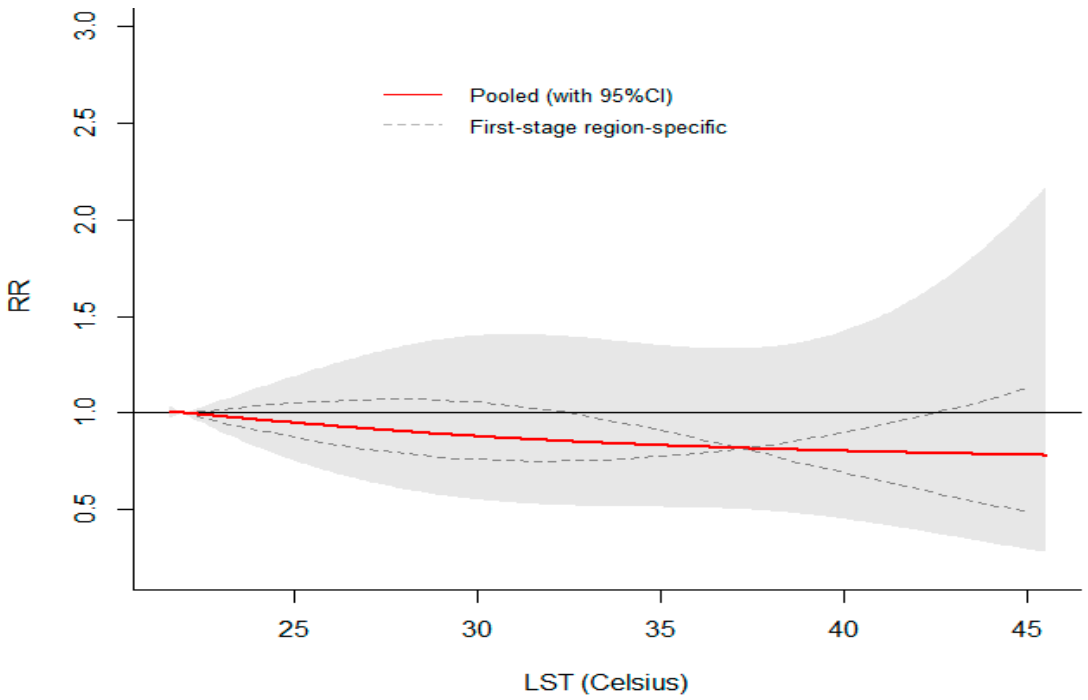


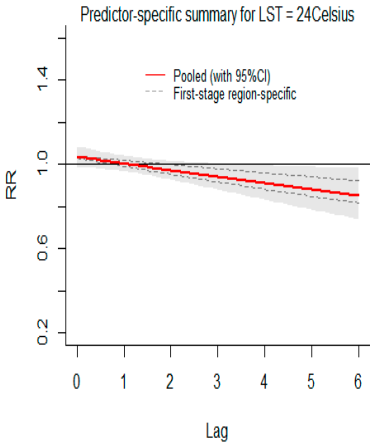
Figure S5 Associations between LST and monthly number of malaria cases lowland applying for Model 2 (the submodel)

(A) Pooled overall cumulative LST-malaria association

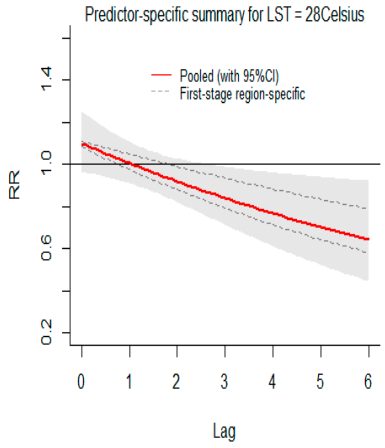


(B) Pooled predictor-specific LST-malaria association

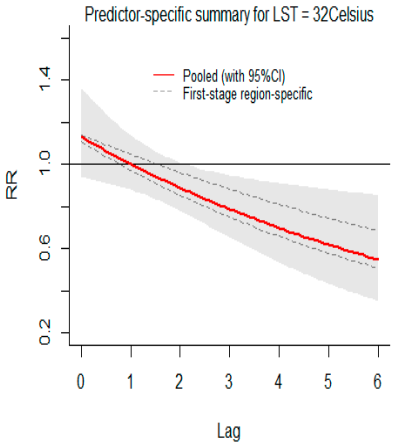
LST=24°C



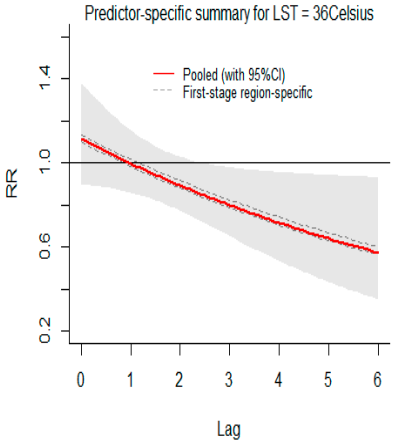
LST=28°C



LST=32°C



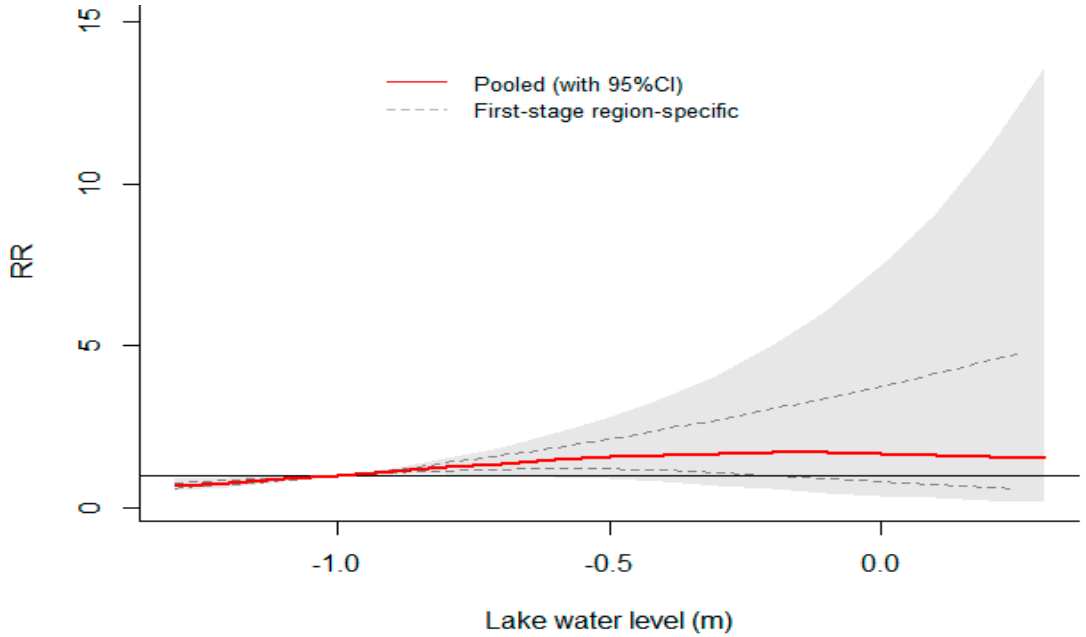
LST=36°C



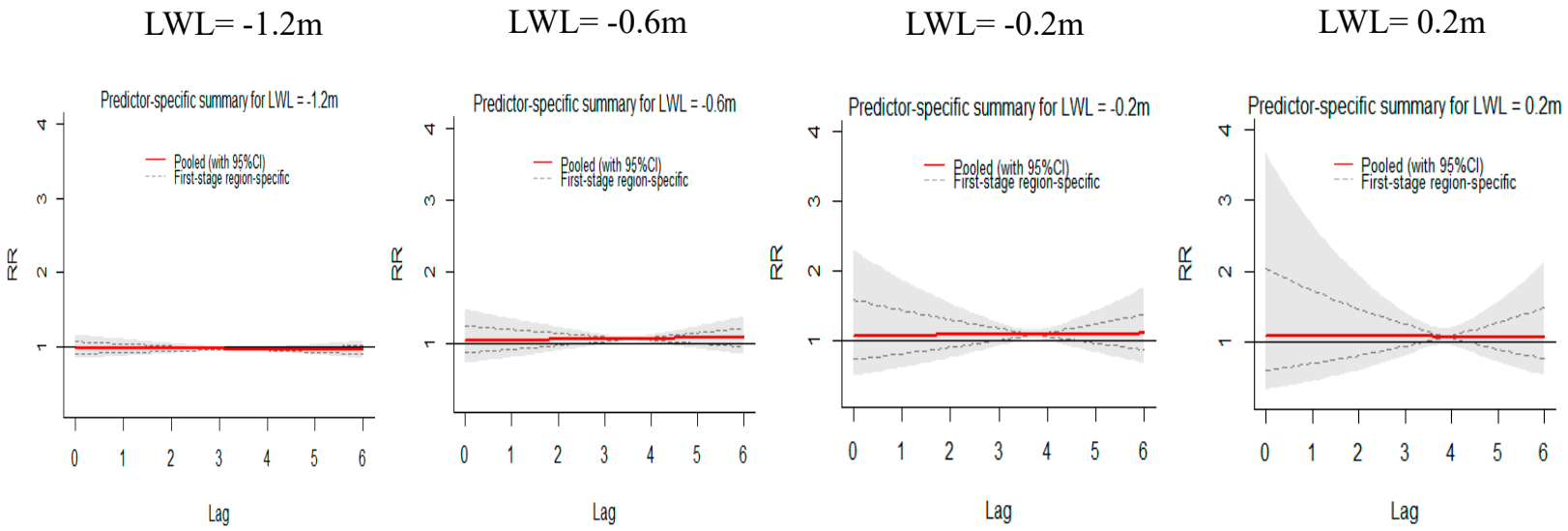
reference=22°C

Figure S6 Associations between LWL and monthly number of malaria cases in lowland applying for Model 2 (the submodel)

(A) Pooled overall cumulative LWL-malaria association



(B) Pooled predictor-specific LWL-malaria association



(C) LWL-malaria association in each hospital

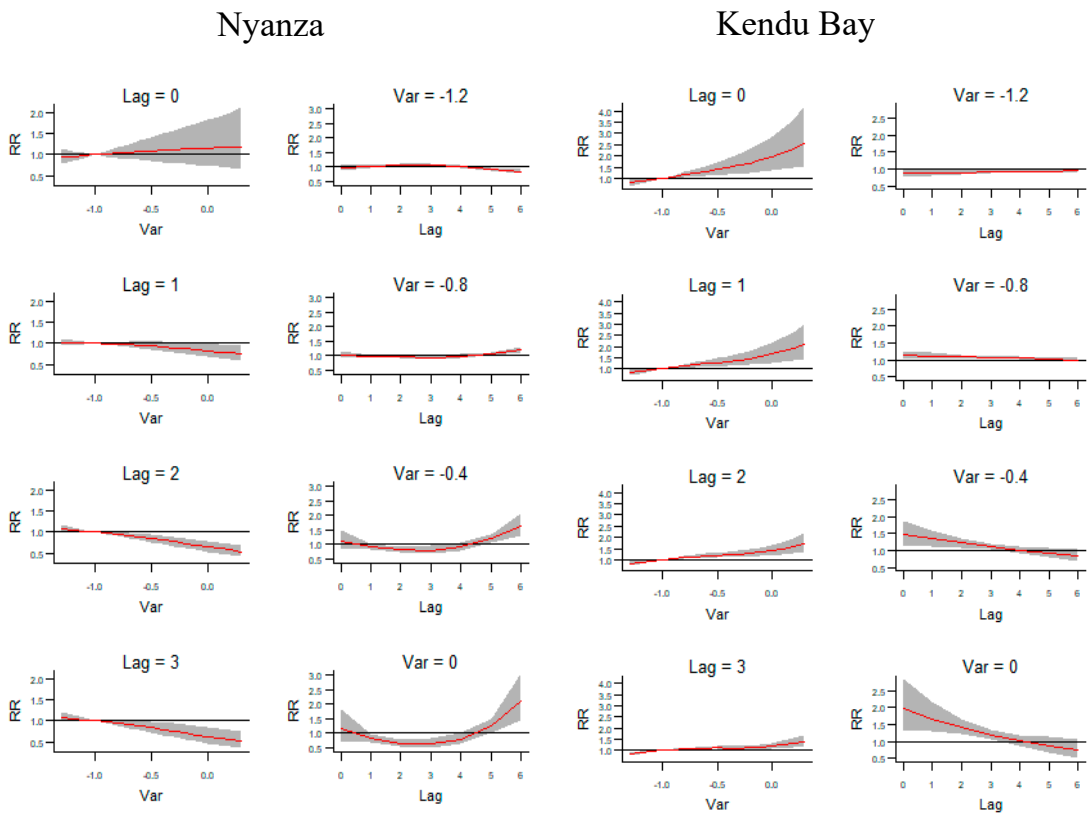


Table S1 pooled overall rainfall-malaria association by area (lowland & highland)

	lowland			**highland**		
rain[mm]	RR	95%CI		RR	95%CI	
10	1.29	1.12	1.48	1.03	0.96	1.10
50	3.35	1.73	6.49	1.14	0.81	1.59
100	6.89	2.55	18.62	1.21	0.74	1.97
120	7.32	2.74	19.56	1.20	0.74	1.93
150	6.92	2.81	17.02	1.17	0.76	1.80
200	5.72	2.51	13.04	1.16	0.78	1.73
300	3.49	1.29	9.45	1.31	0.77	2.24
400	1.92	0.38	9.75	1.67	0.64	4.36

Table S2 pooled lag-specific rainfall-malaria association by area (highland & lowland) in the model 1: the main model

lowland

	lag 0			lag 1			lag 2			lag 3			lag 4			lag 5			lag 6		
rain[mm]	RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI	
10	1.03	1.00	1.07	1.04	1.01	1.06	1.04	1.02	1.07	1.04	1.02	1.07	1.04	1.02	1.07	1.03	1.01	1.06	1.03	0.99	1.07
50	1.17	1.00	1.37	1.20	1.06	1.34	1.22	1.08	1.37	1.22	1.08	1.39	1.21	1.09	1.36	1.17	1.04	1.32	1.14	0.94	1.37
100	1.28	1.01	1.62	1.34	1.12	1.59	1.38	1.15	1.65	1.39	1.15	1.69	1.37	1.15	1.62	1.28	1.07	1.53	1.21	0.92	1.58
120	1.29	1.02	1.63	1.35	1.13	1.61	1.40	1.17	1.68	1.42	1.16	1.72	1.39	1.17	1.65	1.29	1.09	1.53	1.20	0.92	1.55
150	1.27	1.01	1.59	1.35	1.14	1.59	1.40	1.18	1.67	1.42	1.18	1.71	1.38	1.18	1.63	1.27	1.10	1.48	1.16	0.92	1.46
200	1.22	0.98	1.53	1.32	1.13	1.53	1.39	1.18	1.64	1.41	1.17	1.69	1.36	1.16	1.59	1.24	1.09	1.41	1.10	0.91	1.34
300	1.11	0.87	1.42	1.23	1.03	1.46	1.31	1.05	1.64	1.35	1.05	1.73	1.30	1.06	1.59	1.16	1.01	1.34	1.01	0.82	1.23
400	1.00	0.73	1.37	1.12	0.87	1.44	1.21	0.84	1.74	1.26	0.84	1.88	1.22	0.89	1.68	1.08	0.87	1.35	0.94	0.69	1.28

highland

	lag 0			lag 1			lag 2			lag 3			lag 4			lag 5			lag 6		
rain[mm]	RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI	
10	1.00	0.98	1.02	1.01	1.00	1.03	1.02	1.01	1.03	1.02	1.00	1.04	1.01	1.00	1.02	0.99	0.98	1.01	0.98	0.95	1.01
50	0.99	0.90	1.10	1.05	0.99	1.13	1.09	1.03	1.17	1.10	1.02	1.18	1.05	0.99	1.12	0.98	0.91	1.05	0.91	0.80	1.03
100	0.97	0.84	1.13	1.08	0.98	1.19	1.16	1.05	1.28	1.17	1.05	1.31	1.09	0.99	1.21	0.96	0.87	1.07	0.85	0.71	1.01
120	0.96	0.83	1.11	1.08	0.98	1.18	1.17	1.06	1.29	1.19	1.06	1.33	1.10	1.00	1.21	0.96	0.87	1.06	0.83	0.70	0.99
150	0.93	0.82	1.07	1.07	0.98	1.16	1.17	1.07	1.28	1.20	1.07	1.33	1.11	1.01	1.21	0.96	0.88	1.05	0.83	0.71	0.96
200	0.91	0.80	1.04	1.06	0.97	1.15	1.18	1.08	1.29	1.21	1.09	1.34	1.12	1.03	1.22	0.97	0.90	1.04	0.82	0.72	0.92
300	0.92	0.80	1.06	1.08	0.98	1.18	1.21	1.07	1.38	1.25	1.08	1.45	1.15	1.02	1.29	0.97	0.89	1.05	0.80	0.71	0.91
400	0.98	0.81	1.19	1.14	0.98	1.32	1.27	1.02	1.59	1.30	1.02	1.67	1.19	0.98	1.44	0.97	0.85	1.11	0.80	0.66	0.97

Table S3 pooled overall rainfall-malaria association by area (lowland & highland) with different rainfall lag and DF for month of year

(A) for different rainfall lag (lag=4 to 8)

Lowland

	lag=4				**lag=5**				**lag=6(main model)**				**lag=7**				**lag=8**		
rain [mm]	RR	95%CI			RR	95%CI			RR	95%CI			RR	95%CI			RR	95%CI	
10	1.17	1.05	1.29	10	1.23	1.08	1.39	10	1.29	1.12	1.48	10	1.39	1.20	1.61	10	1.42	1.21	1.68
100	3.31	1.59	6.89	100	4.86	1.96	12.05	100	6.89	2.55	18.62	100	11.29	3.94	32.29	100	13.29	4.09	43.13
120	3.52	1.68	7.35	120	5.22	2.12	12.88	120	7.32	2.74	19.56	120	11.47	4.03	32.68	120	13.40	4.18	43.00
200	3.34	1.69	6.58	200	4.58	2.06	10.16	200	5.72	2.51	13.04	200	6.78	2.81	16.37	200	7.24	2.77	18.93
300	2.61	1.04	6.57	300	2.99	1.01	8.81	300	3.49	1.29	9.45	300	3.68	1.42	9.54	300	3.47	1.23	9.83
400	1.81	0.39	8.45	400	1.64	0.26	10.39	400	1.92	0.38	9.75	400	2.17	0.59	7.97	400	1.80	0.44	7.43

Highland

	lag=4				**lag=5**				**lag=6(main model)**				**lag=7**				**lag=8**		
rain [mm]	RR	95%CI			RR	95%CI			RR	95%CI			RR	95%CI			RR	95%CI	
10	1.06	1.00	1.12	10	1.05	0.98	1.12	10	1.03	0.96	1.10	10	1.03	0.96	1.10	10	1.04	0.96	1.12
100	1.54	1.04	2.31	100	1.39	0.88	2.21	100	1.21	0.74	1.97	100	1.14	0.71	1.84	100	1.22	0.72	2.04
120	1.55	1.04	2.31	120	1.39	0.89	2.19	120	1.20	0.74	1.93	120	1.10	0.69	1.75	120	1.16	0.69	1.93

200	1.51	1.05	2.17	200	1.35	0.90	2.02	200	1.16	0.78	1.73	200	0.96	0.64	1.43	200	0.91	0.59	1.42
300	1.71	1.00	2.92	300	1.47	0.80	2.72	300	1.31	0.77	2.24	300	1.09	0.68	1.76	300	0.83	0.49	1.40
400	2.20	0.86	5.63	400	1.78	0.58	5.47	400	1.67	0.64	4.36	400	1.55	0.73	3.30	400	0.88	0.38	2.04

(B) for different month of year DF (mdf)

mdf (Nyanza, Maseno, Kendubay, Kapsabet, Kericho, Kisii)

Lowland

	(main model)															
mdf	**(4,4,4,2,2,2)**			**(2,2,2,2,2,2)**				**(3,3,3,3,3,3)**				**(4,4,4,4,4,4)**			
rain [mm]	RR	95%CI			RR	95%CI			RR	95%CI			RR	95%CI	
10	1.29	1.12	1.48	10	1.29	1.13	1.48	10	1.26	1.10	1.45	10	1.29	1.12	1.48
100	6.89	2.55	18.62	100	6.93	2.67	17.97	100	5.82	2.21	15.34	100	6.95	2.58	18.75
120	7.32	2.74	19.56	120	7.25	2.82	18.61	120	6.10	2.34	15.91	120	7.39	2.77	19.69
200	5.72	2.51	13.04	200	5.44	2.47	11.96	200	4.73	2.11	10.57	200	5.76	2.53	13.13
300	3.49	1.29	9.45	300	3.56	1.40	9.01	300	3.05	1.18	7.88	300	3.56	1.34	9.46
400	1.92	0.38	9.75	400	2.30	0.53	10.01	400	1.87	0.42	8.26	400	2.00	0.42	9.53

Highland

	(main model)														
mdf	**(4,4,4,2,2,2)**			**(2,2,2,2,2,2)**				**(3,3,3,3,3,3)**				**(4,4,4,4,4,4)**			
rain [mm]	RR	95%CI			RR	95%CI			RR	95%CI			RR	95%CI	
10	1.03	0.96	1.10	10	1.03	0.96	1.10	10	1.02	0.96	1.10	10	1.03	0.96	1.11
100	1.21	0.74	1.97	100	1.19	0.74	1.91	100	1.18	0.73	1.91	100	1.28	0.78	2.09
120	1.20	0.74	1.93	120	1.18	0.75	1.87	120	1.17	0.73	1.87	120	1.28	0.79	2.06
200	1.16	0.78	1.73	200	1.15	0.77	1.70	200	1.13	0.76	1.68	200	1.27	0.84	1.91
300	1.31	0.77	2.24	300	1.29	0.77	2.15	300	1.28	0.76	2.14	300	1.49	0.87	2.55
400	1.67	0.64	4.36	400	1.64	0.68	3.95	400	1.63	0.67	3.96	400	1.98	0.77	5.04