

SUPPLEMENTAL MATERIAL

Table S1: Demographic Factors Categorized by Vulnerability Component

Component	Variables from GEMS/VIDA
Sensitivity	Number of people living in the house
	Number of people who sleep in the house
	Number of children <5 years old in the house
	Are animals present in the house*
Adaptive Capacity	Primary care givers education level (less than primary or primary and above)
	House has electricity
	Household owns a bike
	Household owns a phone
	Household has a television
	Household owns a car
	Household owns a cart
	Household owns a scooter
	House has a fridge
	Household owns agricultural land
	Household has a radio
	Household owns a boat
	Household uses an improved drinking water source (Based on WHO definition)*
	Household uses an improved sanitation facility (Based on WHO definition)*
*variables are derived from other variables in GEMS/VIDA GEMS – Global Enteric Multicenter Study VIDA – Vaccine Impact on Diarrhea in Africa WHO – World Health Organization	

Table S2: Sensitivity Index Cut-Offs by Site

	The Gambia	Mali	Kenya
High Sensitivity	>52	>34	>13
Low Sensitivity	≤ 52	≤ 34	≤ 13

Figure S1: Stacked Weighted Daily Cases of Pathogen-Specific Moderate-to-Severe Diarrhea by Country and Study

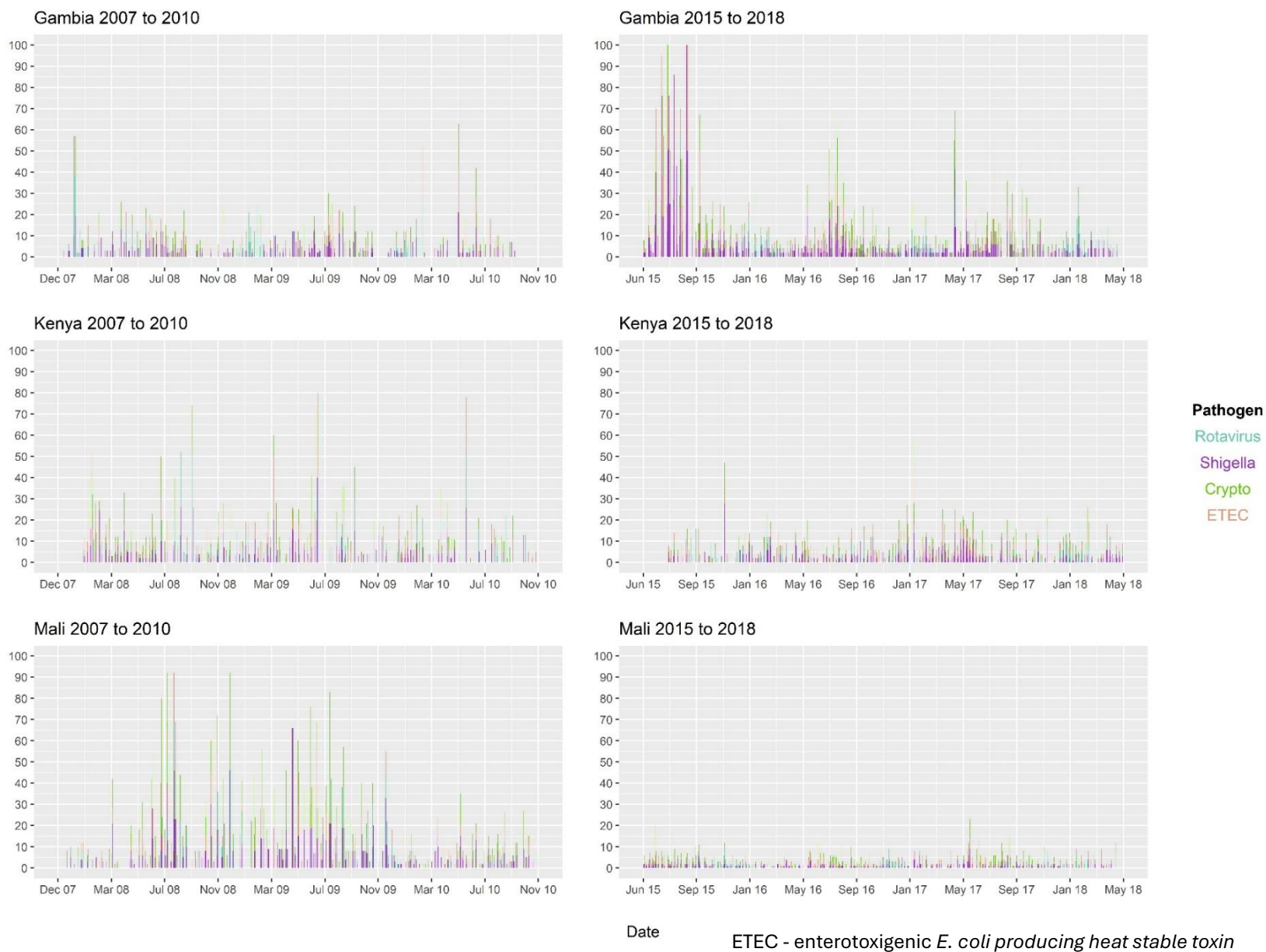


Table S3: Daily Weather Lags Assessed Based on Pathogen

	Temperature	Precipitation
Rotavirus	Lag days 3 - 21	Lag days 3 - 21
Shigella	Lag days 4 - 21	Lag days 4 - 21
Cryptosporidium	Lag days 3 - 21	Lag days 3 - 21
ETEC – enterotoxigenic <i>E. coli</i> producing heat stable toxin	Lag days 3 - 21	Lag days 3 - 21

Table S4: Random Forest Model Hyperparameters Tested

Hyperparameter	Values
Ntree	200
Mtry	2, 3, 4, 5, 6, 7, 8
Seeds	12, 23, 34, 45, 123, 135, 234, 245, 345, 357, 456
Split ratios	0.3, 0.4, 0.5, 0.6, 0.7, 0.8

Table S5: GEMS/VIDA Climate Driver Random Forest Model Accuracies by Country and Pathogen

	The Gambia	Mali	Kenya
Rotavirus	85%	81%	78%
Shigella	54%	56%	69%
Cryptosporidium	73%	71%	80%
ETEC – enterotoxigenic <i>E. coli</i> producing heat stable toxin	76%	71%	76%

Table S6: Adaptive Capacity Factors Random Forest Model Accuracies by Country and Pathogen

	The Gambia	Mali	Kenya
Rotavirus	82%	86%	86%
Shigella	55%	68%	71%
Cryptosporidium	72%	73%	82%
ETEC – enterotoxigenic <i>E. coli</i> producing heat stable toxin	76%	80%	78%

Table S7: Likelihood Ratio of Effect Modification Interaction Model by Country, Climate Driver, Pathogen and Effect Modifier

<i>Effect Modifier</i>	<i>Country</i>		<i>Rotavirus</i>	<i>Shigella</i>	<i>Cryptosporidium</i>	<i>ETEC</i>
			LRT p-value	LRT p-value	LRT p-value	LRT p-value
Study	Kenya	Temperature	0.06	0.615	0.012	0.008
		Cumulative Rainfall	<0.0001	<0.0001	<0.0001	NA
	The Gambia	Temperature	<0.0001	<0.0001	0.002	<0.0001
		Cumulative Rainfall	<0.0001	NA	<0.0001	<0.0001
		Intermittency	<0.0001	<0.0001	0.001	<0.0001
	Mali	Temperature	<0.0001	<0.0001	<0.0001	<0.0001
		Cumulative Rainfall	<0.0001	NA	<0.0001	<0.0001
		Intermittency	<0.0001	<0.0001	<0.0001	<0.0001
Sensitivity	Kenya	Temperature	0.01	<0.0001	<0.0001	0.005
		Cumulative Rainfall	0.487	0.039	<0.0001	NA
	The Gambia	Temperature	0.476	<0.0001	0.006	0.861
		Cumulative Rainfall	0.032	NA	0.525	0.536
		Intermittency	0.450	0.335	0.531	0.025

Transportation	Mali	Temperature	0.271	0.001	0.030	0.082
		Cumulative Rainfall	0.080	NA	0.011	0.070
		Intermittency	0.212	0.129	0.012	<0.0001
	Kenya	Temperature	0.118	0.886	0.676	0.524
		Cumulative Rainfall	0.558	0.084	0.646	NA
		Intermittency	0.006	<0.0001	0.006	0.0003
	The Gambia	Cumulative Rainfall	0.044	NA	0.0009	<0.0001
		Intermittency	0.003	<0.0001	<0.0001	0.0007
		Temperature	<0.0001	<0.0001	<0.0001	<0.0001
	Mali	Cumulative Rainfall	<0.0001	NA	<0.0001	0.0007
		Intermittency	<0.0001	<0.0001	<0.0001	0.021
		Temperature	<0.0001	<0.0001	<0.0001	<0.0001
Television	Kenya	Cumulative Rainfall	0.037	<0.0001	<0.0001	NA
		Temperature	0.076	<0.0001	<0.0001	0.056
		Cumulative Rainfall	0.003	NA	<0.0001	0.077
	The Gambia	Intermittency	0.003	0.0009	<0.0001	0.134
		Temperature	0.0002	<0.0001	0.536	<0.0001
		Cumulative Rainfall	<0.0001	NA	0.269	<0.0001
	Mali	Intermittency	<0.0001	0.124	0.027	0.001
		Temperature	0.361	0.052	0.0008	0.003
		Cumulative Rainfall	0.122	0.156	0.002	NA
Electricity	Kenya	Temperature	0.169	<0.0001	0.0002	<0.0001
		Cumulative Rainfall	0.522	NA	0.001	0.012
		Intermittency	0.125	0.614	<0.0001	0.052
	The Gambia	Temperature	0.0001	0.0005	<0.0001	<0.0001
		Cumulative Rainfall	NA	NA	<0.0001	<0.0001
		Intermittency	<0.0001	0.002	<0.0001	0.005
	Mali	Temperature	0.0001	0.0005	<0.0001	<0.0001
		Cumulative Rainfall	NA	NA	<0.0001	<0.0001
		Intermittency	<0.0001	0.002	<0.0001	0.005

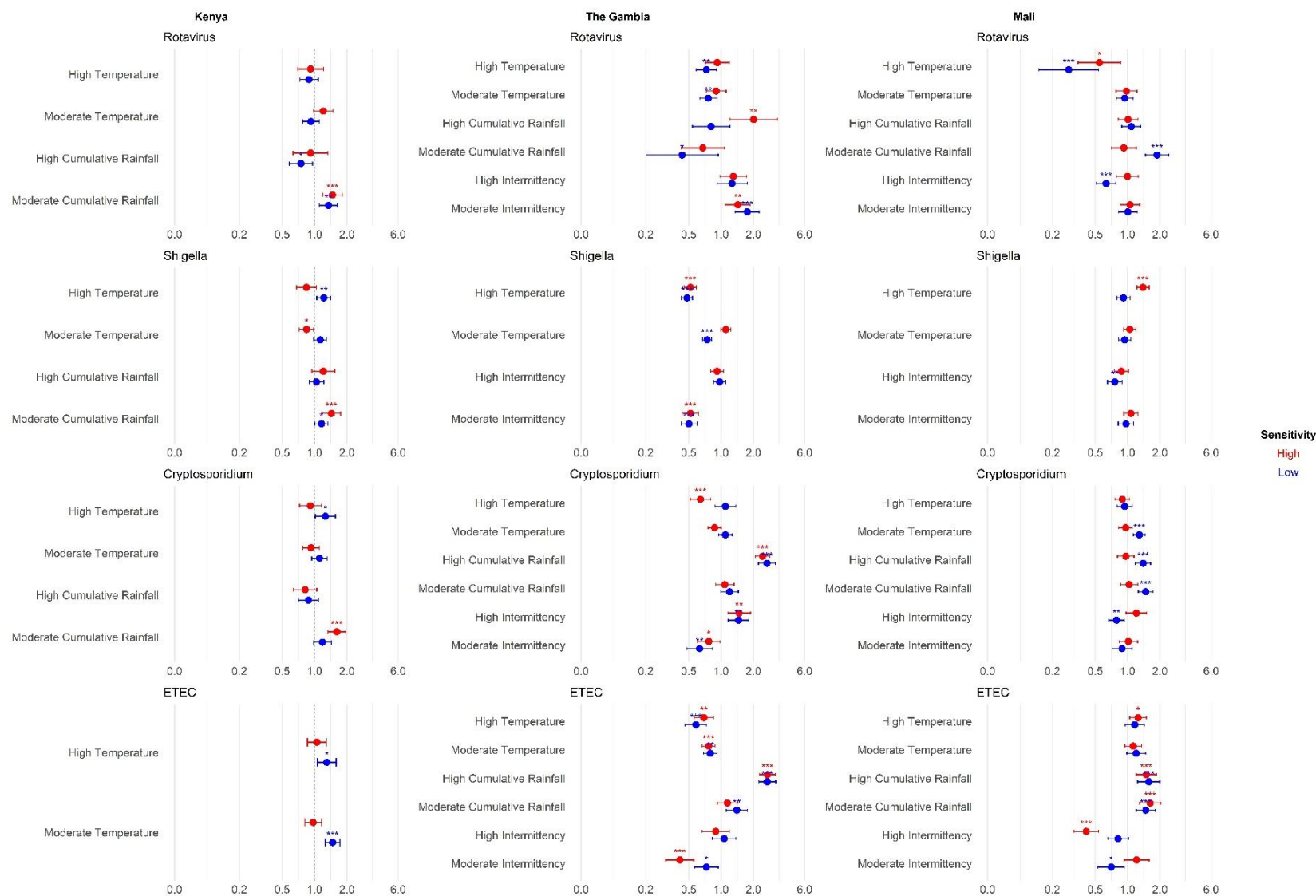
Estimates from zero inflated Poisson count models adjusted for time since the start of the GEMS study, N= 3030, 2707, 3641 in Kenya, The Gambia and Mali respectively

NA – Not identified as a key climate driver in random forest models

Intermittency – days since 1mm rainfall

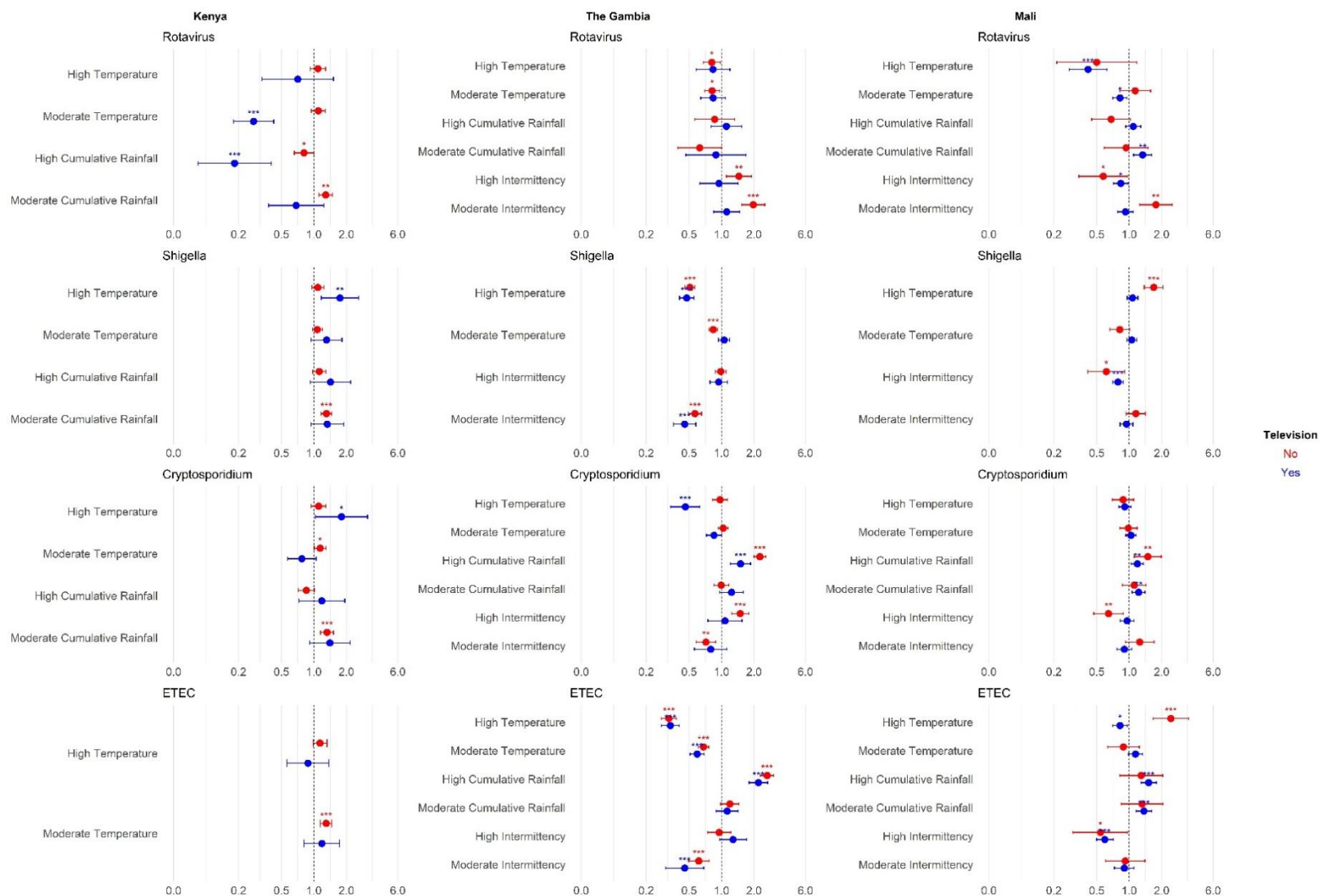
ETEC – enterotoxigenic E. coli producing heat stable toxin

Figure S2: Incidence Rate Ratio of Pathogen-Specific Moderate-to-Severe Diarrhea by Country and Sensitivity Level



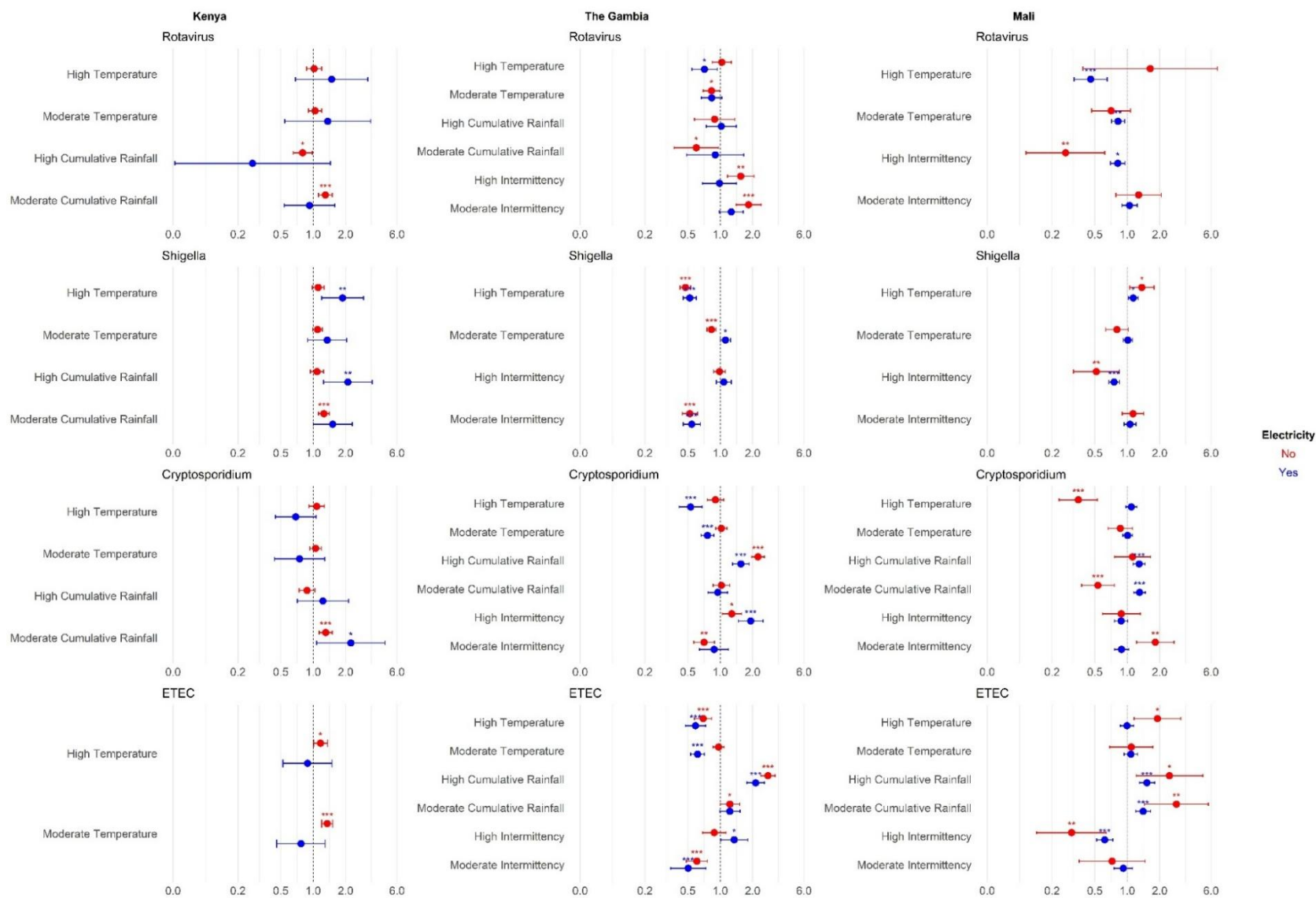
Each plot represents incidence rate ratios (IRR) with 95% confidence intervals compared to the low tertile for the climate driver by sensitivity level (low and high) from zero inflated Poisson model count estimates adjusted for time since the start of GEMS with four degrees of freedom (N = 3030, 5707, 3641 in Kenya, The Gambia and Mali respectively). Statistically significant IRRs are denoted with an asterisk for the corresponding p-value: *0.05 **0.01 ***0.001 ETEC - enterotoxigenic *E. coli* producing heat stable toxin. Intermittency – days since last 1mm rainfall.

Figure S3: Incidence Rate Ratio of Pathogen-Specific Moderate-to-Severe Diarrhea by Country and Household Television Ownership



Each plot represents incidence rate ratios (IRR) with 95% confidence intervals compared to the low tertile for the climate driver by television ownership from zero inflated Poisson model count estimates adjusted for time since the start of GEMS with four degrees of freedom (N = 3030, 5707, 3641 in Kenya, The Gambia and Mali respectively). Statistically significant IRRs are denoted with an asterisk for the corresponding p-value: *0.05 **0.01 ***0.001. ETEC - enterotoxigenic *E. coli* producing heat stable toxin. Intermittency – days since last 1mm rainfall.

Figure S4: Incidence Rate Ratio of Pathogen-Specific Moderate-to-Severe Diarrhea by Country and Household Electricity Status



Each plot represents incidence rate ratios (IRR) with 95% confidence intervals compared to the low tertile for the climate driver by electricity access from zero inflated Poisson model count estimates adjusted for time since the start of GEMS with four degrees of freedom (N = 3030, 5707, 3641 in Kenya, The Gambia and Mali respectively). Statistically significant IRRs are denoted with an asterisk for the corresponding p-value: *0.05 **0.01 ***0.001. In Mali there was perfect separation between cumulative precipitation and electricity and rotavirus cases, so this model was excluded. ETEC - enterotoxigenic *E. coli* producing heat stable toxin. Intermittency – days since last 1mm rainfall.