# Early Warning Signals of Malaria Resurgence in Kericho, Kenya

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Supplemental File 1: Sensitivity Analysis of Testing Window Endpoints (Notional Month of Beginning of Approach to Criticality, Notional Month of Critical Transition)

This supplement examines the sensitivity of the main result to two modeling choices: (1) the notional start of the approach to criticality, and (2) the notional start of the supercritical period (i.e., the first and final month of the time series used for early warning signal detection). We performed a panel analysis of the rolling window method for all combinations of approach to criticality start months from July 1981 through May 1982 and supercritical start months from November 1992 through September 1993. Correlation coefficients and p-values were calculated as in the main text.

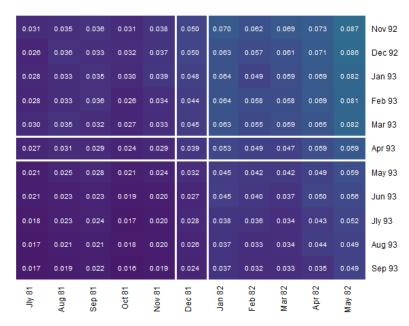
The significance of the signal from variance and index of dispersion is greatest with an earlier start and end to the testing window.

The p-value for increases in autocovariance remains low across various testing windows with little variation.

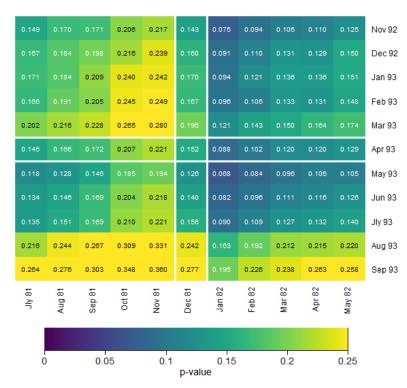
The strength of the signal from lag-1 autocorrelation and decay time are greatest when the notional start of the supercritical period is earlier, suggesting that the critical transition occurs several months prior to the spike in cases.

The first difference of variance, mean, coefficient of variation, skewness, and kurtosis do not return a significant signal at the beginning of the supercritical period regardless of the endpoints of the testing window.

### Variance

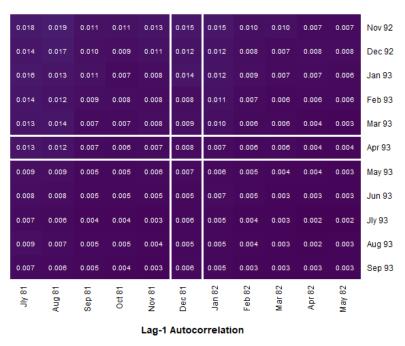


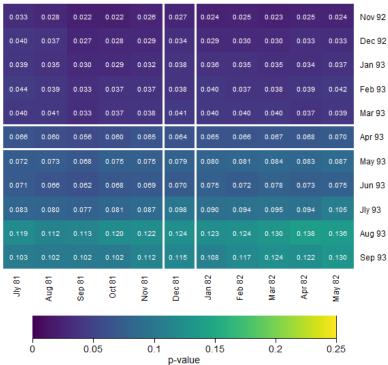
## First Difference of Variance



Supplemental Figures 1.1-1.2: The effect of the notional beginning of approach to criticality (x-axis) and notional month of critical transition (y-axis) on the resulting p-value for indicators of critical slowing down. Each cell displays the p-value for a given set of parameters and is shaded accordingly. The highlighted row/column identifies the values used in the main analysis (Dec 1981 – Apr 1993). The color key for p-values is displayed at the bottom of the plot and standardized across all indicators.

### **Autocovariance**





Supplemental Figures 1.3-1.4: The effect of the notional beginning of approach to criticality (x-axis) and notional month of critical transition (y-axis) on the resulting p-value for indicators of critical slowing down. Each cell displays the p-value for a given set of parameters and is shaded accordingly. The highlighted row/column identifies the values used in the main analysis (Dec 1981 – Apr 1993). The color key for p-values is displayed at the bottom of the plot and standardized across all indicators.

#### **Decay Time** Nov 92 0.013 0.006 0.009 0.006 0.008 0.006 0.009 0.009 0.010 0.009 Dec 92 0.009 0.017 0.012 0.011 0.011 0.011 0.015 0.012 0.013 0.014 Jan 93 0.015 Feb 93 0.020 0.017 0.013 0.014 0.016 0.015 0.015 0.016 0.015 0.019 Mar 93 0.014 0.016 0.017 0.017 0.015 0.020 0.019 0.013 0.015 0.019 Apr 93 May 93 Jun 93 0.040 0.044 Jly 93 Aug 93 0.090 0.078 0.084 0.088 0.085 0.096 0.098 0.079 0.086 Sep 93 82 È Aug Sep ö Dec Jan Feb Арг May ŝ Mean 0.247 0.270 0.273 0.264 Nov 92 0.234 Dec 92 0.258 0.259 0.259 0.224 Jan 93 0.252 0.252 0.252 0.229 0.250 0.247 0.244 Feb 93 0.221 0.244 0.244 0.242 Mar 93 0.210 0.236 0.239 0.231 Apr 93 May 93 0.216 0.231 0.214 Jun 93 0.223 0.217 0.224 Jly 93 0.217 0.217 0.211 Aug 93 0.212 0.215 0.219 Sep 93 82 Jan May ö ŝ Αpr

Supplemental Figures 1.5-1.6: The effect of the notional beginning of approach to criticality (x-axis) and notional month of critical transition (y-axis) on the resulting p-value for indicators of critical slowing down. Each cell displays the p-value for a given set of parameters and is shaded accordingly. The highlighted row/column identifies the values used in the main analysis (Dec 1981 – Apr 1993). The color key for p-values is displayed at the bottom of the plot and standardized across all indicators.

0.15

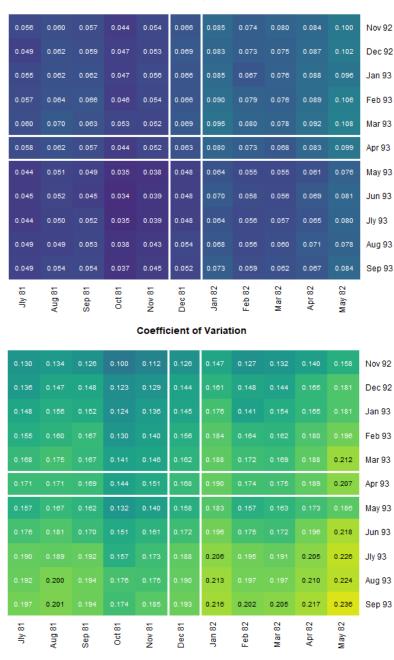
0.2

0.25

0.1

0.05

## **Index of Dispersion**



Supplemental Figures 1.7-1.8: The effect of the notional beginning of approach to criticality (x-axis) and notional month of critical transition (y-axis) on the resulting p-value for indicators of critical slowing down. Each cell displays the p-value for a given set of parameters and is shaded accordingly. The highlighted row/column identifies the values used in the main analysis (Dec 1981 – Apr 1993). The color key for p-values is displayed at the bottom of the plot and standardized across all indicators.

0.15

0.2

0.25

0.05

#### Skewness 0.488 0.484 0.447 Nov 92 0.481 0.474 0.451 Dec 92 0.350 0.361 0.384 0.454 0.458 0.444 0.442 0.432 0.428 0.404 0.386 Jan 93 0.324 0.325 0.355 0.424 0.432 0.430 0.408 0.412 0.401 0.391 0.368 Feb 93 Mar 93 0.309 0.323 0.330 0.404 0.402 0.405 0.390 0.394 0.375 0.354 0.345 0.424 0.423 0.415 0.397 0.390 0.378 0.349 Apr 93 May 93 0.444 0.404 0.450 0.439 0.431 0.409 0.405 0.393 Jun 93 0.442 0.439 0.427 0.412 Jly 93 0.370 0.371 0.392 0.431 0.424 0.423 0.411 0.415 0.401 0.383 0.366 Aug 93 0.357 0.380 0.407 0.414 0.408 0.395 0.393 0.390 0.362 0.362 Sep 93 0.348 82 6 È Aug Sep ö Dec Jan Feb ăa May è Αpr Kurtosis Nov 92 0.528 0.518 0.507 0.500 0.532 0.497 0.503 0.503 0.489 0.519 0.479 Dec 92 0.510 0.537 0.519 0.500 0.495 0.499 0.486 0.505 0.501 Jan 93 Feb 93 0.484 0.497 0.490 0.471 0.459 Mar 93 Apr 93 0.498 0.497 0.502 0.531 0.520 0.505 0.481 0.497 0.484 0.479 0.463 0.554 0.531 0.534 May 93 0.548 0.558 0.571 0.569 0.545 0.521 0.509 Jun 93 0.536 0.541 0.548 0.572 0.564 0.549 0.528 0.534 0.520 0.518 0.500 Jly 93 0.548 0.560 0.532 0.507 0.556 0.576 0.571 0.530 0.545 0.515 0.531 Aug 93 0.532 0.544 0.573 0.562 0.541 0.528 0.533 0.528 0.506 0.503 Sep 93 82 92 20 9 œ È Aug Jan Feb May Ma è 함 0.05 0.15 0.2 0.25

Supplemental Figures 1.9-1.10: The effect of the notional beginning of approach to criticality (x-axis) and notional month of critical transition (y-axis) on the resulting p-value for indicators of critical slowing down. Each cell displays the p-value for a given set of parameters and is shaded accordingly. The highlighted row/column identifies the values used in the main analysis (Dec 1981 – Apr 1993). The color key for p-values is displayed at the bottom of the plot and standardized across all indicator