# Epidemiology and Infection

Fine-Temporal Forecasting of Outbreak Probability and Severity: Ross River Virus in Western Australia

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# Supplementary Material

## Supplementary Table 1: Percent (%) proportion of study period with missing data. Where the values: Ptot, is for weekly Precipitation; Tmin, Minimum temperature; Tmax, Maximum temperature; THmin, Minimum tide height; and THmax, Maximum tide height. Where NAs appear, the environmental data for that site was not applicable.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Site | Tmin | Tmax | THmin | THmax | Ptot |
| Derby | 19 | 19 | NA | 3 | 14 |
| Broome | 0 | 0 | 7 | 7 | 0 |
| Port Hedland | 0 | 0 | 22 | 22 | 1 |
| Mandurah | 2 | 2 | 2 | 2 | 2 |
| Capel | 100 | 100 | NA | NA | 1 |

**Supplementary Table 2:** Correlation matrix of the predictor variables used in modelling Ross River virus outbreaks and incidence in Derby. . Where the values: Ptot, is for weekly Precipitation; Tmin, Minimum temperature; Tmax, Maximum temperature; and THmax, Maximum tide height.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Derby** | Ptot | Tmin | Tmax | THmax |
| Ptot | 1.00 | 0.34 | 0.29 | 0.14 |
| Tmin | 0.34 | 1.00 | 0.44 | 0.12 |
| Tmax | 0.29 | 0.44 | 1.00 | 0.05 |
| THmax | 0.14 | 0.12 | 0.05 | 1.00 |

**Supplementary Table 3:** Correlation matrix of the predictor variables used in modelling Ross River virus outbreaks and incidence in Broome. . Where the values: Ptot, is for weekly Precipitation; Tmin, Minimum temperature; Tmax, Maximum temperature; THmin, Minimum tide height; and THmax, Maximum tide height.

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| --- | --- | --- | --- | --- | --- |
| **Broome** | Ptot | Tmin | Tmax | THmin | THmax |
| Ptot | 1.00 | 0.32 | 0.16 | -0.08 | 0.07 |
| Tmin | 0.32 | 1.00 | 0.45 | 0.15 | -0.03 |
| Tmax | 0.16 | 0.45 | 1.00 | 0.08 | -0.01 |
| THmin | -0.08 | 0.15 | 0.08 | 1.00 | 0.12 |
| THmax | 0.07 | -0.03 | -0.01 | 0.12 | 1.00 |

**Supplementary Table 4:** Correlation matrix of the predictor variables used in modelling Ross River virus outbreaks and incidence in Port Hedland. . Where the values: Ptot, is for weekly Precipitation; Tmin, Minimum temperature; Tmax, Maximum temperature; THmin, Minimum tide height; and THmax, Maximum tide height.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Port** **Hedland** | Ptot | Tmin | Tmax | THmin | THmax |
| Ptot | 1.00 | 0.23 | 0.19 | 0.08 | 0.08 |
| Tmin | 0.23 | 1.00 | 0.77 | 0.07 | 0.23 |
| Tmax | 0.19 | 0.77 | 1.00 | 0.02 | 0.13 |
| THmin | 0.08 | 0.07 | 0.02 | 1.00 | 0.18 |
| THmax | 0.08 | 0.23 | 0.13 | 0.18 | 1.00 |

**Supplementary Table 5:** Correlation matrix of the predictor variables used in modelling Ross River virus outbreaks and incidence in Mandurah. . Where the values: Ptot, is for weekly Precipitation; Tmin, Minimum temperature; Tmax, Maximum temperature; THmin, Minimum tide height; and THmax, Maximum tide height.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Mandurah** | Ptot | Tmin | Tmax | THmin | THmax |
| Ptot | 1.00 | -0.28 | -0.27 | 0.13 | -0.02 |
| Tmin | -0.28 | 1.00 | 0.85 | -0.52 | -0.30 |
| Tmax | -0.27 | 0.85 | 1.00 | -0.40 | -0.32 |
| THmin | 0.13 | -0.52 | -0.40 | 1.00 | 0.49 |
| THmax | -0.02 | -0.30 | -0.32 | 0.49 | 1.00 |

**Supplementary Table 6:** Correlation matrix of the predictor variables used in modelling Ross River virus outbreaks and incidence in Capel. . Where the values: Ptot, is for weekly Precipitation; Tmin, Minimum temperature; Tmax, and Maximum temperature.

|  |  |  |  |
| --- | --- | --- | --- |
| Capel | Ptot | Tmin | Tmax |
| Ptot | 1.00 | -0.18 | -0.22 |
| Tmin | -0.18 | 1.00 | 0.81 |
| Tmax | -0.22 | 0.81 | 1.00 |

**Supplementary Table 7:** Regression model averaged coefficients for monthly incidence in Mandurah. Where the values: Ptot, is for weekly Precipitation; Tmin, Minimum temperature; Tmax, Maximum temperature; THmin, Minimum tide height; and THmax, Maximum tide height.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Estimate | Std.error | Adjusted SE | z | p-value |
| (Intercept) | -6.28E-01 | 1.97E-01 | 1.99E-01 | 3.15 | 0.002 |
| Ptot | 1.01E-03 | 3.12E-04 | 3.18E-04 | 3.17 | 0.002 |
| Tmax | 3.02E-02 | 1.45E-02 | 1.47E-02 | 2.06 | 0.039 |
| THmax | 2.50E-03 | 1.28E-03 | 1.30E-03 | 1.92 | 0.054 |
| Tmin | -2.36E-02 | 2.45E-02 | 2.48E-02 | 0.95 | 0.341 |
| THmin | 2.41E-03 | 2.14E-03 | 2.17E-03 | 1.11 | 0.265 |

## Supplementary Table 8

(Please see electronic attachment) Forecasting tool.

**Supplementary Figure 1** Outbreak and incidence predictions across the entire study period for each site. Observed incidence (left axis) plotted against the threshold which defines and outbreak (left axis), predicted outbreak probabilities (right axis), and predicted incidence (per/1,000 individuals, left axis) for a 7 year timespan from 2007 to 2014 for five sites in Western Australia: a, Derby; b, Broome; c, Port Hedland; d, Mandurah; e, Capel.