**Supplementary Figure 1:** Schematic diagram of the BaySTDetect model after modifications to the original model. $\mathbf{W}$ and $\mathbf{W}'$ denote the spatial and temporal adjacency matrices respectively, and $\eta_i \sim \text{ICAR}(\mathbf{W}, \sigma^2)$, $\gamma_t \sim \text{ICAR}(\mathbf{W}', \sigma^2)$, and $\xi_{it} \sim \text{ICAR}(\mathbf{W}', \sigma^2)$ are shorthand notation for Equations (4), (5) and (6) respectively.

**Supplementary Figure 2:** Schematic diagram of the space-time mixture model after modifications to the original model. $\lambda_i \sim \text{ICAR}(\mathbf{W}, \sigma^2)$ and $\psi_t \sim \text{ICAR}(\mathbf{W}', \sigma^2)$ are shorthand notation for Equation (8) and (9) respectively, and $\mathcal{I}^{-1}(\cdot)$ denotes the inverse gamma distribution.