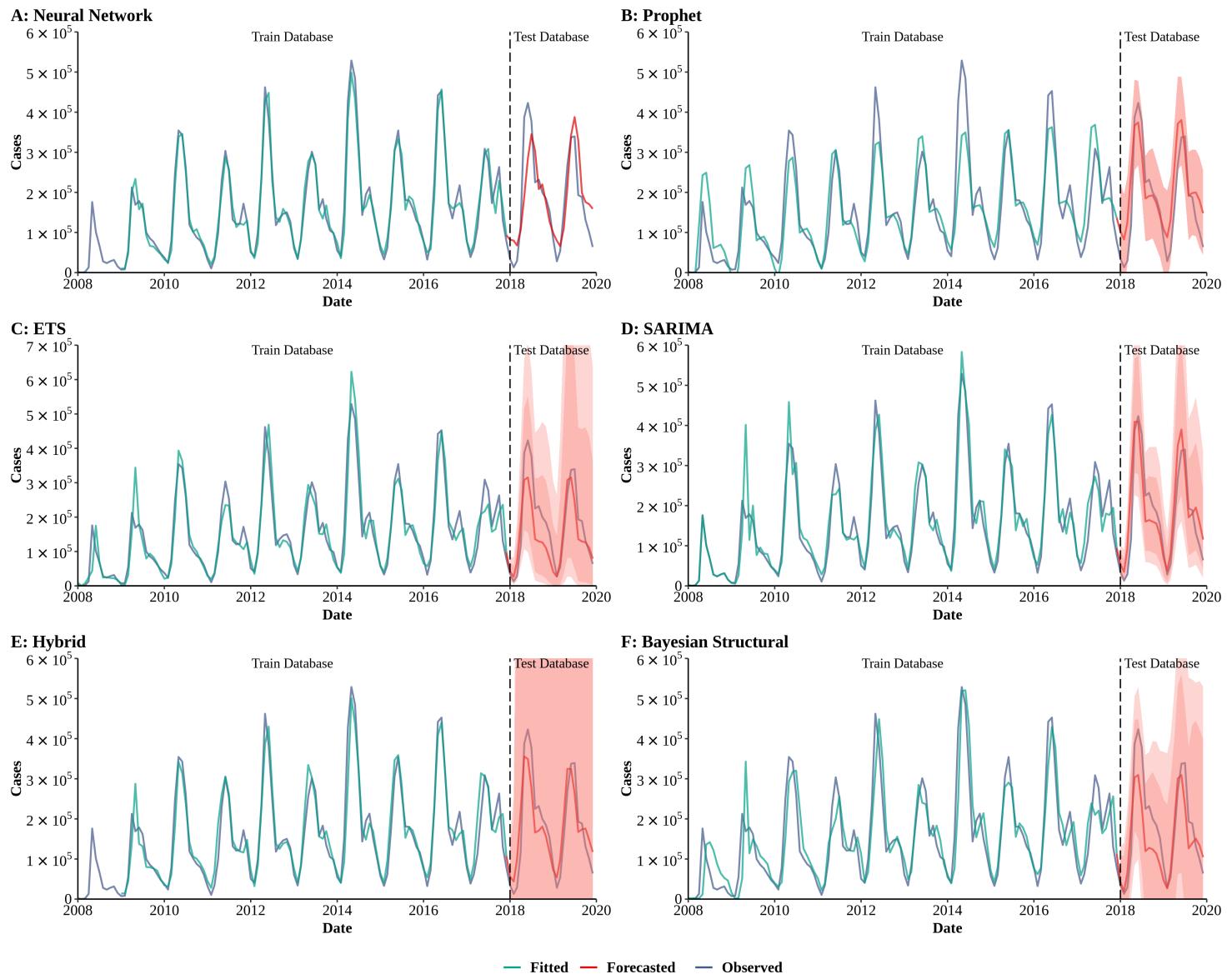


Supplementary Appendix 1:

Temporal trends and shifts of 24 notifiable infectious diseases in China before and after the COVID-19 epidemic



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|----------|----------|----------|
| Neural Network | 23166.29 | 70971.65 | 36809.15 |
| Prophet | 55051.71 | 64877.15 | 56807.42 |
| ETS | 40789.02 | 63654.84 | 45406.79 |
| SARIMA | 41585.50 | 53910.64 | 43880.76 |
| Hybrid* | 36961.10 | 52387.08 | 40208.46 |
| Bayesian Structural | 55741.00 | 67751.16 | 57915.91 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|-------|
| Neural Network | 13.13 | 38.83 | 17.80 |
| Prophet | 37.51 | 43.26 | 38.47 |
| ETS | 22.63 | 35.12 | 24.71 |
| SARIMA | 18.83 | 33.32 | 21.24 |
| Hybrid* | 18.72 | 35.79 | 21.82 |
| Bayesian Structural | 34.94 | 36.58 | 35.21 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.29 | 1.07 | 0.42 |
| Prophet | 0.65 | 1.09 | 0.84 |
| ETS | 0.47 | 1.07 | 0.56 |
| SARIMA | 0.44 | 0.71 | 0.49 |
| Hybrid* | 0.41 | 0.92 | 0.51 |
| Bayesian Structural | 0.68 | 1.12 | 0.80 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

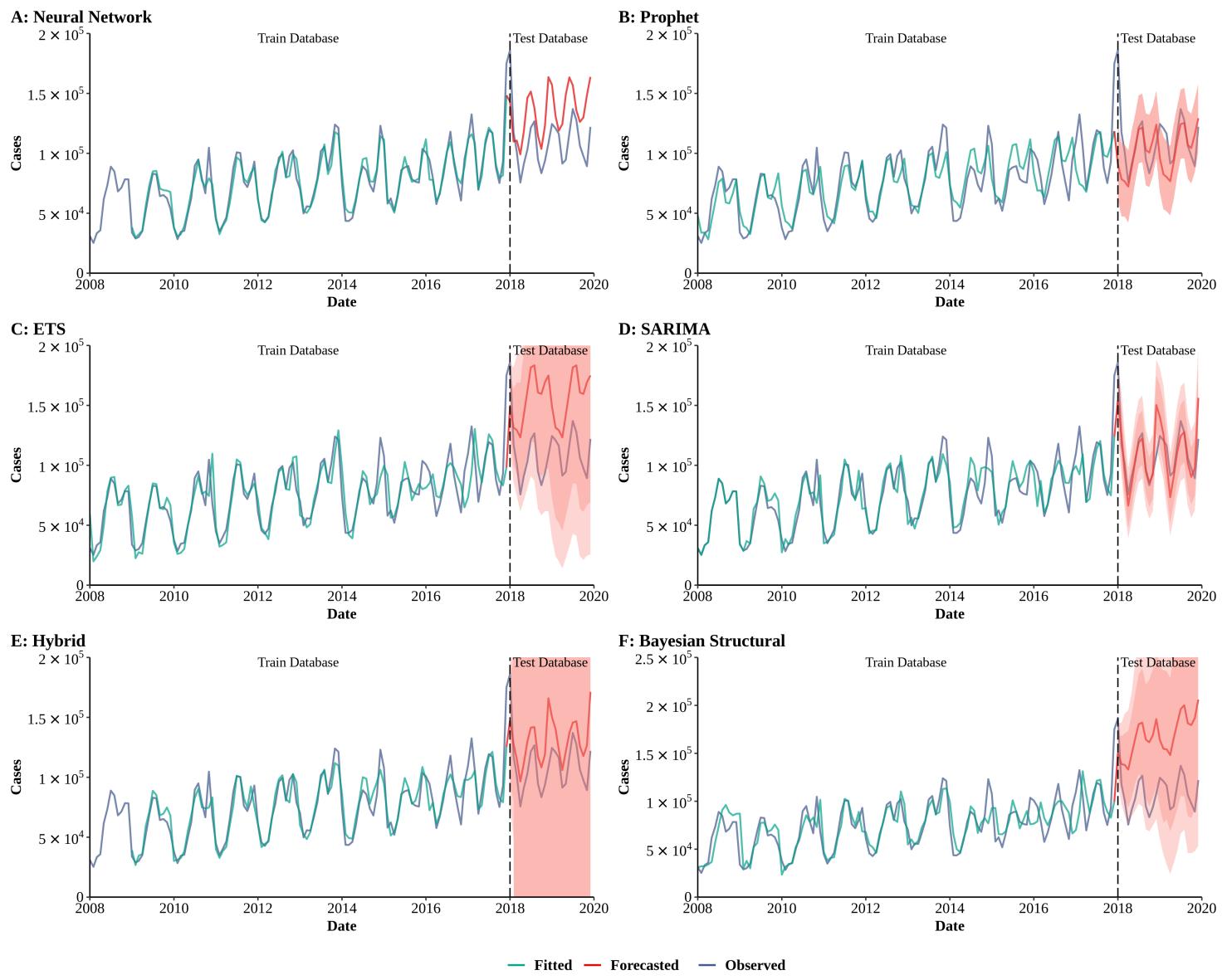
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.96 | 0.66 | 0.90 |
| Prophet | 0.78 | 0.79 | 0.77 |
| ETS | 0.88 | 0.81 | 0.86 |
| SARIMA | 0.88 | 0.81 | 0.87 |
| Hybrid* | 0.90 | 0.84 | 0.88 |
| Bayesian Structural | 0.77 | 0.78 | 0.76 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 1. Training and comparing variant time series models for hand, foot, and mouth disease (HFMD).

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|----------|----------|----------|
| Neural Network | 6985.44 | 32542.36 | 15246.99 |
| Prophet | 15061.20 | 26531.66 | 17502.99 |
| ETS | 14680.65 | 52087.52 | 25135.36 |
| SARIMA | 12083.49 | 15076.35 | 12631.64 |
| Hybrid* | 10438.18 | 26264.10 | 14648.01 |
| Bayesian Structural | 16864.37 | 63556.50 | 30170.25 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|-------|
| Neural Network | 6.55 | 23.09 | 9.56 |
| Prophet | 15.13 | 16.02 | 15.28 |
| ETS | 13.26 | 36.59 | 17.15 |
| SARIMA | 10.37 | 9.05 | 10.15 |
| Hybrid* | 9.39 | 19.58 | 11.25 |
| Bayesian Structural | 15.04 | 44.11 | 19.89 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.39 | 1.76 | 0.69 |
| Prophet | 0.76 | 1.56 | 1.05 |
| ETS | 0.66 | 4.02 | 1.17 |
| SARIMA | 0.59 | 0.50 | 0.56 |
| Hybrid* | 0.49 | 1.46 | 0.77 |
| Bayesian Structural | 0.78 | 5.66 | 1.62 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

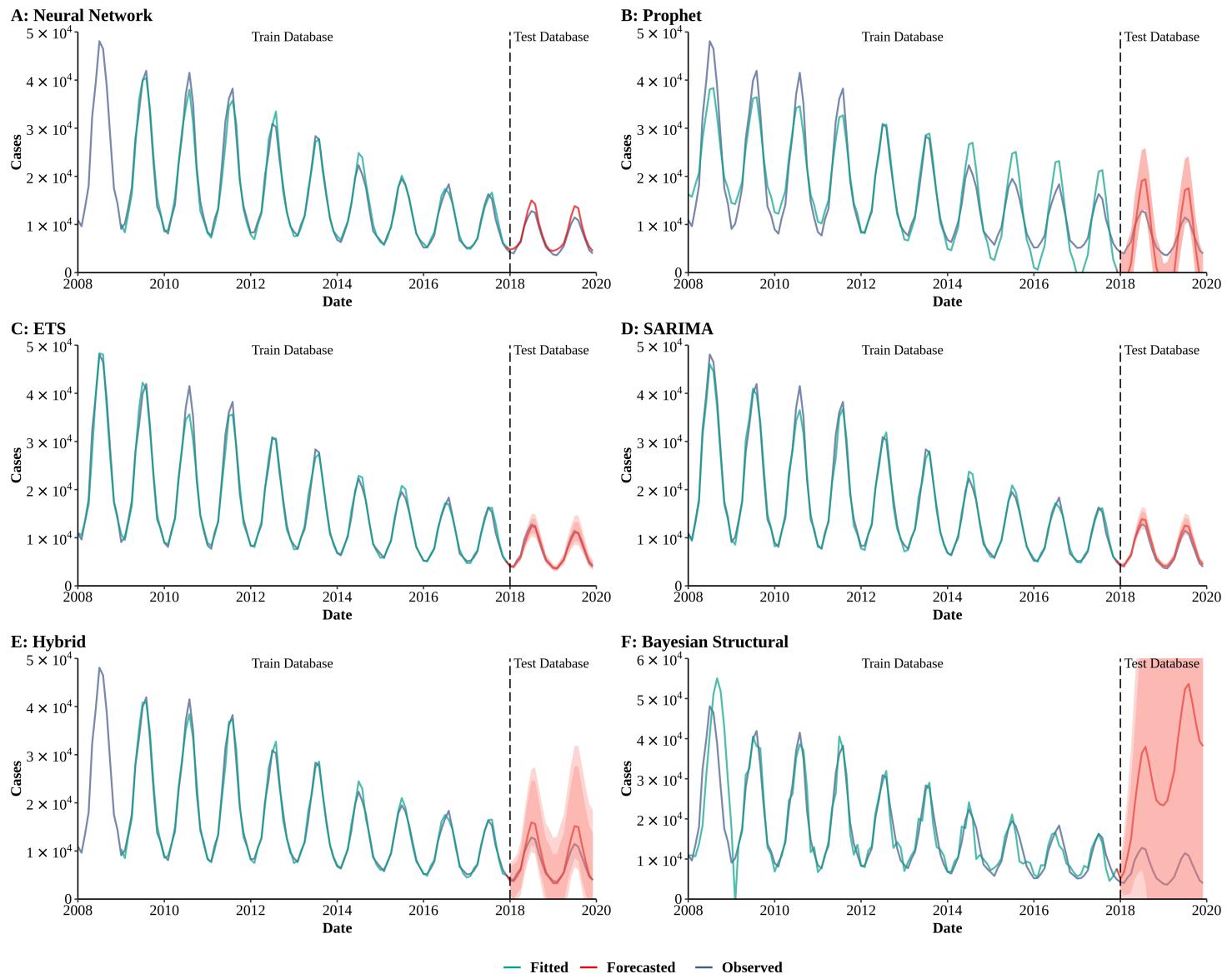
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.93 | 0.21 | 0.79 |
| Prophet | 0.67 | 0.05 | 0.63 |
| ETS | 0.69 | 0.06 | 0.61 |
| SARIMA | 0.79 | 0.63 | 0.81 |
| Hybrid* | 0.84 | 0.46 | 0.78 |
| Bayesian Structural | 0.59 | 0.05 | 0.52 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 2. Training and comparing variant time series models for infectious diarrhea.

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|---------|----------|----------|
| Neural Network | 1341.81 | 1165.43 | 1311.50 |
| Prophet | 3405.83 | 5430.37 | 3818.54 |
| ETS | 1253.26 | 425.26 | 1157.16 |
| SARIMA | 1202.91 | 776.69 | 1142.96 |
| Hybrid* | 1069.45 | 1800.21 | 1234.91 |
| Bayesian Structural | 4869.63 | 26569.85 | 11722.65 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|--------|-------|
| Neural Network | 5.97 | 12.07 | 7.08 |
| Prophet | 25.48 | 108.03 | 39.24 |
| ETS | 4.50 | 4.48 | 4.50 |
| SARIMA | 4.92 | 8.70 | 5.55 |
| Hybrid* | 5.13 | 13.04 | 6.57 |
| Bayesian Structural | 17.69 | 116.35 | 34.14 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.26 | 0.55 | 0.29 |
| Prophet | 0.68 | 1.26 | 0.79 |
| ETS | 0.20 | 0.25 | 0.21 |
| SARIMA | 0.22 | 0.43 | 0.23 |
| Hybrid* | 0.21 | 0.61 | 0.26 |
| Bayesian Structural | 0.71 | 5.88 | 1.45 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

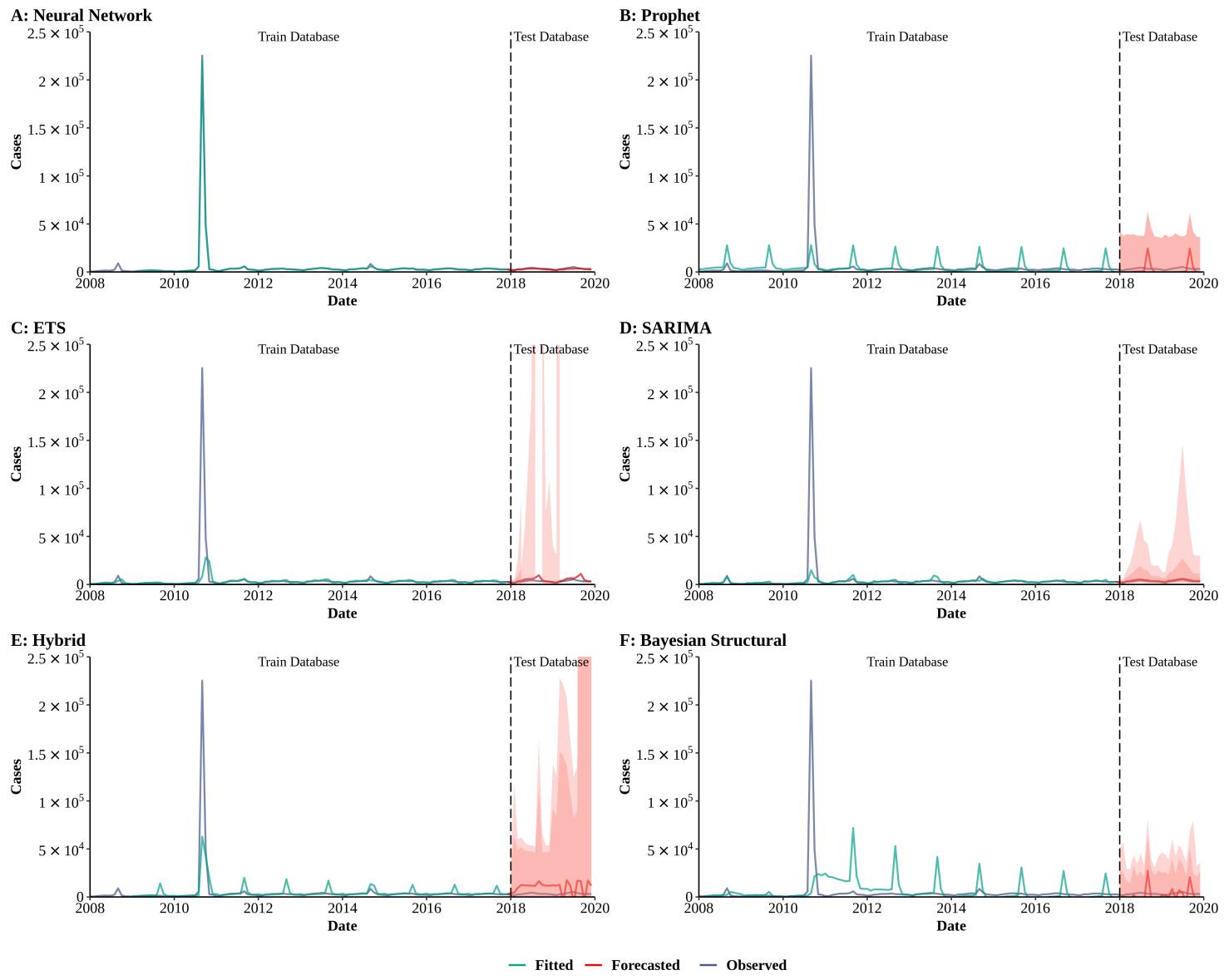
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.98 | 0.98 | 0.98 |
| Prophet | 0.89 | 0.97 | 0.87 |
| ETS | 0.99 | 0.98 | 0.99 |
| SARIMA | 0.99 | 0.99 | 0.99 |
| Hybrid* | 0.99 | 0.98 | 0.98 |
| Bayesian Structural | 0.81 | 0.33 | 0.32 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 3. Training and comparing variant time series models for dysentery.

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|----------|---------|----------|
| Neural Network | 543.35 | 681.98 | 571.27 |
| Prophet | 19467.68 | 6921.68 | 17994.74 |
| ETS | 20016.56 | 2443.01 | 18299.74 |
| SARIMA | 19596.49 | 750.79 | 17891.69 |
| Hybrid* | 16068.29 | 9575.93 | 15096.98 |
| Bayesian Structural | 23260.47 | 7834.35 | 21473.34 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|--------|--------|--------|
| Neural Network | 2.31 | 16.00 | 4.82 |
| Prophet | 84.57 | 170.09 | 98.83 |
| ETS | 22.76 | 30.15 | 23.99 |
| SARIMA | 20.55 | 18.79 | 20.26 |
| Hybrid* | 31.21 | 124.49 | 48.17 |
| Bayesian Structural | 109.19 | 148.07 | 115.67 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.03 | 2.01 | 0.05 |
| Prophet | 1.22 | 1.09 | 1.21 |
| ETS | 0.63 | 1.08 | 2.22 |
| SARIMA | 2.39 | 1.38 | 2.31 |
| Hybrid* | 0.66 | 1.34 | 1.10 |
| Bayesian Structural | 1.80 | 0.70 | 1.34 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

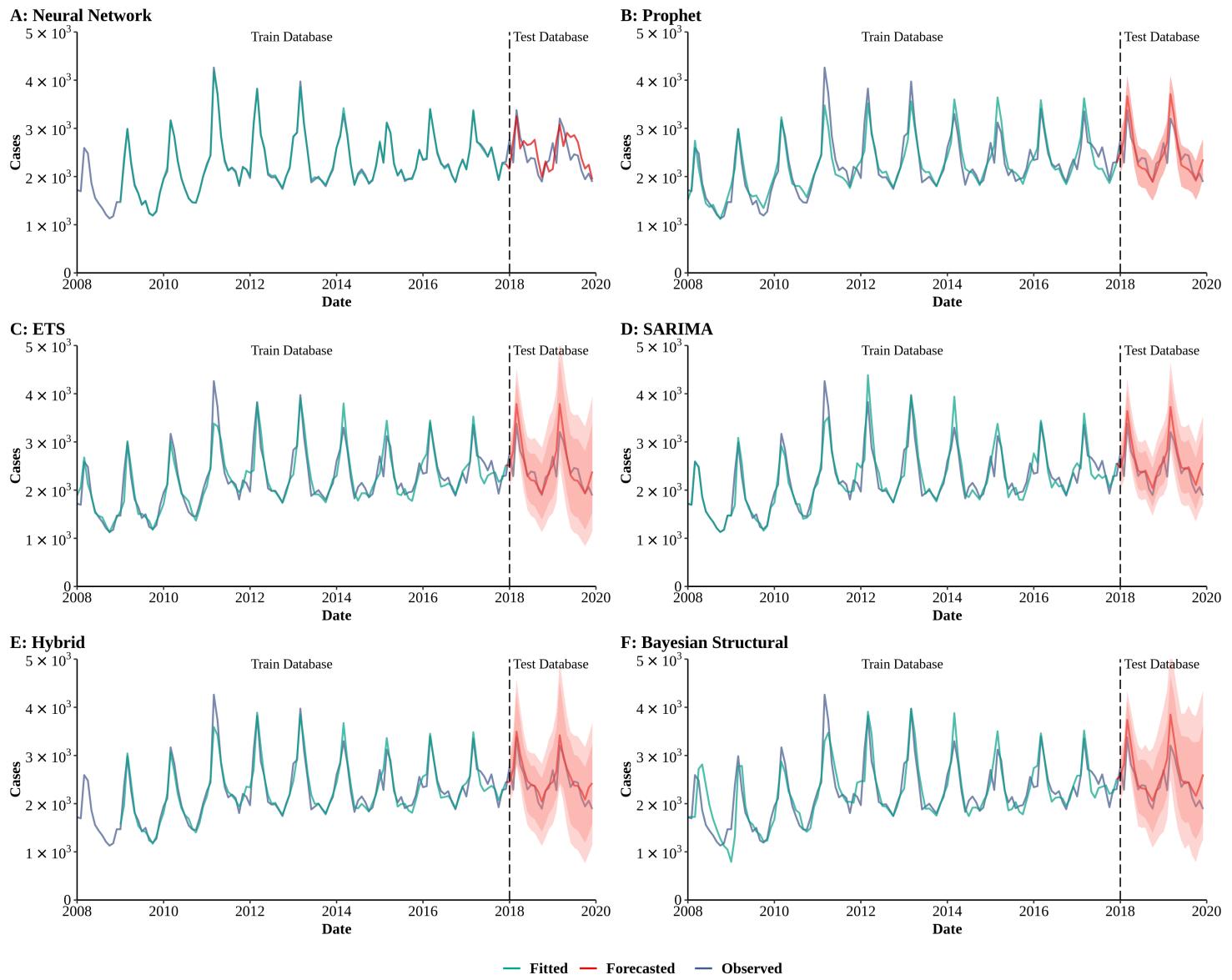
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 1.00 | 0.69 | 1.00 |
| Prophet | 0.11 | 0.01 | 0.10 |
| ETS | 0.09 | 0.43 | 0.08 |
| SARIMA | 0.37 | 0.91 | 0.34 |
| Hybrid* | 0.67 | 0.00 | 0.52 |
| Bayesian Structural | 0.00 | 0.02 | 0.00 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 4. Training and comparing variant time series models for acute hemorrhagic conjunctivitis (AHC).

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|--------|--------|--------|
| Neural Network | 30.96 | 322.84 | 140.48 |
| Prophet | 220.32 | 258.24 | 227.08 |
| ETS | 222.31 | 277.30 | 232.38 |
| SARIMA | 230.76 | 273.79 | 238.47 |
| Hybrid* | 166.39 | 222.37 | 177.89 |
| Bayesian Structural | 307.54 | 317.07 | 309.15 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|------|
| Neural Network | 0.98 | 11.47 | 2.89 |
| Prophet | 7.32 | 8.02 | 7.44 |
| ETS | 6.96 | 7.95 | 7.13 |
| SARIMA | 6.43 | 8.26 | 6.73 |
| Hybrid* | 5.12 | 7.20 | 5.49 |
| Bayesian Structural | 9.98 | 9.12 | 9.83 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.07 | 1.03 | 0.22 |
| Prophet | 0.51 | 0.67 | 0.58 |
| ETS | 0.48 | 0.65 | 0.55 |
| SARIMA | 0.47 | 0.71 | 0.51 |
| Hybrid* | 0.35 | 0.72 | 0.44 |
| Bayesian Structural | 0.66 | 0.80 | 0.72 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

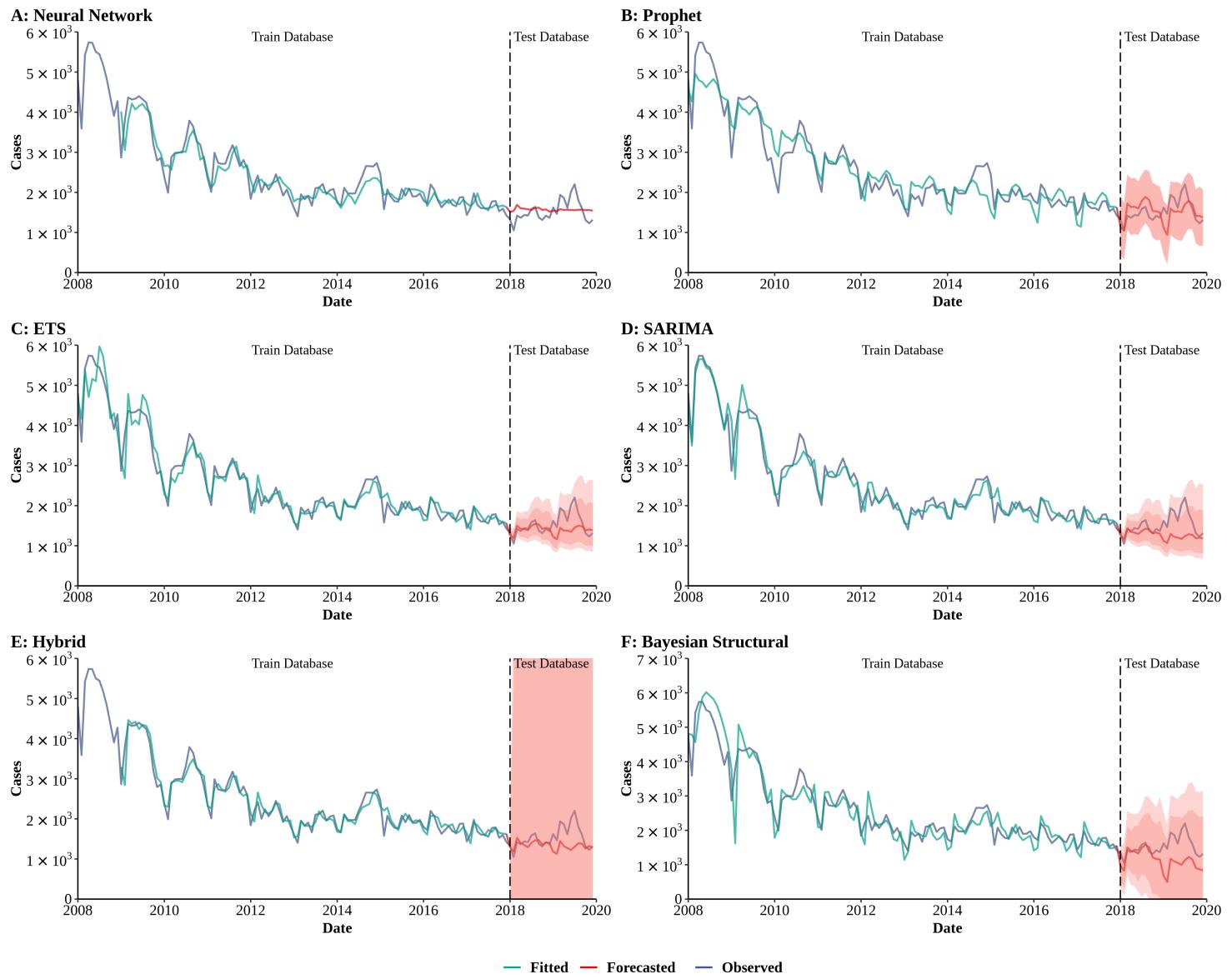
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 1.00 | 0.42 | 0.93 |
| Prophet | 0.86 | 0.75 | 0.84 |
| ETS | 0.86 | 0.75 | 0.84 |
| SARIMA | 0.86 | 0.74 | 0.85 |
| Hybrid* | 0.92 | 0.76 | 0.90 |
| Bayesian Structural | 0.76 | 0.73 | 0.75 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 5. Training and comparing variant time series models for hepatitis E.

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|--------|--------|--------|
| Neural Network | 263.66 | 270.96 | 265.00 |
| Prophet | 357.76 | 287.44 | 347.03 |
| ETS | 264.30 | 292.03 | 269.12 |
| SARIMA | 252.13 | 388.66 | 279.56 |
| Hybrid* | 188.44 | 339.85 | 223.72 |
| Bayesian Structural | 407.92 | 537.14 | 432.15 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|-------|
| Neural Network | 8.39 | 14.44 | 9.49 |
| Prophet | 10.63 | 15.67 | 11.47 |
| ETS | 6.94 | 13.47 | 8.03 |
| SARIMA | 6.80 | 18.57 | 8.76 |
| Hybrid* | 5.85 | 15.56 | 7.61 |
| Bayesian Structural | 11.08 | 32.39 | 14.63 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 1.29 | 8.52 | 1.56 |
| Prophet | 1.01 | 1.52 | 1.46 |
| ETS | 0.71 | 2.72 | 0.86 |
| SARIMA | 0.73 | 3.81 | 0.91 |
| Hybrid* | 0.57 | 2.40 | 0.88 |
| Bayesian Structural | 1.06 | 2.51 | 0.97 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

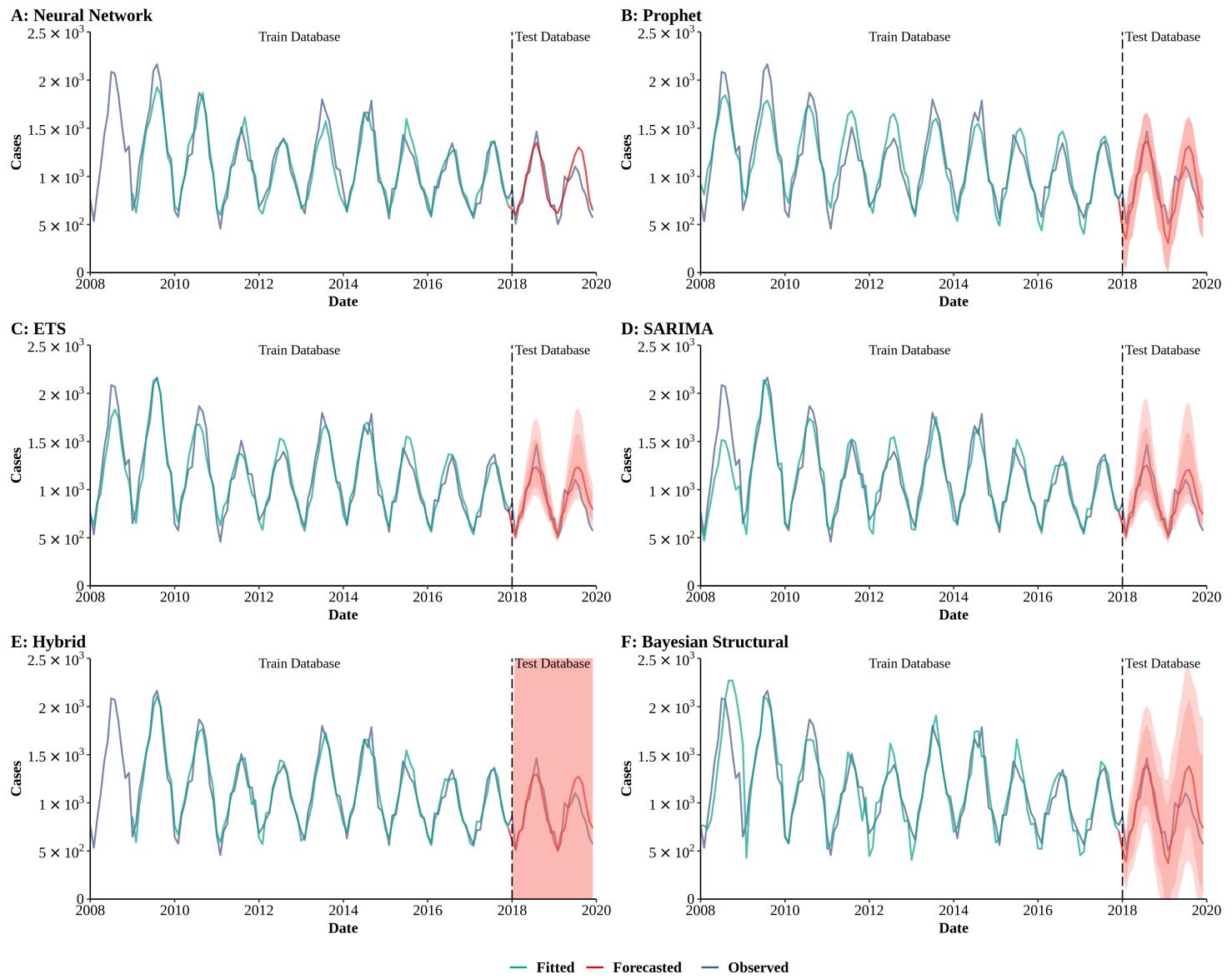
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.87 | 0.00 | 0.87 |
| Prophet | 0.89 | 0.14 | 0.89 |
| ETS | 0.94 | 0.06 | 0.94 |
| SARIMA | 0.94 | 0.00 | 0.94 |
| Hybrid* | 0.93 | 0.00 | 0.92 |
| Bayesian Structural | 0.88 | 0.01 | 0.88 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 6. Training and comparing variant time series models for hepatitis A.

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|--------|--------|--------|
| Neural Network | 118.60 | 142.54 | 123.30 |
| Prophet | 157.00 | 180.26 | 161.11 |
| ETS | 114.48 | 146.08 | 120.33 |
| SARIMA | 148.40 | 131.32 | 145.69 |
| Hybrid* | 93.86 | 146.31 | 105.36 |
| Bayesian Structural | 205.97 | 181.17 | 202.05 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|-------|
| Neural Network | 8.51 | 12.76 | 9.28 |
| Prophet | 12.04 | 18.89 | 13.18 |
| ETS | 8.20 | 13.64 | 9.11 |
| SARIMA | 9.43 | 12.75 | 9.98 |
| Hybrid* | 7.23 | 12.80 | 8.24 |
| Bayesian Structural | 12.66 | 17.40 | 13.45 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.57 | 0.89 | 0.62 |
| Prophet | 0.70 | 0.85 | 0.77 |
| ETS | 0.48 | 1.04 | 0.59 |
| SARIMA | 0.61 | 0.96 | 0.65 |
| Hybrid* | 0.43 | 0.88 | 0.51 |
| Bayesian Structural | 0.73 | 0.88 | 0.70 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

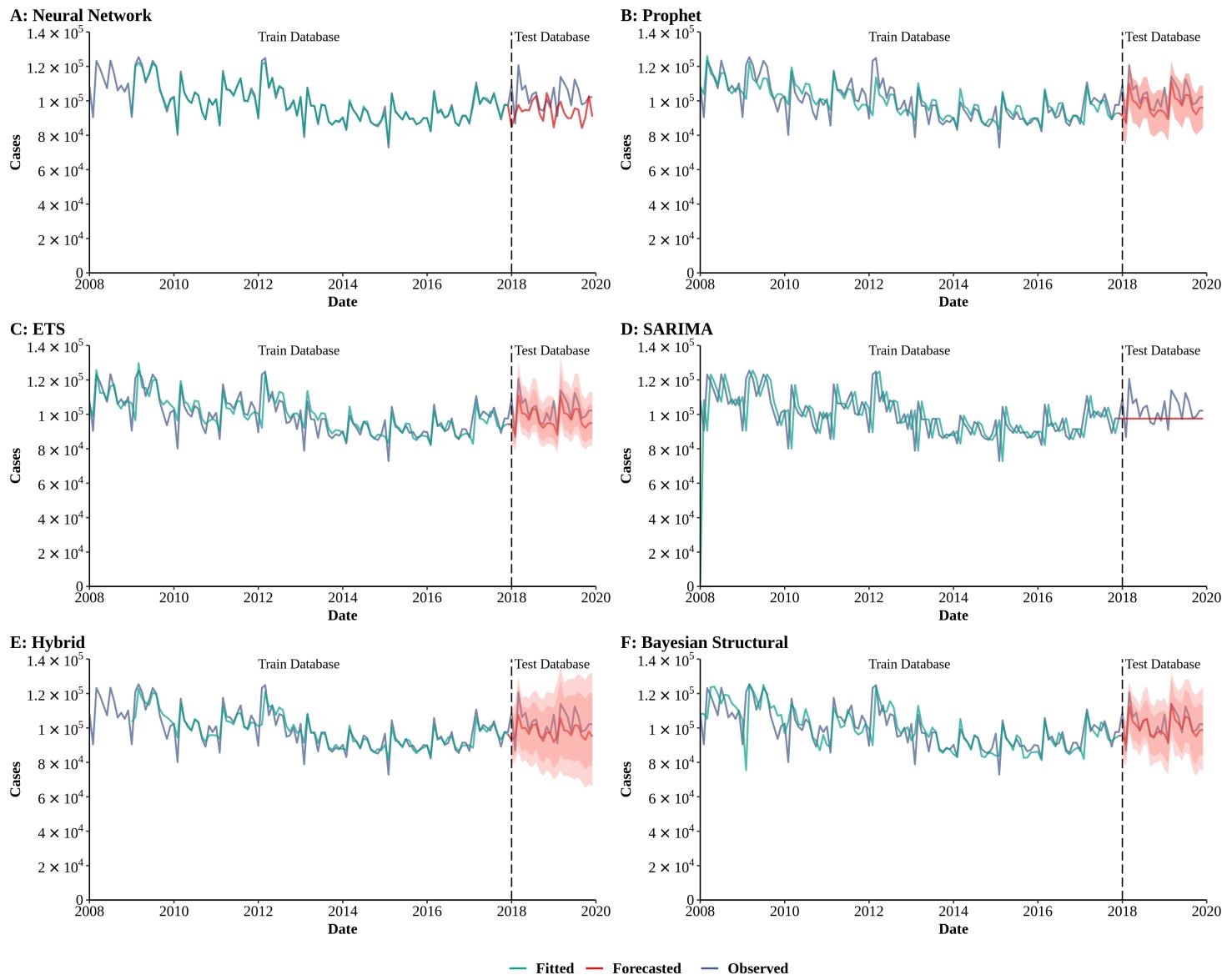
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.90 | 0.72 | 0.88 |
| Prophet | 0.84 | 0.71 | 0.82 |
| ETS | 0.91 | 0.67 | 0.90 |
| SARIMA | 0.86 | 0.73 | 0.86 |
| Hybrid* | 0.93 | 0.70 | 0.91 |
| Bayesian Structural | 0.78 | 0.69 | 0.78 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 7. Training and comparing variant time series models for enteric fever.

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



| G : RMSE of Models | | | |
|---------------------|----------|----------|----------|
| Method | Train | Test | All |
| Neural Network | 1042.85 | 12621.77 | 5463.98 |
| Prophet | 6373.59 | 7132.88 | 6506.30 |
| ETS | 6186.51 | 6740.76 | 6282.28 |
| SARIMA | 15019.02 | 9396.49 | 14236.98 |
| Hybrid* | 4820.37 | 7811.5 | 5486.87 |
| Bayesian Structural | 8376.61 | 4952.78 | 7909.57 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

| H : SMAPE of Models | | | |
|---------------------|-------|-------|------|
| Method | Train | Test | All |
| Neural Network | 0.71 | 10.55 | 2.50 |
| Prophet | 4.51 | 5.59 | 4.69 |
| ETS | 4.23 | 5.29 | 4.41 |
| SARIMA | 9.86 | 7.33 | 9.44 |
| Hybrid* | 3.23 | 6.23 | 3.77 |
| Bayesian Structural | 5.41 | 3.43 | 5.08 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

| I : MASE of Models | | | |
|---------------------|-------|------|------|
| Method | Train | Test | All |
| Neural Network | 0.10 | 1.61 | 0.35 |
| Prophet | 0.54 | 1.06 | 0.87 |
| ETS | 0.51 | 0.98 | 0.78 |
| SARIMA | 0.99 | Inf | 1.16 |
| Hybrid* | 0.40 | 1.5 | 0.81 |
| Bayesian Structural | 0.65 | 0.64 | 0.82 |

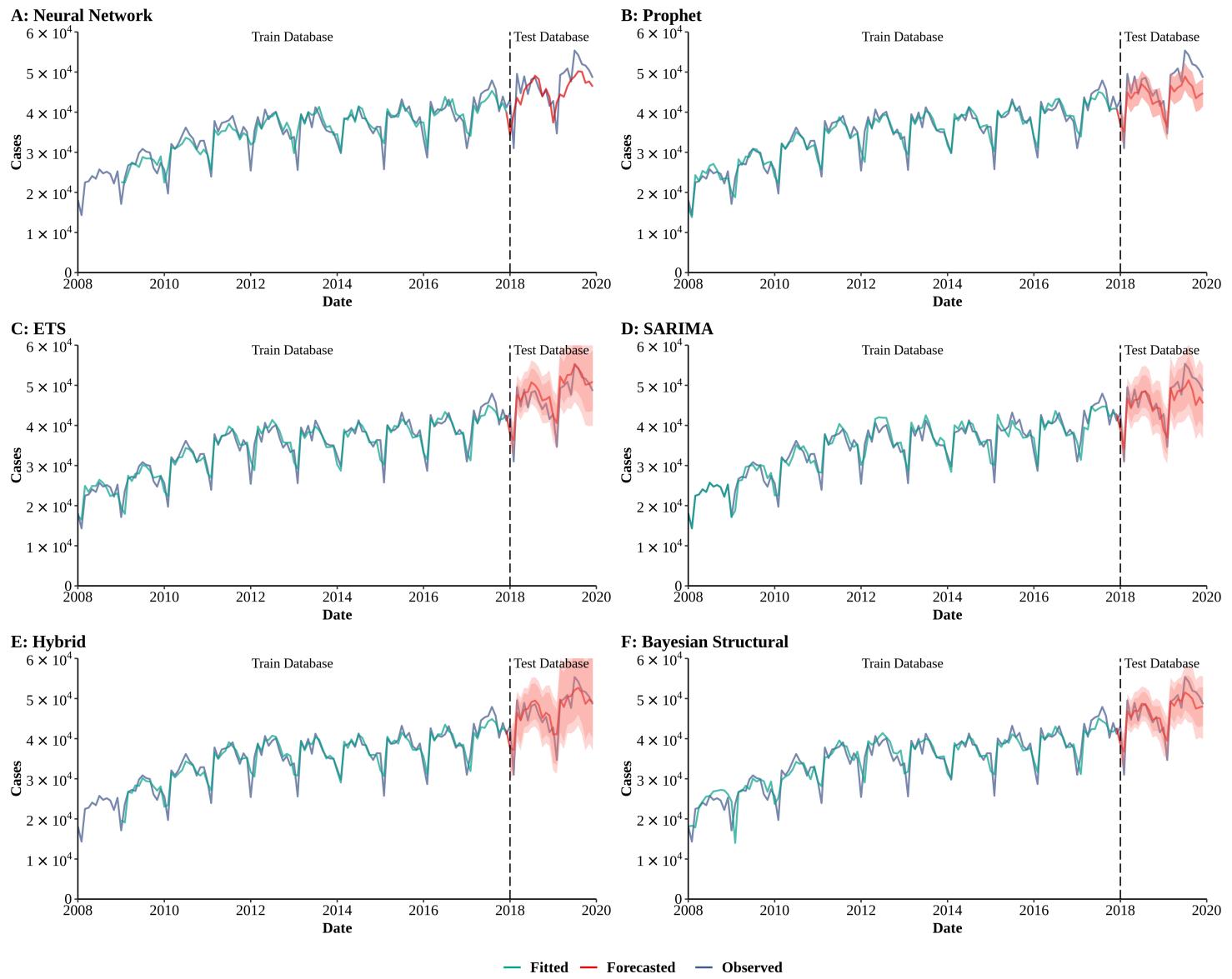
*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

| J : R-squared of Models | | | |
|-------------------------|-------|------|------|
| Method | Train | Test | All |
| Neural Network | 0.99 | 0.02 | 0.75 |
| Prophet | 0.67 | 0.67 | 0.64 |
| ETS | 0.70 | 0.71 | 0.67 |
| SARIMA | 0.10 | | 0.09 |
| Hybrid* | 0.80 | 0.45 | 0.73 |
| Bayesian Structural | 0.54 | 0.7 | 0.54 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 8. Training and comparing variant time series models for hepatitis B.

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|---------|---------|---------|
| Neural Network | 2281.29 | 4500.74 | 2817.99 |
| Prophet | 1745.29 | 4232.62 | 2350.36 |
| ETS | 1865.64 | 2945.75 | 2084.88 |
| SARIMA | 1943.45 | 2973.30 | 2149.63 |
| Hybrid* | 1842.27 | 2852.31 | 2063.03 |
| Bayesian Structural | 2461.40 | 2653.99 | 2494.53 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 5.13 | 8.43 | 5.73 |
| Prophet | 4.04 | 8.04 | 4.71 |
| ETS | 4.45 | 5.24 | 4.58 |
| SARIMA | 4.30 | 5.40 | 4.48 |
| Hybrid* | 4.21 | 5.11 | 4.37 |
| Bayesian Structural | 5.84 | 4.77 | 5.66 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.79 | 1.63 | 0.94 |
| Prophet | 0.41 | 1.65 | 0.74 |
| ETS | 0.45 | 0.97 | 0.70 |
| SARIMA | 0.57 | 0.84 | 0.62 |
| Hybrid* | 0.44 | 1.05 | 0.71 |
| Bayesian Structural | 0.57 | 1.02 | 0.87 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

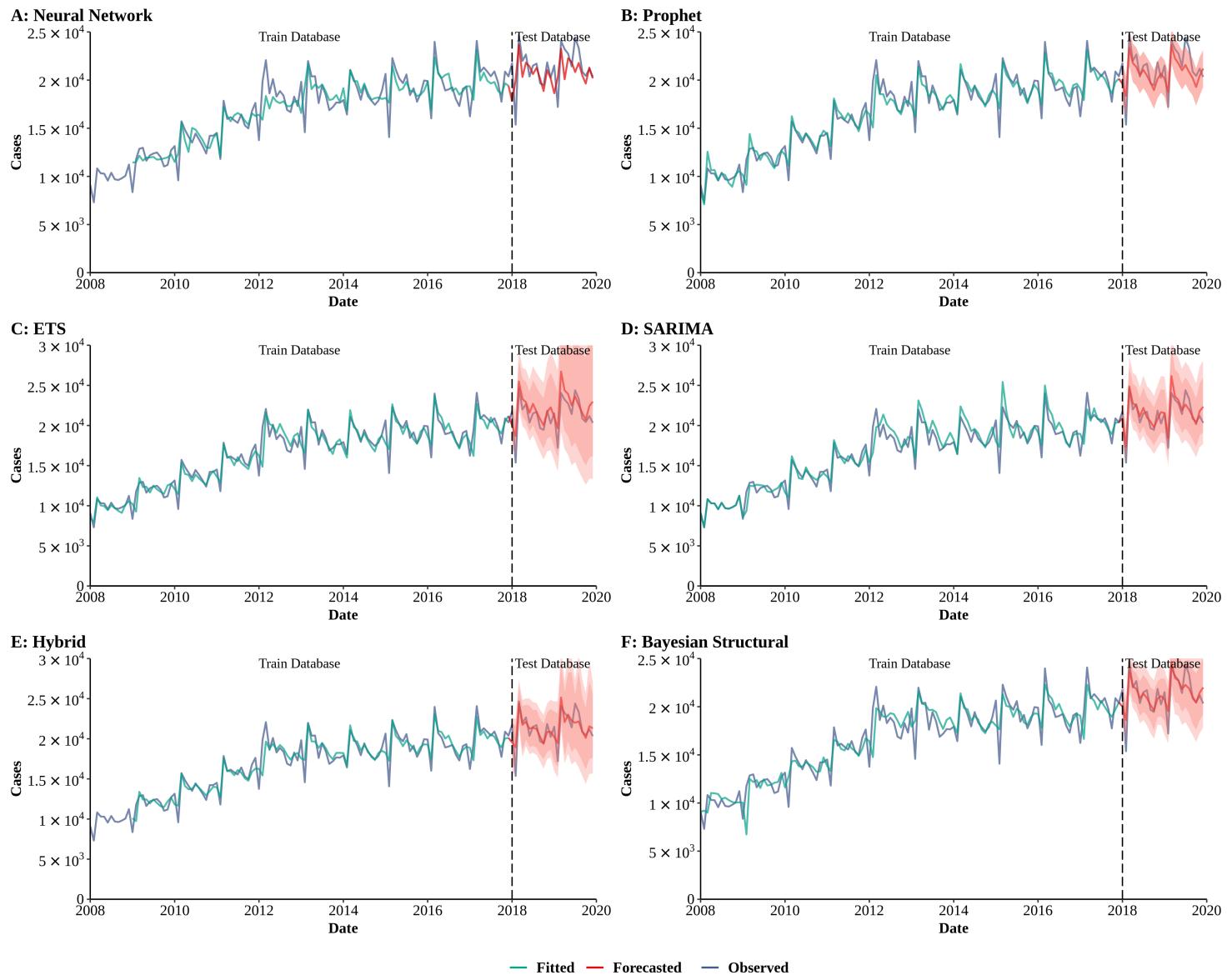
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.84 | 0.42 | 0.85 |
| Prophet | 0.93 | 0.76 | 0.93 |
| ETS | 0.93 | 0.78 | 0.94 |
| SARIMA | 0.92 | 0.78 | 0.93 |
| Hybrid* | 0.90 | 0.74 | 0.92 |
| Bayesian Structural | 0.87 | 0.81 | 0.91 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 9. Training and comparing variant time series models for syphilis.

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|---------|---------|---------|
| Neural Network | 1312.88 | 1933.97 | 1445.79 |
| Prophet | 1007.63 | 1379.99 | 1078.66 |
| ETS | 1062.58 | 1478.36 | 1142.43 |
| SARIMA | 1076.37 | 1059.44 | 1073.56 |
| Hybrid* | 1058.35 | 1274.67 | 1100.84 |
| Bayesian Structural | 1329.26 | 1191.46 | 1307.31 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 5.75 | 6.89 | 5.96 |
| Prophet | 4.50 | 5.41 | 4.65 |
| ETS | 4.85 | 5.74 | 5.00 |
| SARIMA | 4.61 | 4.11 | 4.53 |
| Hybrid* | 4.56 | 4.61 | 4.57 |
| Bayesian Structural | 6.28 | 4.25 | 5.94 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.99 | 0.88 | 0.96 |
| Prophet | 0.44 | 0.93 | 0.66 |
| ETS | 0.48 | 0.73 | 0.65 |
| SARIMA | 0.61 | 0.49 | 0.59 |
| Hybrid* | 0.45 | 0.74 | 0.75 |
| Bayesian Structural | 0.60 | 0.76 | 1.01 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

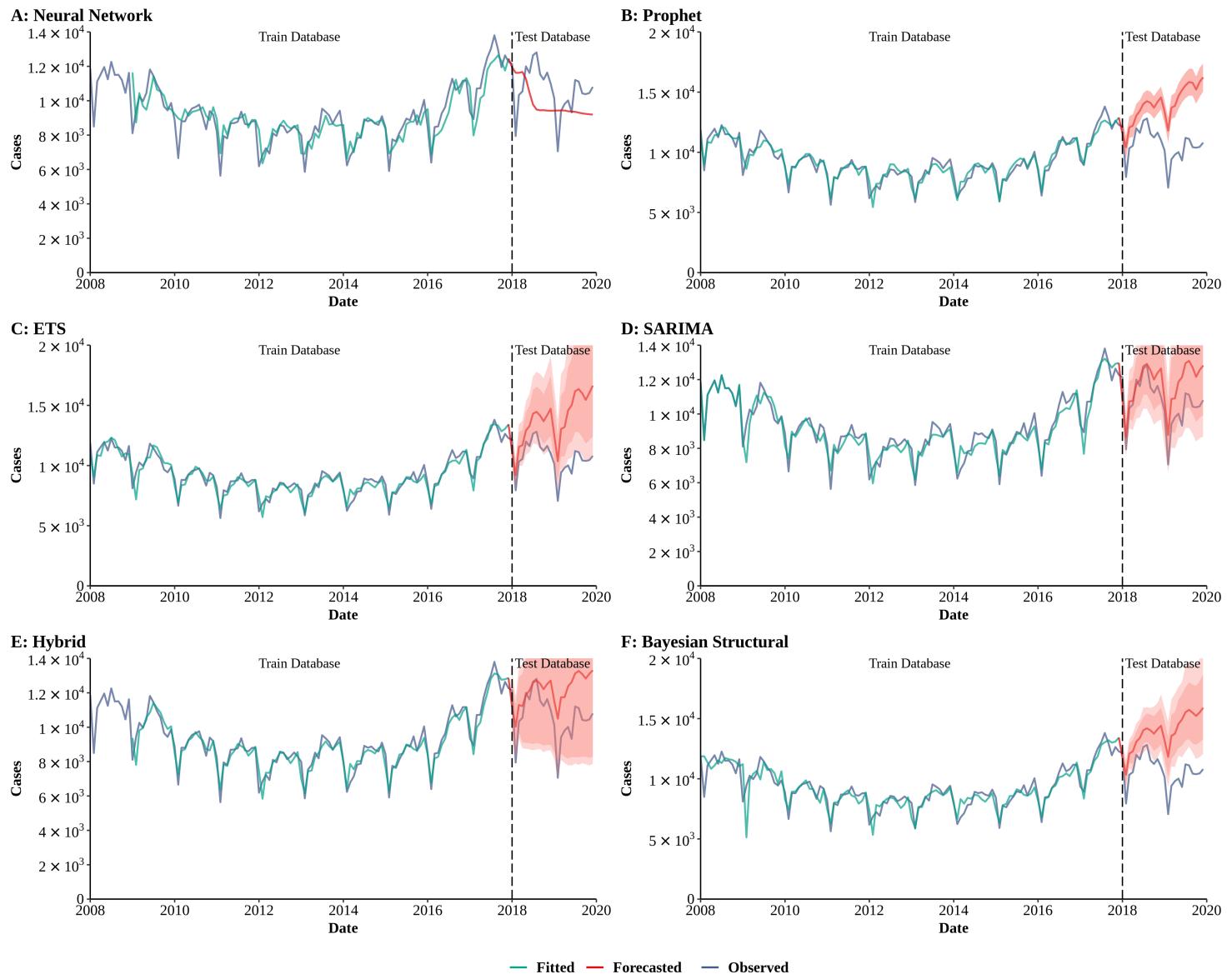
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.83 | 0.24 | 0.82 |
| Prophet | 0.93 | 0.69 | 0.93 |
| ETS | 0.92 | 0.68 | 0.92 |
| SARIMA | 0.93 | 0.77 | 0.94 |
| Hybrid* | 0.89 | 0.63 | 0.90 |
| Bayesian Structural | 0.88 | 0.71 | 0.89 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 10. Training and comparing variant time series models for hepatitis C.

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|--------|---------|---------|
| Neural Network | 768.48 | 1740.44 | 1016.83 |
| Prophet | 471.53 | 3697.52 | 1569.68 |
| ETS | 528.79 | 3631.33 | 1559.10 |
| SARIMA | 531.86 | 1435.89 | 761.16 |
| Hybrid* | 456.14 | 1903.21 | 910.39 |
| Bayesian Structural | 804.54 | 3582.51 | 1636.60 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|------|
| Neural Network | 6.21 | 14.24 | 7.67 |
| Prophet | 4.05 | 27.30 | 7.93 |
| ETS | 4.51 | 26.01 | 8.10 |
| SARIMA | 4.50 | 11.09 | 5.60 |
| Hybrid* | 3.93 | 14.80 | 5.91 |
| Bayesian Structural | 5.80 | 26.65 | 9.27 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|------|
| Neural Network | 0.92 | 11.56 | 1.39 |
| Prophet | 0.47 | 5.18 | 1.38 |
| ETS | 0.52 | 3.45 | 1.26 |
| SARIMA | 0.58 | 1.58 | 0.76 |
| Hybrid* | 0.48 | 3.43 | 1.01 |
| Bayesian Structural | 0.67 | 5.30 | 1.44 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

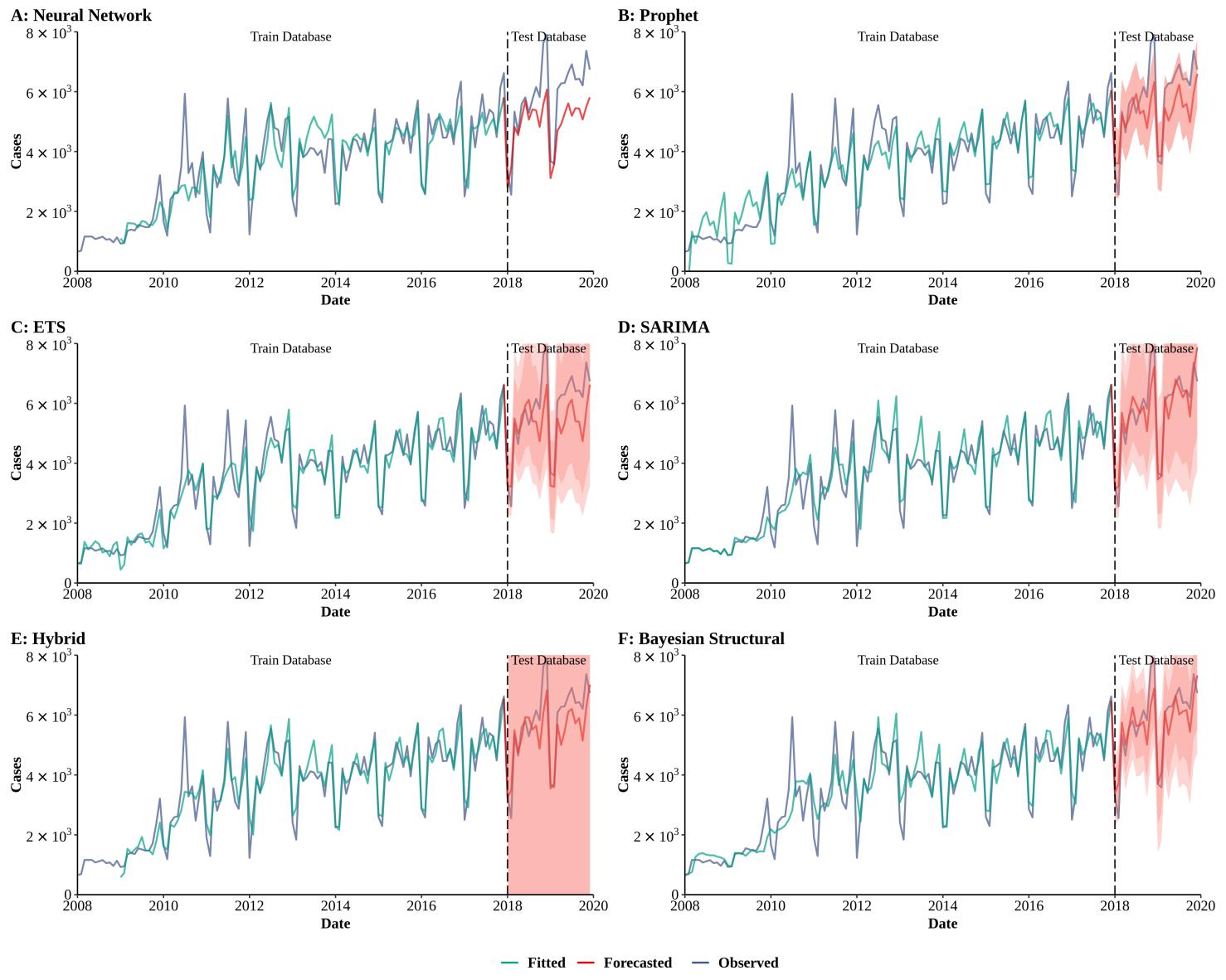
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.76 | 0.00 | 0.63 |
| Prophet | 0.92 | 0.08 | 0.60 |
| ETS | 0.90 | 0.17 | 0.63 |
| SARIMA | 0.91 | 0.52 | 0.83 |
| Hybrid* | 0.92 | 0.28 | 0.78 |
| Bayesian Structural | 0.78 | 0.11 | 0.57 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 11. Training and comparing variant time series models for gonorrhea.

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|--------|---------|--------|
| Neural Network | 596.07 | 1073.56 | 707.28 |
| Prophet | 574.77 | 891.28 | 638.51 |
| ETS | 495.51 | 902.15 | 583.31 |
| SARIMA | 551.30 | 518.54 | 545.98 |
| Hybrid* | 487.79 | 728.33 | 539.56 |
| Bayesian Structural | 610.87 | 614.95 | 611.56 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|-------|
| Neural Network | 12.69 | 16.54 | 13.39 |
| Prophet | 19.42 | 13.50 | 18.43 |
| ETS | 11.50 | 13.56 | 11.84 |
| SARIMA | 10.56 | 7.26 | 10.01 |
| Hybrid* | 10.65 | 10.58 | 10.64 |
| Bayesian Structural | 13.48 | 8.89 | 12.71 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.69 | 1.55 | 0.81 |
| Prophet | 0.54 | 1.16 | 0.70 |
| ETS | 0.42 | 0.97 | 0.60 |
| SARIMA | 0.54 | 0.45 | 0.51 |
| Hybrid* | 0.39 | 0.76 | 0.53 |
| Bayesian Structural | 0.51 | 0.60 | 0.65 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

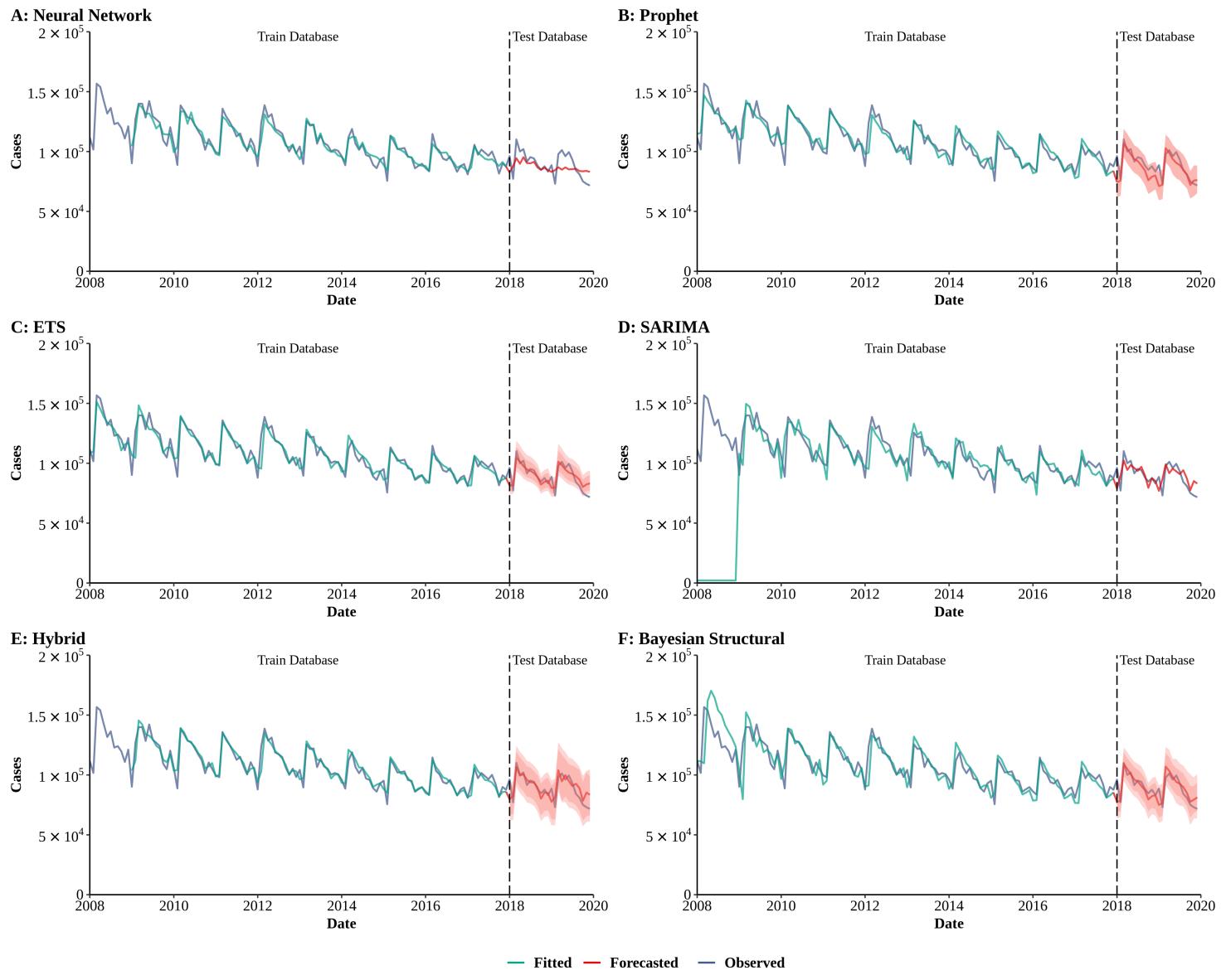
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.81 | 0.81 | 0.82 |
| Prophet | 0.86 | 0.80 | 0.87 |
| ETS | 0.90 | 0.74 | 0.90 |
| SARIMA | 0.87 | 0.85 | 0.90 |
| Hybrid* | 0.87 | 0.82 | 0.89 |
| Bayesian Structural | 0.84 | 0.82 | 0.88 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 12. Training and comparing variant time series models for acquired immunodeficiency syndrome (AIDS).

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|----------|---------|----------|
| Neural Network | 5030.28 | 9071.85 | 5972.13 |
| Prophet | 6212.04 | 7120.76 | 6372.49 |
| ETS | 5942.67 | 5897.21 | 5935.12 |
| SARIMA | 40903.90 | 7918.45 | 37479.66 |
| Hybrid* | 4755.05 | 6802.06 | 5187.66 |
| Bayesian Structural | 10801.55 | 6343.39 | 10194.82 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|------|-------|
| Neural Network | 3.60 | 8.56 | 4.50 |
| Prophet | 4.20 | 5.89 | 4.48 |
| ETS | 3.73 | 5.55 | 4.03 |
| SARIMA | 24.50 | 7.31 | 21.64 |
| Hybrid* | 3.12 | 6.28 | 3.69 |
| Bayesian Structural | 6.30 | 5.39 | 6.15 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.65 | 3.27 | 0.87 |
| Prophet | 0.48 | 0.82 | 0.72 |
| ETS | 0.43 | 1.10 | 0.67 |
| SARIMA | 2.03 | 0.99 | 1.90 |
| Hybrid* | 0.37 | 0.87 | 0.57 |
| Bayesian Structural | 0.76 | 0.78 | 0.79 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

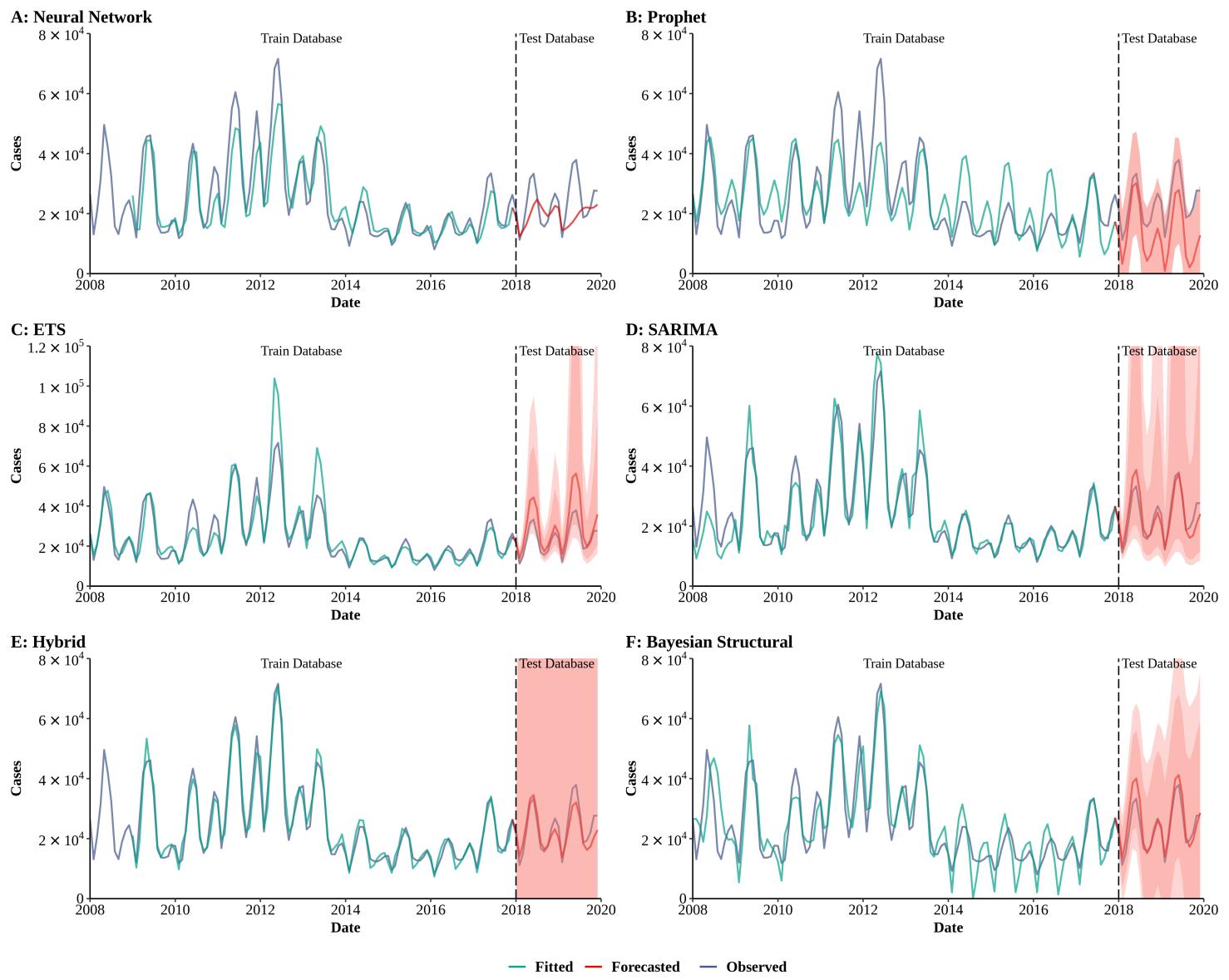
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.90 | 0.37 | 0.87 |
| Prophet | 0.86 | 0.69 | 0.87 |
| ETS | 0.88 | 0.68 | 0.89 |
| SARIMA | 0.00 | 0.41 | 0.00 |
| Hybrid* | 0.91 | 0.57 | 0.90 |
| Bayesian Structural | 0.71 | 0.66 | 0.74 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 13. Training and comparing variant time series models for tuberculosis.

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|---------|----------|---------|
| Neural Network | 6262.62 | 7847.20 | 6579.18 |
| Prophet | 8694.83 | 11301.79 | 9180.87 |
| ETS | 6438.00 | 8451.67 | 6815.05 |
| SARIMA | 5460.20 | 3226.85 | 5155.60 |
| Hybrid* | 2705.90 | 3379.12 | 2840.20 |
| Bayesian Structural | 6676.57 | 3516.83 | 6261.67 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|-------|
| Neural Network | 17.24 | 24.85 | 18.63 |
| Prophet | 27.51 | 72.56 | 35.01 |
| ETS | 12.86 | 21.30 | 14.27 |
| SARIMA | 14.06 | 11.14 | 13.58 |
| Hybrid* | 9.79 | 12.56 | 10.29 |
| Bayesian Structural | 28.18 | 11.13 | 25.34 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.85 | 2.93 | 1.01 |
| Prophet | 1.01 | 1.58 | 1.12 |
| ETS | 0.56 | 0.79 | 0.59 |
| SARIMA | 0.51 | 0.46 | 0.50 |
| Hybrid* | 0.34 | 0.63 | 0.37 |
| Bayesian Structural | 0.78 | 0.44 | 0.65 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

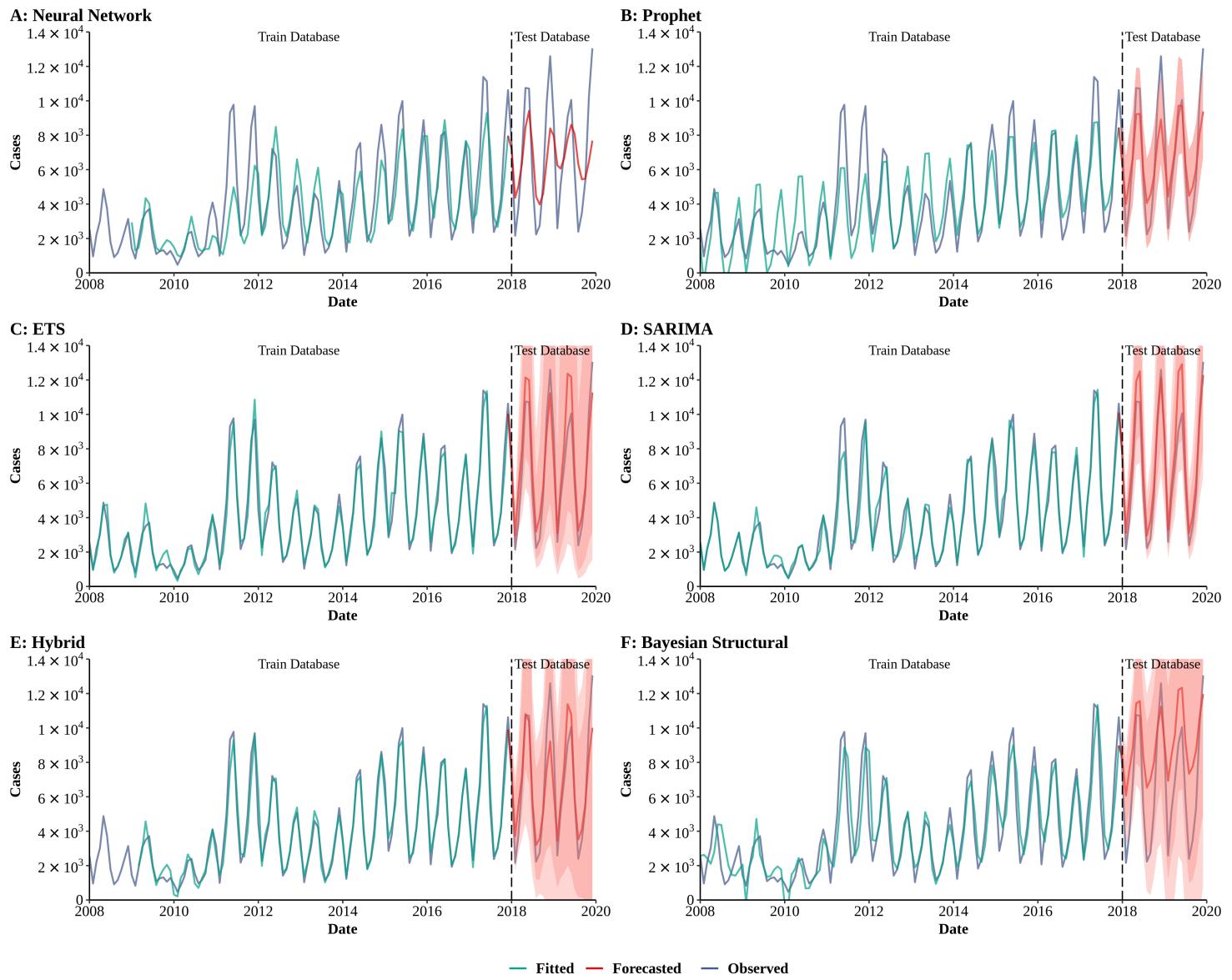
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.80 | 0.12 | 0.75 |
| Prophet | 0.58 | 0.76 | 0.51 |
| ETS | 0.86 | 0.90 | 0.84 |
| SARIMA | 0.86 | 0.82 | 0.86 |
| Hybrid* | 0.96 | 0.81 | 0.95 |
| Bayesian Structural | 0.77 | 0.89 | 0.78 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 14. Training and comparing variant time series models for mumps.

(A) Neural Network model; (B) Prophet model; (C) Exponential smoothing (ETS) model; (D) Seasonal autoregressive integrated moving average (SARIMA) model; (E) Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; (F) Bayesian structural model; (G) Root mean square error (RMSE) of variant models; (H) Symmetric mean absolute percentage error (SMAPE) of variant models; (I) Mean absolute scaled error (MASE) of variant models; (J) R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|---------|---------|---------|
| Neural Network | 1558.42 | 2408.54 | 1744.09 |
| Prophet | 1374.66 | 1735.82 | 1441.15 |
| ETS | 510.89 | 1332.81 | 716.64 |
| SARIMA | 572.96 | 1233.43 | 726.03 |
| Hybrid* | 509.08 | 1479.54 | 784.50 |
| Bayesian Structural | 1181.05 | 2937.21 | 1612.53 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|-------|
| Neural Network | 29.92 | 32.53 | 30.40 |
| Prophet | 37.43 | 25.25 | 35.40 |
| ETS | 11.00 | 18.69 | 12.28 |
| SARIMA | 10.42 | 16.31 | 11.40 |
| Hybrid* | 12.95 | 18.58 | 13.99 |
| Bayesian Structural | 29.16 | 41.57 | 31.23 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.84 | 1.61 | 0.97 |
| Prophet | 0.63 | 0.89 | 0.69 |
| ETS | 0.21 | 0.42 | 0.27 |
| SARIMA | 0.24 | 0.32 | 0.26 |
| Hybrid* | 0.22 | 0.49 | 0.29 |
| Bayesian Structural | 0.52 | 1.58 | 0.81 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

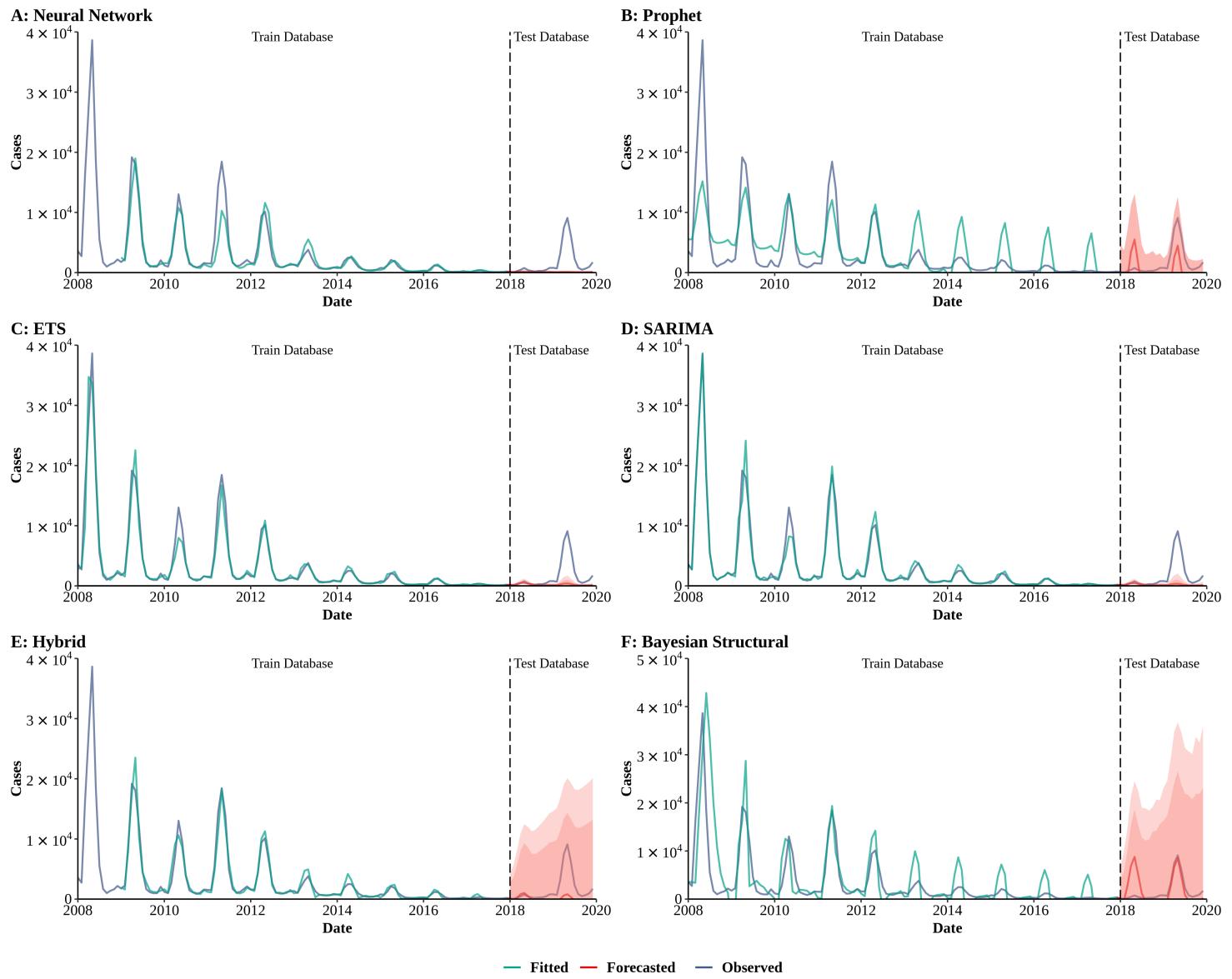
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.67 | 0.61 | 0.67 |
| Prophet | 0.73 | 0.88 | 0.77 |
| ETS | 0.96 | 0.87 | 0.94 |
| SARIMA | 0.95 | 0.92 | 0.94 |
| Hybrid* | 0.97 | 0.83 | 0.93 |
| Bayesian Structural | 0.80 | 0.86 | 0.74 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 15. Training and comparing variant time series models for scarlet fever.

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|---------|---------|---------|
| Neural Network | 1573.72 | 2812.30 | 1861.26 |
| Prophet | 3846.09 | 4937.86 | 4048.55 |
| ETS | 1391.54 | 2718.32 | 1686.77 |
| SARIMA | 1058.91 | 2734.35 | 1476.66 |
| Hybrid* | 901.09 | 2727.67 | 1420.25 |
| Bayesian Structural | 5191.85 | 2524.56 | 4850.26 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|--------|--------|--------|
| Neural Network | 22.14 | 128.75 | 41.52 |
| Prophet | 100.31 | 181.14 | 113.78 |
| ETS | 15.10 | 110.44 | 30.99 |
| SARIMA | 14.79 | 113.77 | 31.29 |
| Hybrid* | 45.17 | 163.72 | 66.72 |
| Bayesian Structural | 98.49 | 148.92 | 106.89 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|--------|------|
| Neural Network | 0.59 | 104.62 | 0.89 |
| Prophet | 1.45 | 2.67 | 1.66 |
| ETS | 0.33 | 21.71 | 0.51 |
| SARIMA | 0.23 | 24.49 | 0.38 |
| Hybrid* | 0.40 | 6.90 | 0.59 |
| Bayesian Structural | 1.68 | 0.99 | 0.93 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

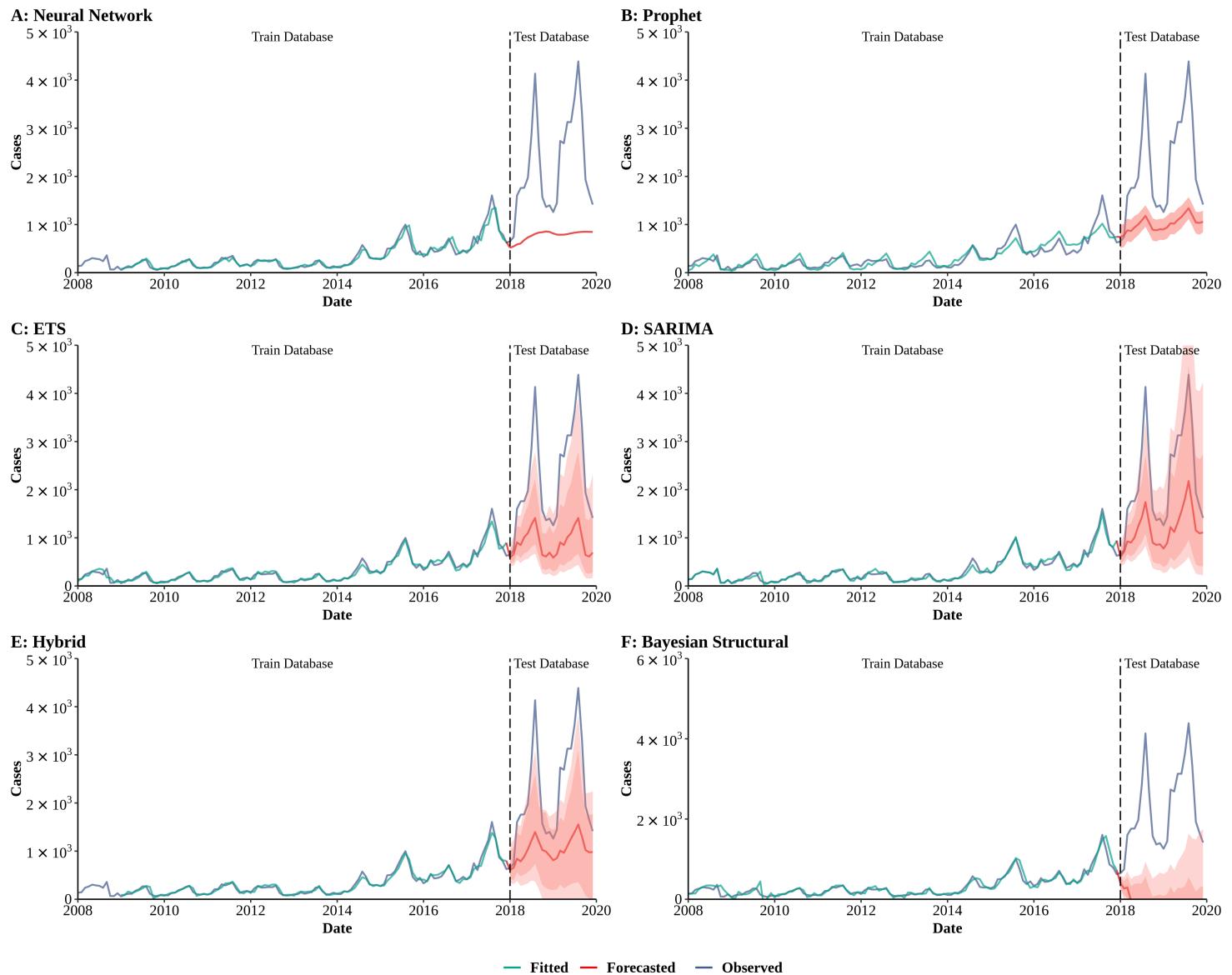
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.86 | 0.00 | 0.77 |
| Prophet | 0.56 | 0.29 | 0.49 |
| ETS | 0.94 | 0.16 | 0.91 |
| SARIMA | 0.97 | 0.14 | 0.93 |
| Hybrid* | 0.95 | 0.22 | 0.87 |
| Bayesian Structural | 0.53 | 0.37 | 0.53 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 16. Training and comparing variant time series models for rubella.

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|--------|---------|---------|
| Neural Network | 70.71 | 1737.35 | 743.56 |
| Prophet | 118.82 | 1490.06 | 617.91 |
| ETS | 61.36 | 1534.59 | 628.99 |
| SARIMA | 59.63 | 1221.93 | 501.81 |
| Hybrid* | 56.17 | 1425.04 | 609.76 |
| Bayesian Structural | 90.87 | 3914.19 | 1600.11 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|--------|-------|
| Neural Network | 12.81 | 85.94 | 26.11 |
| Prophet | 29.51 | 65.75 | 35.55 |
| ETS | 14.45 | 77.64 | 24.98 |
| SARIMA | 13.86 | 54.60 | 20.65 |
| Hybrid* | 15.00 | 64.13 | 23.94 |
| Bayesian Structural | 23.35 | 186.56 | 50.55 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|------|
| Neural Network | 0.68 | 70.50 | 5.22 |
| Prophet | 1.14 | 17.73 | 4.23 |
| ETS | 0.54 | 8.12 | 3.10 |
| SARIMA | 0.54 | 4.87 | 2.14 |
| Hybrid* | 0.52 | 9.35 | 3.29 |
| Bayesian Structural | 0.78 | 19.69 | 6.32 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

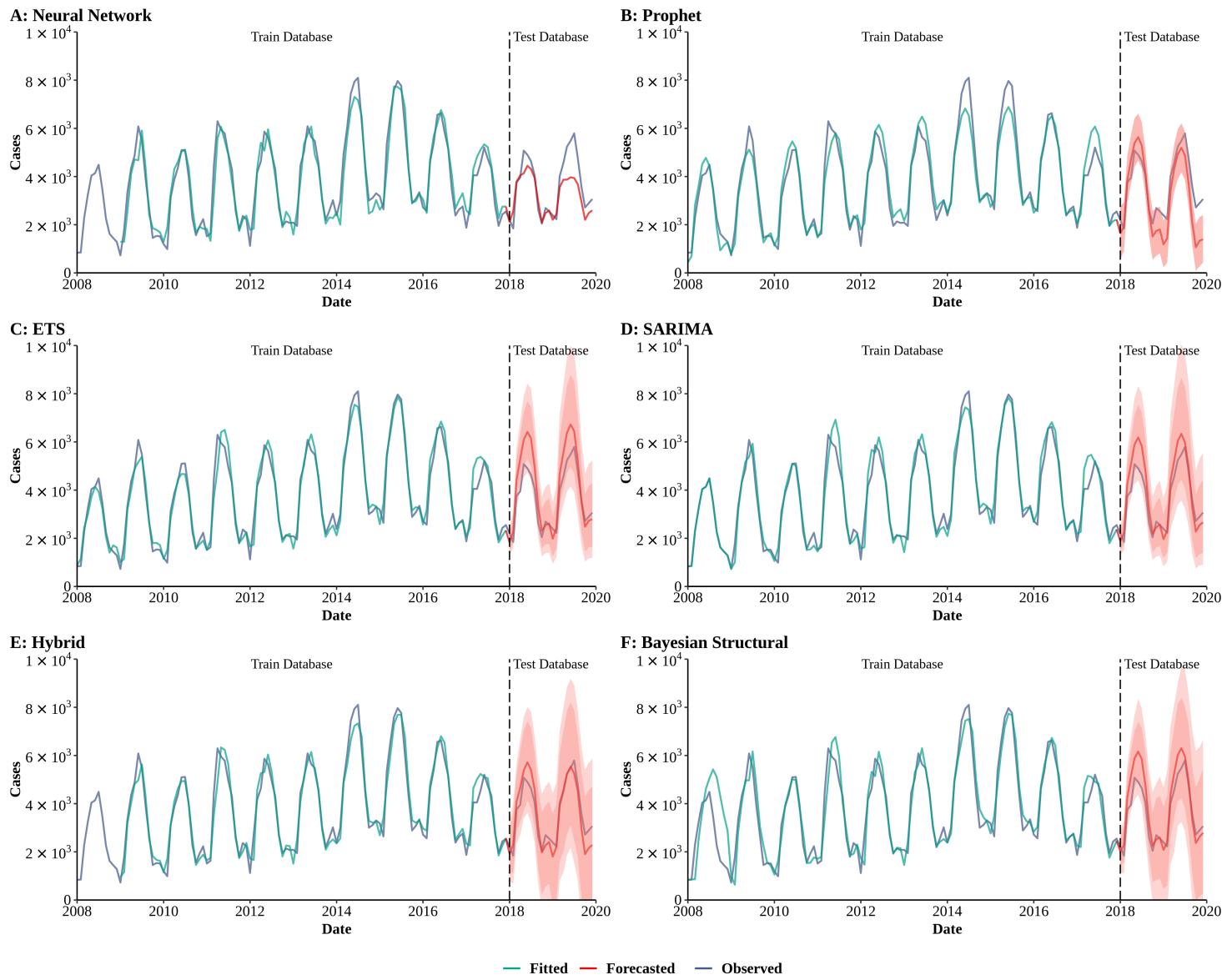
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.94 | 0.21 | 0.53 |
| Prophet | 0.81 | 0.84 | 0.75 |
| ETS | 0.95 | 0.77 | 0.76 |
| SARIMA | 0.95 | 0.91 | 0.89 |
| Hybrid* | 0.96 | 0.86 | 0.80 |
| Bayesian Structural | 0.90 | 0.08 | 0.38 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 17. Training and comparing variant time series models for pertussis.

(A) Neural Network model; (B) Prophet model; (C) Exponential smoothing (ETS) model; (D) Seasonal autoregressive integrated moving average (SARIMA) model; (E) Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; (F) Bayesian structural model; (G) Root mean square error (RMSE) of variant models; (H) Symmetric mean absolute percentage error (SMAPE) of variant models; (I) Mean absolute scaled error (MASE) of variant models; (J) R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|--------|--------|--------|
| Neural Network | 476.56 | 721.00 | 529.46 |
| Prophet | 508.54 | 878.22 | 586.56 |
| ETS | 402.23 | 784.80 | 487.32 |
| SARIMA | 427.34 | 619.29 | 464.87 |
| Hybrid* | 427.35 | 489.75 | 439.36 |
| Bayesian Structural | 682.57 | 611.43 | 671.24 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|-------|
| Neural Network | 12.14 | 14.47 | 12.56 |
| Prophet | 11.14 | 28.12 | 13.97 |
| ETS | 9.61 | 15.33 | 10.57 |
| SARIMA | 9.00 | 13.31 | 9.72 |
| Hybrid* | 9.94 | 12.91 | 10.48 |
| Bayesian Structural | 15.14 | 12.61 | 14.72 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.47 | 1.29 | 0.56 |
| Prophet | 0.46 | 0.95 | 0.58 |
| ETS | 0.37 | 0.78 | 0.46 |
| SARIMA | 0.37 | 0.66 | 0.42 |
| Hybrid* | 0.39 | 0.57 | 0.45 |
| Bayesian Structural | 0.58 | 0.66 | 0.61 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

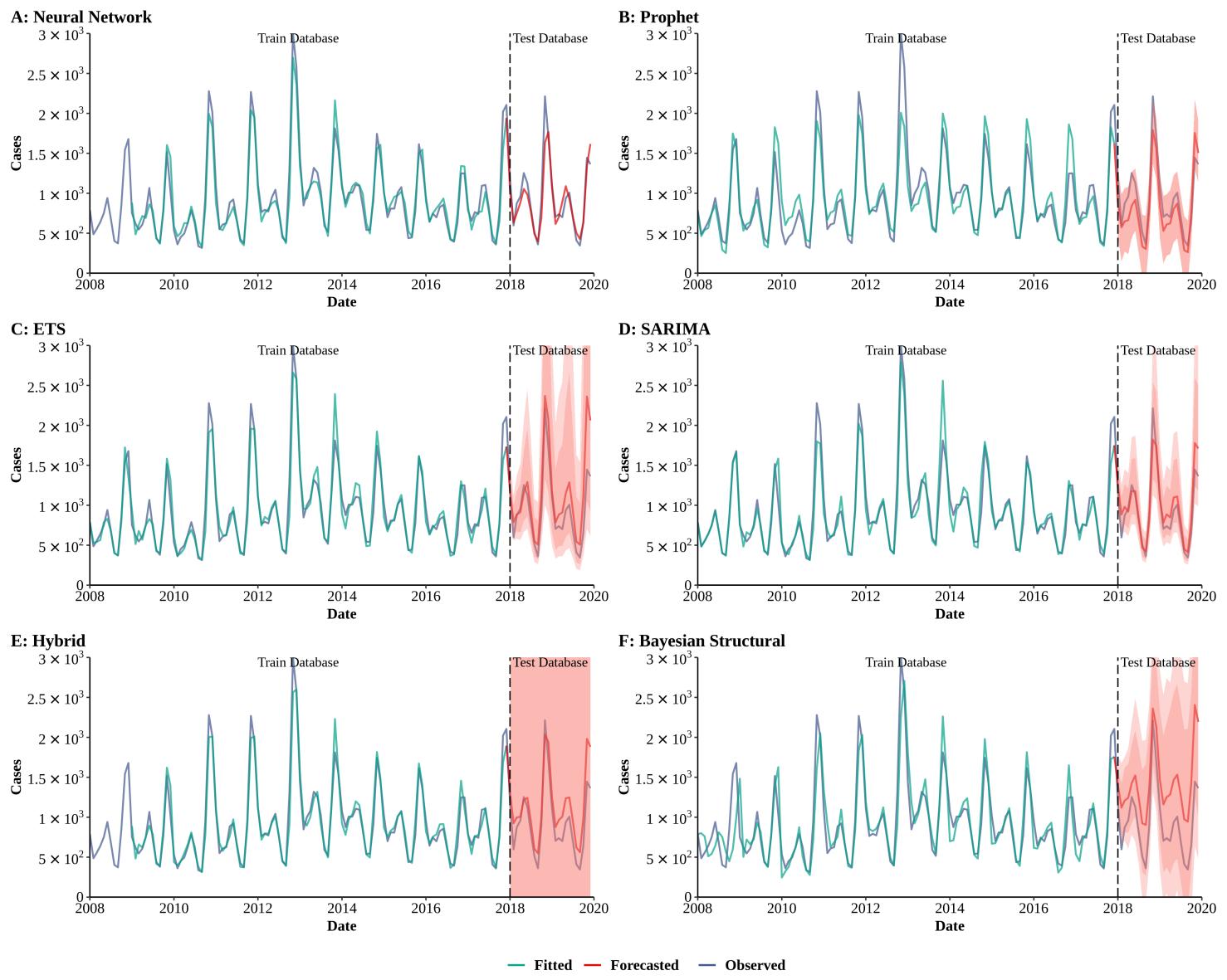
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.93 | 0.81 | 0.91 |
| Prophet | 0.92 | 0.82 | 0.89 |
| ETS | 0.95 | 0.94 | 0.93 |
| SARIMA | 0.95 | 0.93 | 0.94 |
| Hybrid* | 0.94 | 0.89 | 0.93 |
| Bayesian Structural | 0.86 | 0.93 | 0.86 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 18. Training and comparing variant time series models for brucellosis.

(A) Neural Network model; (B) Prophet model; (C) Exponential smoothing (ETS) model; (D) Seasonal autoregressive integrated moving average (SARIMA) model; (E) Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; (F) Bayesian structural model; (G) Root mean square error (RMSE) of variant models; (H) Symmetric mean absolute percentage error (SMAPE) of variant models; (I) Mean absolute scaled error (MASE) of variant models; (J) R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|--------|--------|--------|
| Neural Network | 129.41 | 164.96 | 136.56 |
| Prophet | 207.66 | 207.95 | 207.71 |
| ETS | 140.57 | 300.89 | 177.64 |
| SARIMA | 151.85 | 162.02 | 153.59 |
| Hybrid* | 121.62 | 249.60 | 153.06 |
| Bayesian Structural | 236.21 | 520.65 | 302.78 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|-------|
| Neural Network | 9.78 | 12.05 | 10.19 |
| Prophet | 14.26 | 21.87 | 15.53 |
| ETS | 9.00 | 20.91 | 10.99 |
| SARIMA | 8.90 | 12.89 | 9.57 |
| Hybrid* | 8.28 | 23.35 | 11.02 |
| Bayesian Structural | 16.84 | 46.29 | 21.75 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.32 | 0.42 | 0.33 |
| Prophet | 0.45 | 0.62 | 0.48 |
| ETS | 0.29 | 0.58 | 0.34 |
| SARIMA | 0.29 | 0.44 | 0.31 |
| Hybrid* | 0.26 | 0.75 | 0.34 |
| Bayesian Structural | 0.50 | 1.69 | 0.65 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

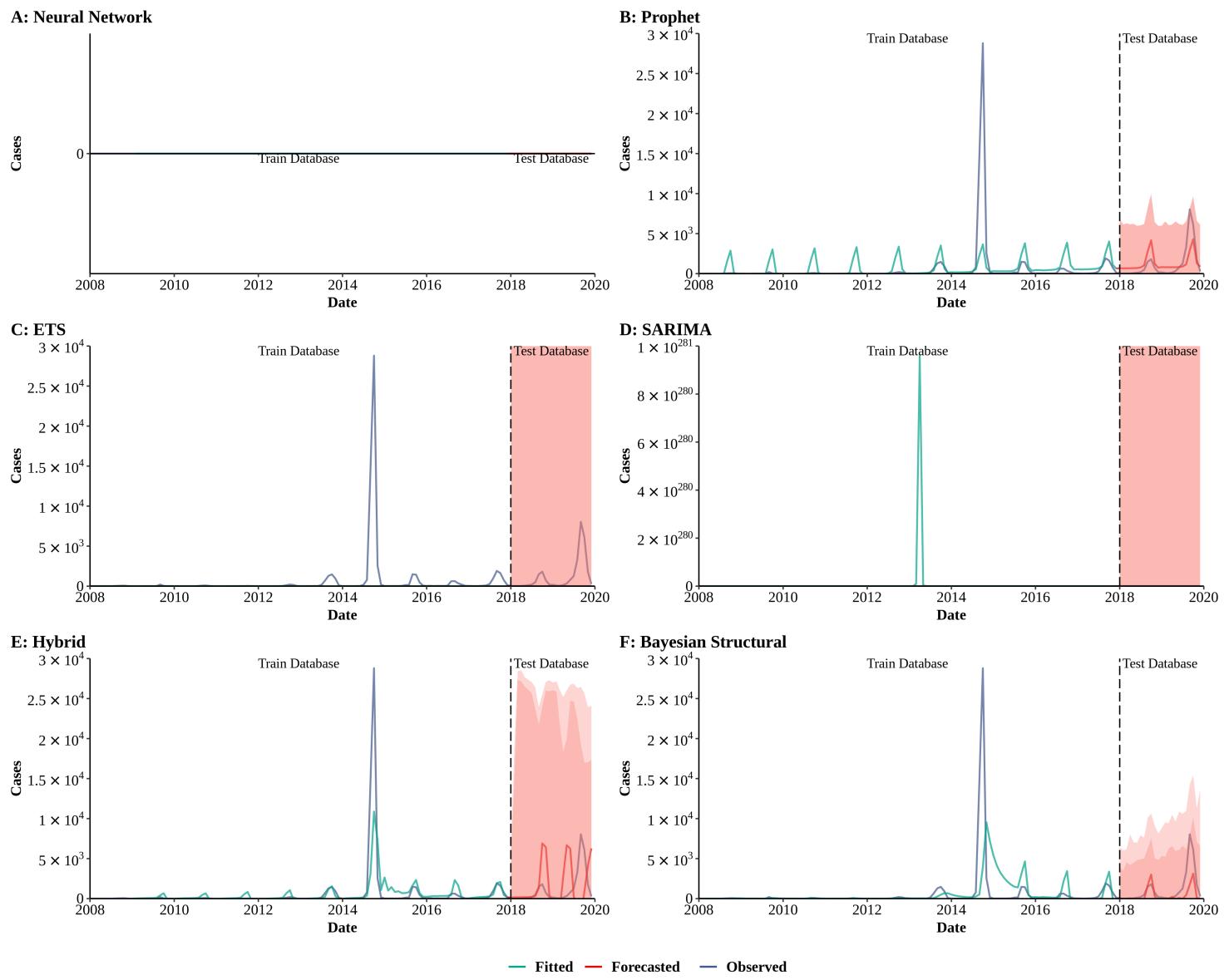
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.94 | 0.87 | 0.93 |
| Prophet | 0.82 | 0.87 | 0.82 |
| ETS | 0.92 | 0.84 | 0.87 |
| SARIMA | 0.91 | 0.88 | 0.90 |
| Hybrid* | 0.94 | 0.88 | 0.91 |
| Bayesian Structural | 0.78 | 0.81 | 0.68 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 19. Training and comparing variant time series models for hemorrhagic fever with renal syndrome (HFRS).

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



| MSE of Models | | | H : SMAPE of Models | | | | | | I : MASE of Models | | | | | | J : R-squared of Models | | |
|---------------------|----------------------|-----------------|---------------------|---------------------|--------|--------|--------|---------------------|--------------------|------|----------------------|---------------------|-------|------|-------------------------|--|--|
| Method | Train | Test | All | Method | Train | Test | All | Method | Train | Test | All | Method | Train | Test | All | | |
| Network | 1.84602724798645e+20 | Inf | Inf | Neural Network | | | | Neural Network | 0.5 | | | Neural Network | 0 | | | | |
| Prophet | 2733.45 | 1410.49 | 2560.86 | Prophet | 151.58 | 110.96 | 144.81 | Prophet | 1.51 | 1.61 | 1.54 | Prophet | 0.14 | 0.53 | 0.17 | | |
| ETS | 2990.29 | 2281.21 | 2884.24 | ETS | | 200 | | ETS | 0.93 | Inf | 2.89128965216679e+47 | ETS | 0 | | 0.01 | | |
| SARIMA | Inf | 219274805302992 | Inf | SARIMA | | 199.97 | | SARIMA | 0.5 | 0.98 | 0.5 | SARIMA | 0 | 0.01 | 0 | | |
| Hybrid* | 2157.25 | 3705.31 | 2510.74 | Hybrid* | 137.28 | 136.22 | 137.09 | Hybrid* | 0.89 | 1.41 | 1.36 | Hybrid* | 0.65 | 0.03 | 0.27 | | |
| Bayesian Structural | 2924.7 | 1635.01 | 2752.80 | Bayesian Structural | 120.88 | 150.47 | 125.81 | Bayesian Structural | 1.43 | 1.38 | 2.11 | Bayesian Structural | 0.07 | 0.51 | 0.09 | | |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

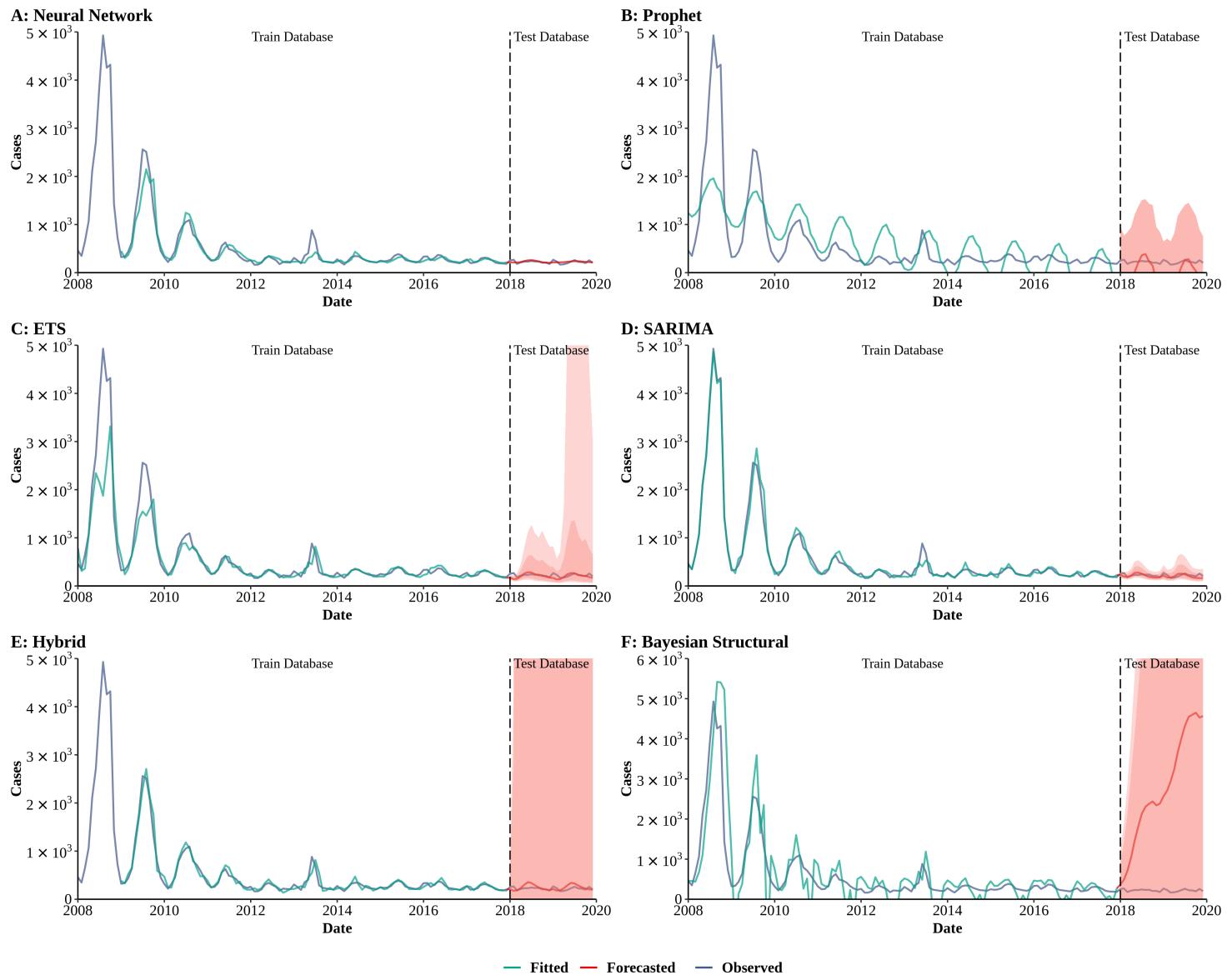
*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 20. Training and comparing variant time series models for dengue fever.

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|--------|---------|---------|
| Neural Network | 143.42 | 28.46 | 130.30 |
| Prophet | 603.18 | 438.84 | 579.04 |
| ETS | 414.04 | 50.21 | 378.52 |
| SARIMA | 108.42 | 39.92 | 100.31 |
| Hybrid* | 88.96 | 59.95 | 84.43 |
| Bayesian Structural | 601.14 | 2873.50 | 1295.11 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|--------|-------|
| Neural Network | 15.18 | 10.58 | 14.34 |
| Prophet | 81.31 | 133.30 | 89.97 |
| ETS | 18.02 | 17.73 | 17.98 |
| SARIMA | 12.43 | 15.32 | 12.91 |
| Hybrid* | 14.03 | 19.68 | 15.06 |
| Bayesian Structural | 68.27 | 157.04 | 83.06 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|------|
| Neural Network | 0.91 | 3.20 | 0.96 |
| Prophet | 2.36 | 2.47 | 2.70 |
| ETS | 0.92 | 1.52 | 1.15 |
| SARIMA | 0.33 | 1.53 | 0.36 |
| Hybrid* | 0.56 | 1.53 | 0.56 |
| Bayesian Structural | 2.03 | 12.58 | 1.85 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

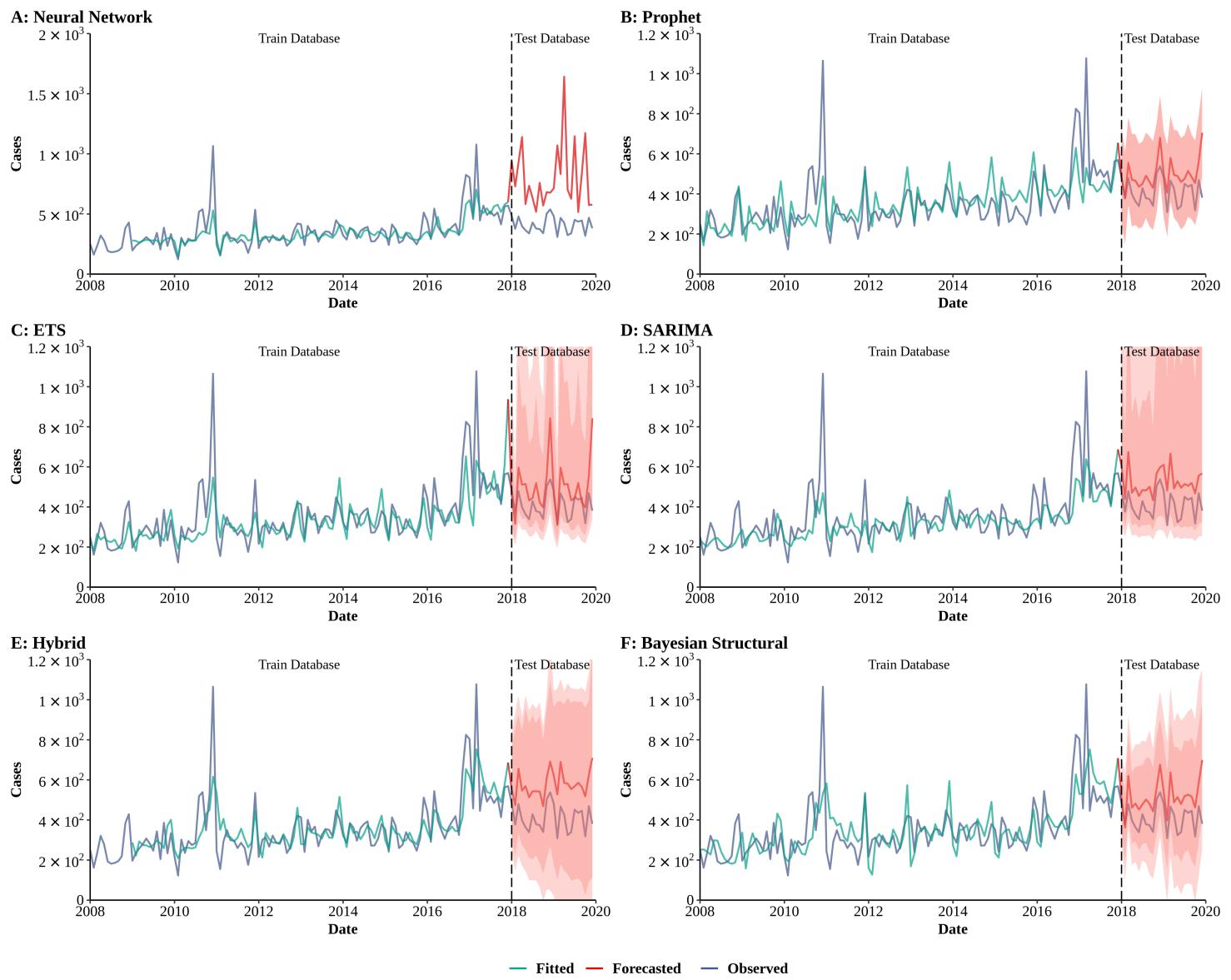
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.89 | 0.09 | 0.90 |
| Prophet | 0.50 | 0.05 | 0.47 |
| ETS | 0.85 | 0.04 | 0.86 |
| SARIMA | 0.98 | 0.11 | 0.98 |
| Hybrid* | 0.96 | 0.06 | 0.96 |
| Bayesian Structural | 0.69 | 0.01 | 0.23 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 21. Training and comparing variant time series models for malaria.

(A) Neural Network model; (B) Prophet model; (C) Exponential smoothing (ETS) model; (D) Seasonal autoregressive integrated moving average (SARIMA) model; (E) Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; (F) Bayesian structural model; (G) Root mean square error (RMSE) of variant models; (H) Symmetric mean absolute percentage error (SMAPE) of variant models; (I) Mean absolute scaled error (MASE) of variant models; (J) R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|--------|--------|--------|
| Neural Network | 95.45 | 478.23 | 221.44 |
| Prophet | 112.31 | 110.10 | 111.95 |
| ETS | 109.05 | 142.56 | 115.31 |
| SARIMA | 110.36 | 125.16 | 112.96 |
| Hybrid* | 95.87 | 175.19 | 114.45 |
| Bayesian Structural | 119.07 | 123.53 | 119.83 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|-------|
| Neural Network | 14.42 | 60.22 | 22.75 |
| Prophet | 19.64 | 19.54 | 19.62 |
| ETS | 18.07 | 20.92 | 18.54 |
| SARIMA | 19.26 | 25.01 | 20.22 |
| Hybrid* | 16.81 | 34.16 | 19.96 |
| Bayesian Structural | 22.52 | 23.12 | 22.62 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 1.29 | 1.30 | 1.29 |
| Prophet | 0.73 | 1.20 | 0.99 |
| ETS | 0.68 | 0.81 | 0.93 |
| SARIMA | 1.51 | 1.54 | 1.52 |
| Hybrid* | 0.62 | 2.50 | 1.42 |
| Bayesian Structural | 0.82 | 1.21 | 1.17 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

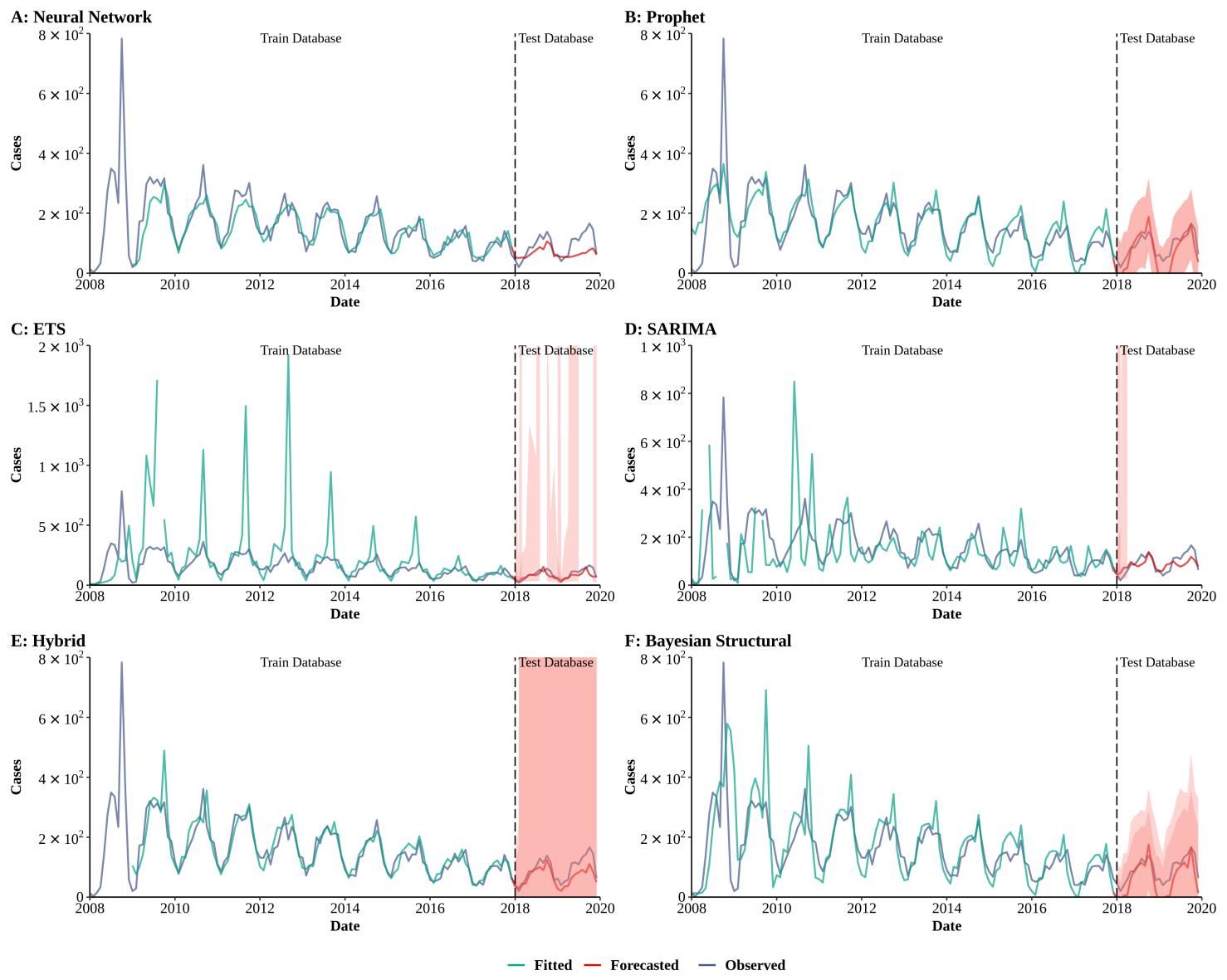
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.66 | 0.00 | 0.16 |
| Prophet | 0.44 | 0.30 | 0.41 |
| ETS | 0.50 | 0.24 | 0.41 |
| SARIMA | 0.52 | 0.51 | 0.40 |
| Hybrid* | 0.61 | 0.38 | 0.45 |
| Bayesian Structural | 0.41 | 0.39 | 0.39 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 22. Training and comparing variant time series models for echinococcosis.

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.



G : RMSE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|-------|
| Neural Network | 38.34 | 39.99 | 38.64 |
| Prophet | 61.24 | 40.07 | 58.25 |
| ETS | | 31.64 | |
| SARIMA | | 28.12 | |
| Hybrid* | 35.81 | 30.42 | 34.89 |
| Bayesian Structural | 99.95 | 43.44 | 92.95 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

H : SMAPE of Models

| Method | Train | Test | All |
|---------------------|-------|-------|-------|
| Neural Network | 19.05 | 36.51 | 22.23 |
| Prophet | 32.12 | 72.98 | 38.93 |
| ETS | | 26.32 | |
| SARIMA | | 28.67 | |
| Hybrid* | 16.79 | 32.40 | 19.63 |
| Bayesian Structural | 39.53 | 83.92 | 46.93 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

I : MASE of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 1.08 | 4.04 | 1.26 |
| Prophet | 0.82 | 0.95 | 0.95 |
| ETS | | 1.04 | |
| SARIMA | | 1.50 | |
| Hybrid* | 0.7 | 1.45 | 0.74 |
| Bayesian Structural | 1.26 | 0.98 | 0.94 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

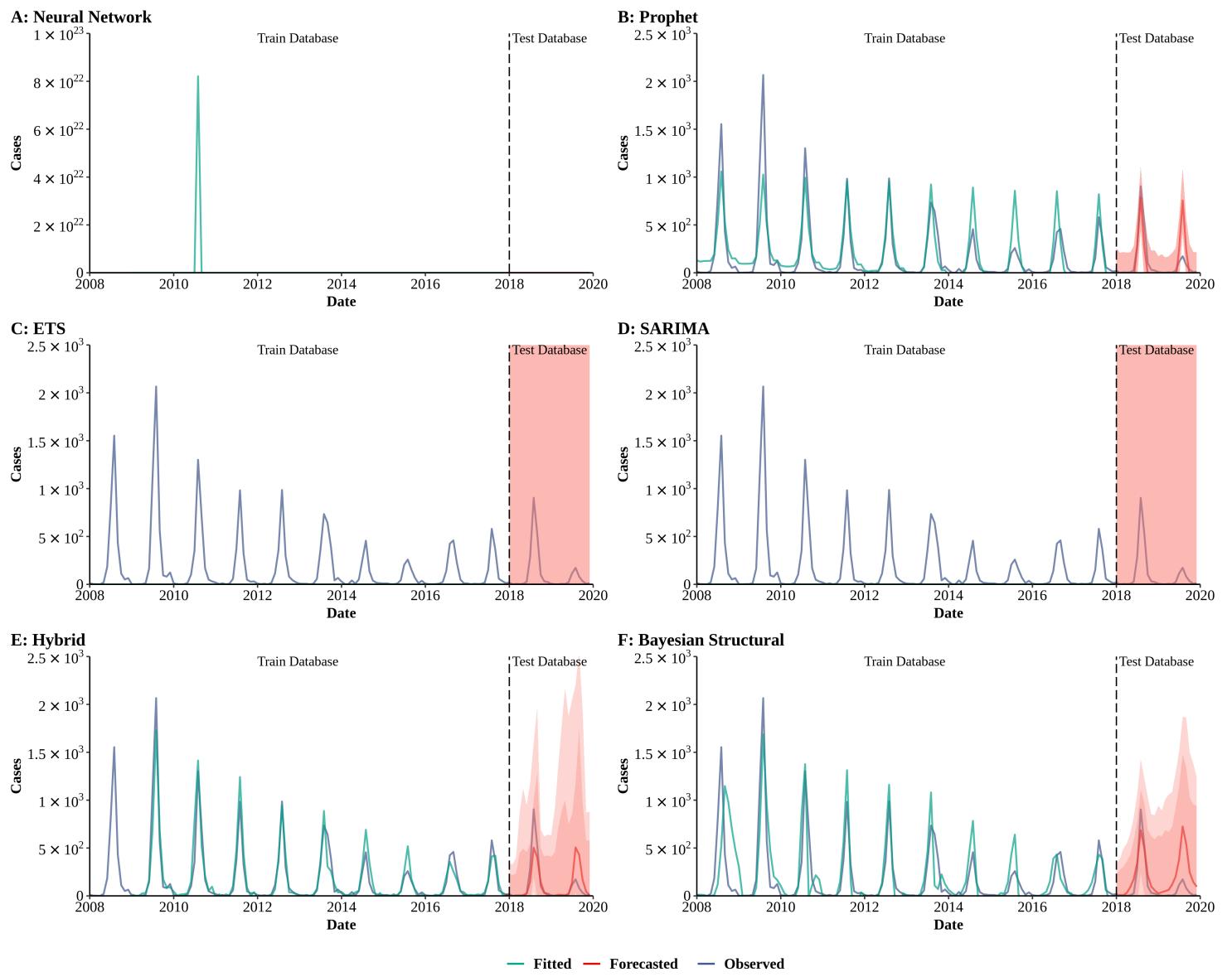
J : R-squared of Models

| Method | Train | Test | All |
|---------------------|-------|------|------|
| Neural Network | 0.75 | 0.50 | 0.75 |
| Prophet | 0.63 | 0.80 | 0.64 |
| ETS | | 0.49 | |
| SARIMA | | 0.60 | |
| Hybrid* | 0.8 | 0.79 | 0.82 |
| Bayesian Structural | 0.41 | 0.84 | 0.46 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 23. Training and comparing variant time series models for typhus.

(A) Neural Network model; (B) Prophet model; (C) Exponential smoothing (ETS) model; (D) Seasonal autoregressive integrated moving average (SARIMA) model; (E) Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; (F) Bayesian structural model; (G) Root mean square error (RMSE) of variant models; (H) Symmetric mean absolute percentage error (SMAPE) of variant models; (I) Mean absolute scaled error (MASE) of variant models; (J) R-squared of variant models.



ISE of Models

H : SMAPE of Models

I : MASE of Models

J : R-squared of Models

| Model | Train | Test | All | Method | Train | Test | All | Method | Train | Test | All | Method | Train | Test | All |
|----------------|----------------------|--------|---------------------|---------------------|--------|--------|--------|---------------------|-------|----------------------|----------------------|---------------------|-------|------|------|
| Neural Network | 7.89987168153572e+21 | 227.45 | 7.1457027980749e+21 | Neural Network | 199.86 | 200 | 199.86 | Neural Network | 0.5 | 5.44223834967596e+50 | 0.5 | Neural Network | 0.12 | 0.19 | 0.12 |
| Prophet | 173.93 | 182.4 | 175.37 | Prophet | 115.31 | 165.91 | 123.74 | Prophet | 0.66 | 0.95 | 0.72 | Prophet | 0.72 | 0.63 | 0.69 |
| ETS | 372.19 | 227.45 | 352.23 | ETS | 200 | 200 | 200 | ETS | 1.08 | Inf | 1.00657255156489e+91 | ETS | 0 | 0 | 0 |
| SARIMA | 371.73 | 227.02 | 351.77 | SARIMA | 162.17 | 160.33 | 161.86 | SARIMA | Inf | Inf | Inf | SARIMA | | | |
| Hybrid* | 102.42 | 136.92 | 109.5 | Hybrid* | 82.39 | 76.13 | 81.25 | Hybrid* | 0.37 | 0.79 | 0.4 | Hybrid* | 0.89 | 0.56 | 0.86 |
| Structural | 240.71 | 184.14 | 232.24 | Bayesian Structural | 122.15 | 128.8 | 126.66 | Bayesian Structural | 0.89 | 1.07 | 0.77 | Bayesian Structural | 0.56 | 0.53 | 0.55 |

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

*Hybrid: Combined SARIMA, ETS, STL and Neural Network model

Supplementary Fig. 24. Training and comparing variant time series models for Japanese encephalitis (JE).

(A) Neural Network model; **(B)** Prophet model; **(C)** Exponential smoothing (ETS) model; **(D)** Seasonal autoregressive integrated moving average (SARIMA) model; **(E)** Hybrid models combining SARIMA, ETS, STL (seasonal and trend decomposition using loess), and neural network model; **(F)** Bayesian structural model; **(G)** Root mean square error (RMSE) of variant models; **(H)** Symmetric mean absolute percentage error (SMAPE) of variant models; **(I)** Mean absolute scaled error (MASE) of variant models; **(J)** R-squared of variant models.