Supplementary material for: When do we need multipel infectious disease models? Agreement between projection rank and magnitude in a multi-model setting

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Cecile Viboud, National Institutes of Health
Katriona Shea, The Pennsylvania State University

SIR Simulations

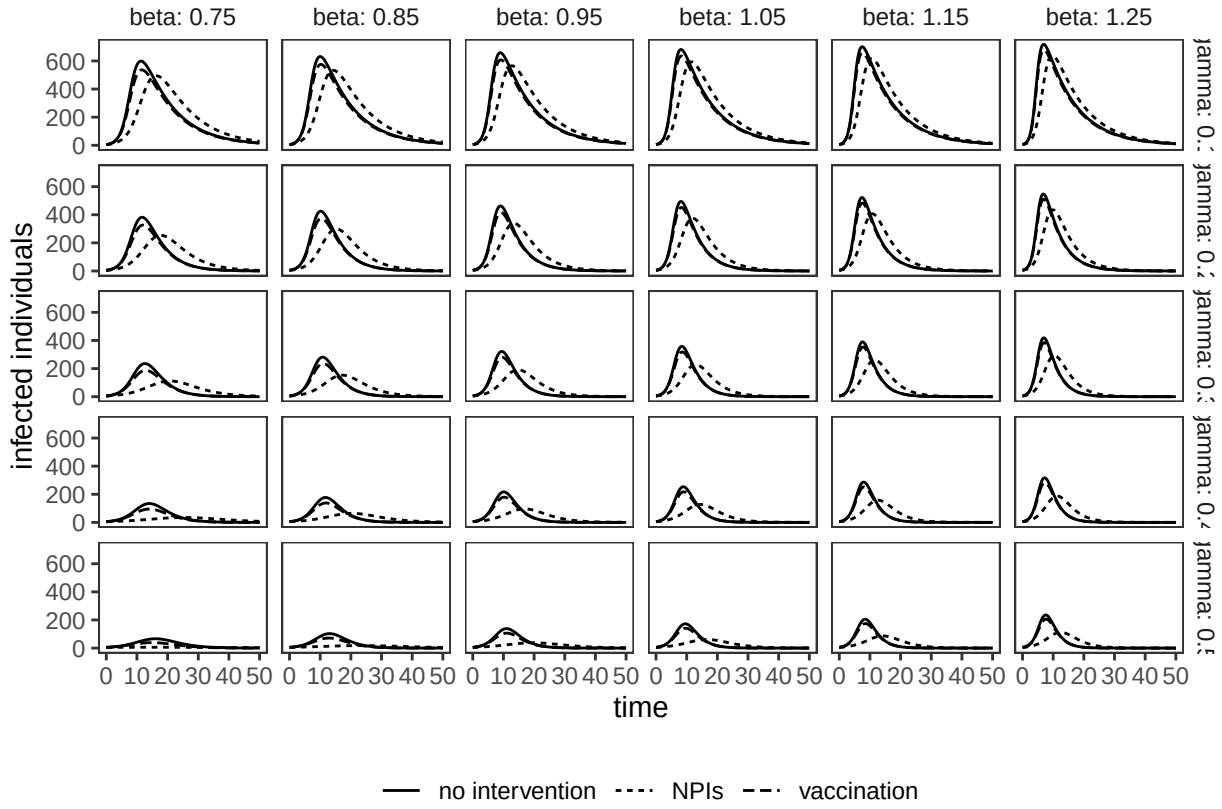

Fig. S1: ADD HERE

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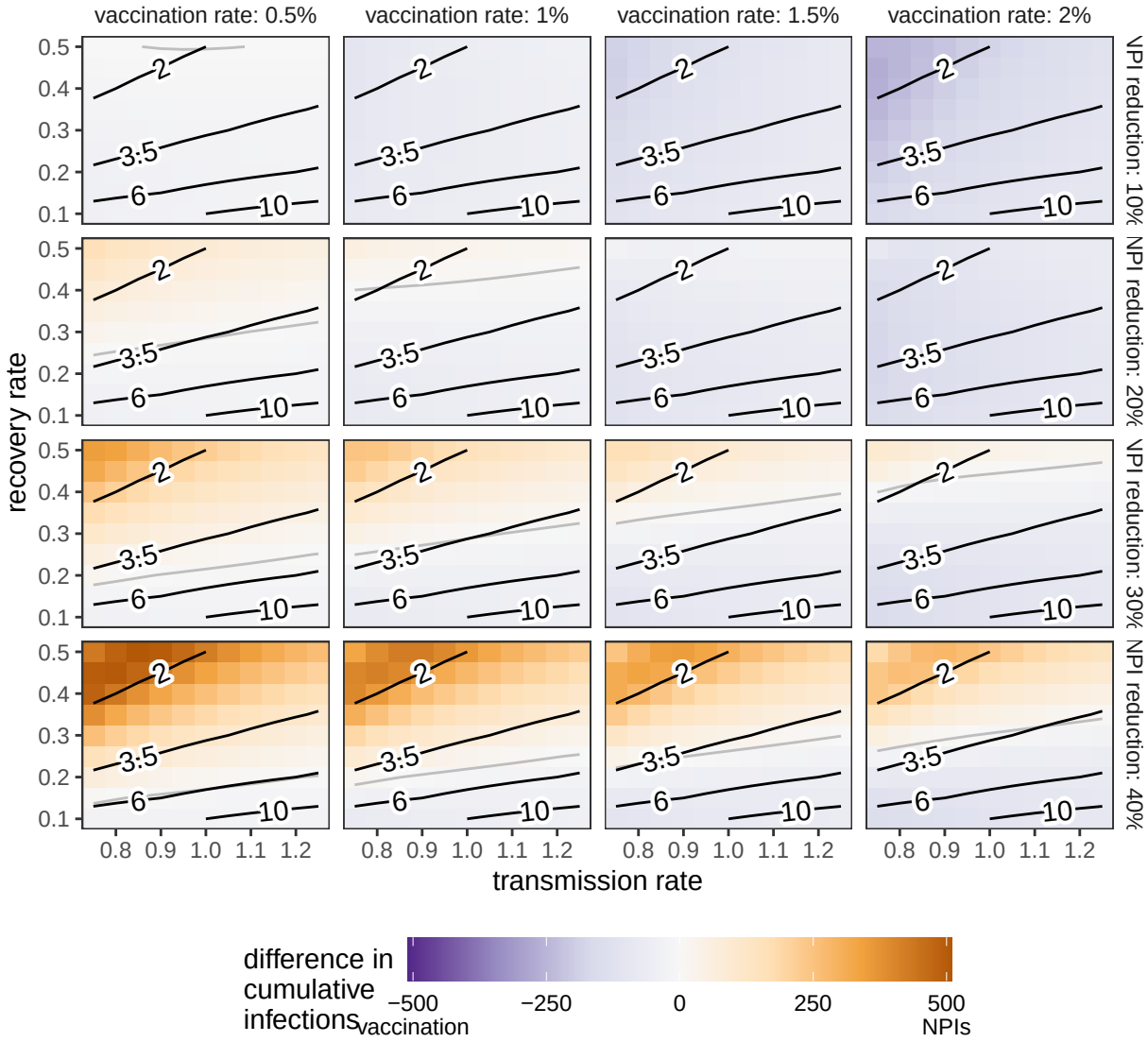


Fig. S2: Results from Fig. 1B repeated for varying intervention efficacies (vaccination rate ranging from 0.5% to 2% of the population per day, and NPI reduction of the transmission rate ranging from 10% to 40%). Each panel shows a large part of the space of possible models across biological uncertainties (transmission rate, β, and recovery rate, γ). Each position on the graph represents an individual model, the color of the tile represents the recommended intervention (orange: non-pharmaceutical interventions, NPIs; purple: vaccination), and the intensity of the color is the magnitude of the projected difference in cumulative infections. Colors have been rescaled from Fig. 1. The gray line shows where the difference in cumulative infections is 0, or where neither intervention is recommended over the other. Black contours show sample values of individual model R_0 = 2,3.5, 6, and 10.

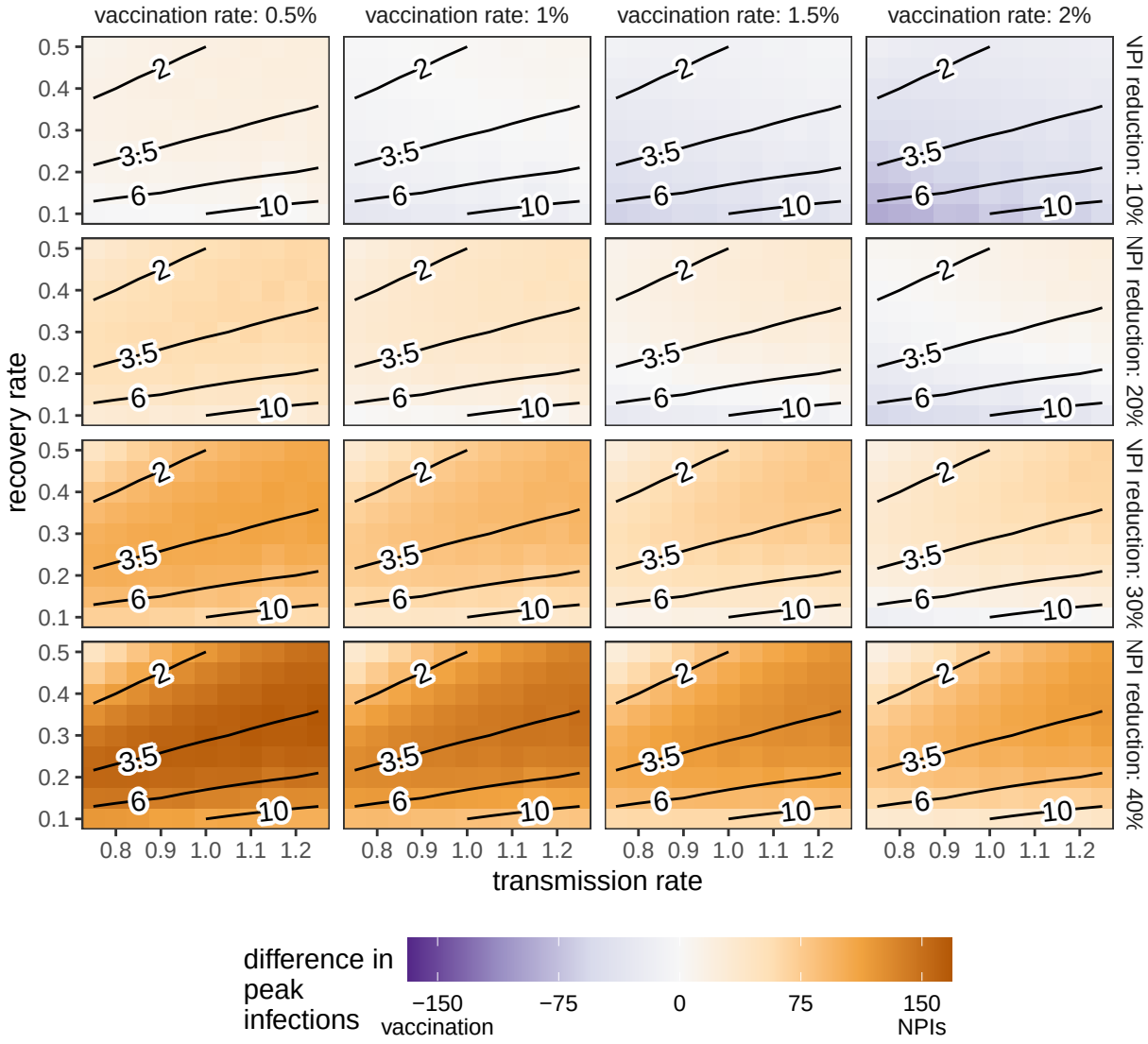


Fig. S3: Model results for minimizing peak infections. Results are shown for varying intervention efficacies (vaccination rate ranging from 0.5% to 2% of the population per day, and NPI reduction of the transmission rate ranging from 10% to 40%). Each panel shows a large part of the space of possible models across biological uncertainties (transmission rate, β, and recovery rate, γ). Each position on the graph represents an individual model, the color of the tile represents the recommended intervention (orange: non-pharmaceutical interventions, NPIs; purple: vaccination), and the intensity of the color is the magnitude of the projected difference in peak infections. Colors have been rescaled from Figure 1. The gray line shows where the difference in peak infections is 0, or where neither intervention is recommended over the other. Black contours show sample values of individual model R_0 = 2,3.5, 6, and 10.

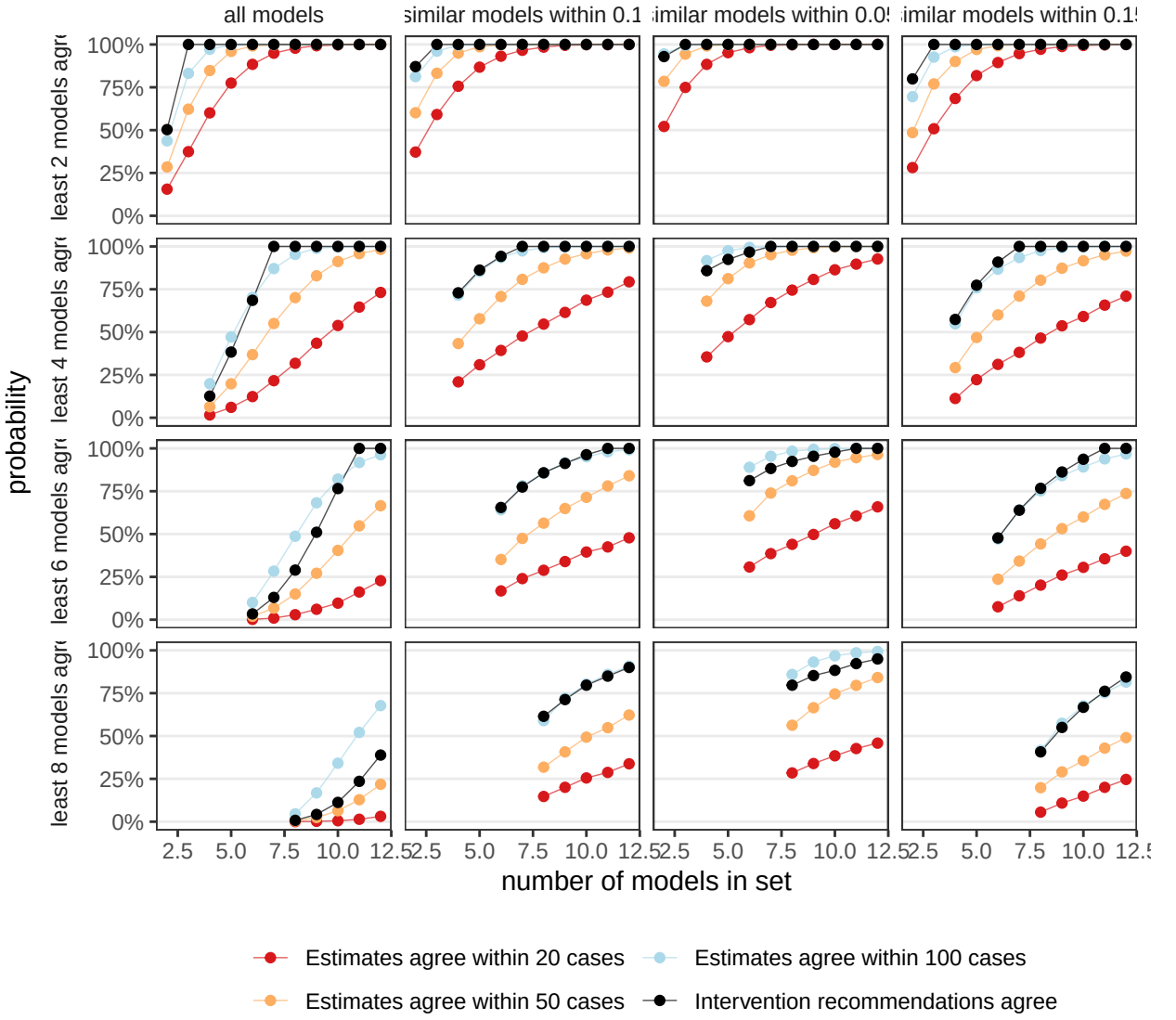


Fig. S4: Probability of models agreeing about intervention recommendations or estimates of cumulative infections without intervention for different sampling schemes (columns) and number of models agreeing (rows). Probabilities are calculated for a set of models of size two to size ten, either when choosing randomly among all models or among models with "similar" assumptions, defined as those with transmission and recovery rate assumptions within $\pm$ 0.1, $\pm$ 0.05 or $\pm$ 0.15 of a given model. Agreement probability of at least 2, 4, 6, or 8 models is shown for estimates of cumulative cases within 20 infections (2% of population, red), within 50 infections (5% of population, yellow), within 100 infections (10% of population, blue), or recommended intervention (black).

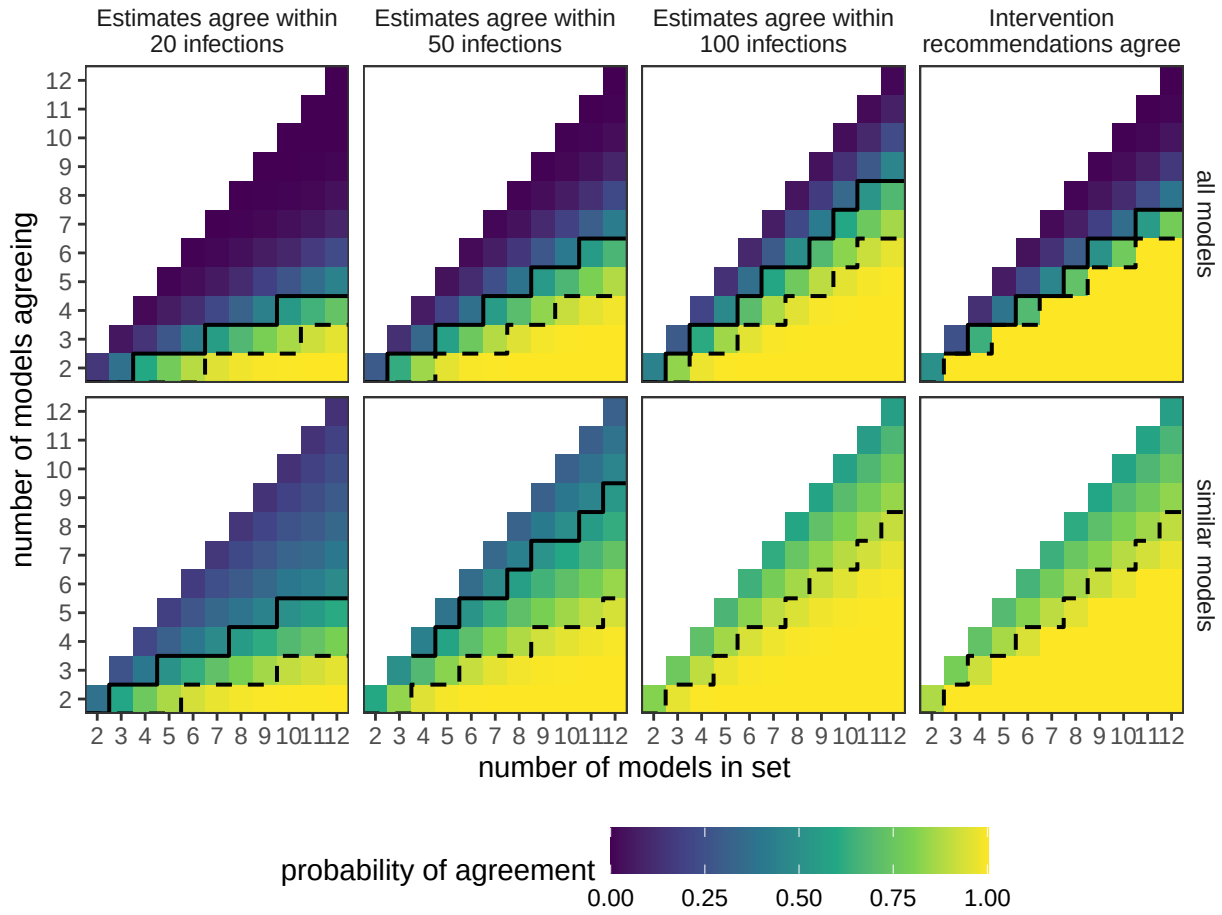


Fig. S5: ADD HERE

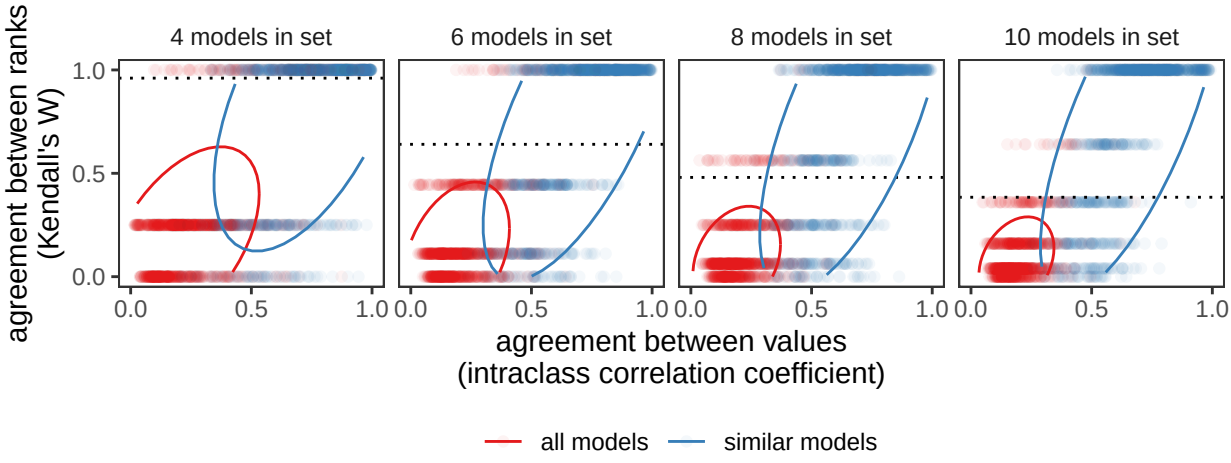


Fig. S6: ADD HERE

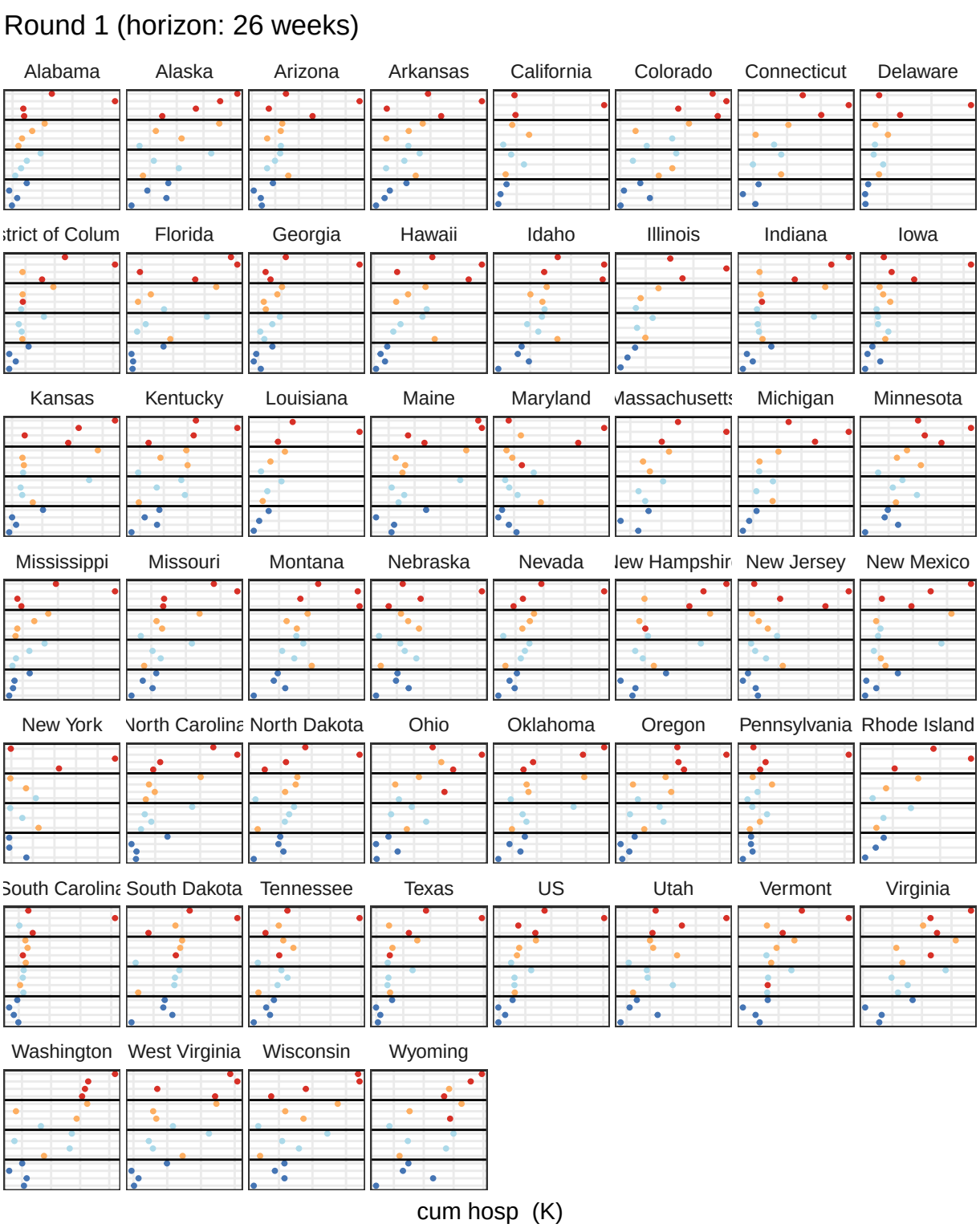


Fig. S7: COVID-19 Scenario Modeling Hub projections of cumulative hospitalizations for Round 1. Projections are collected from 4 models for four scenarios. Across locations (panels), projections are shown for each scenario (separated by horizontal black lines) from each model (individual points), points are colored based on the rank of that scenario for each model (blue is lowest projection, and red is highest projection).

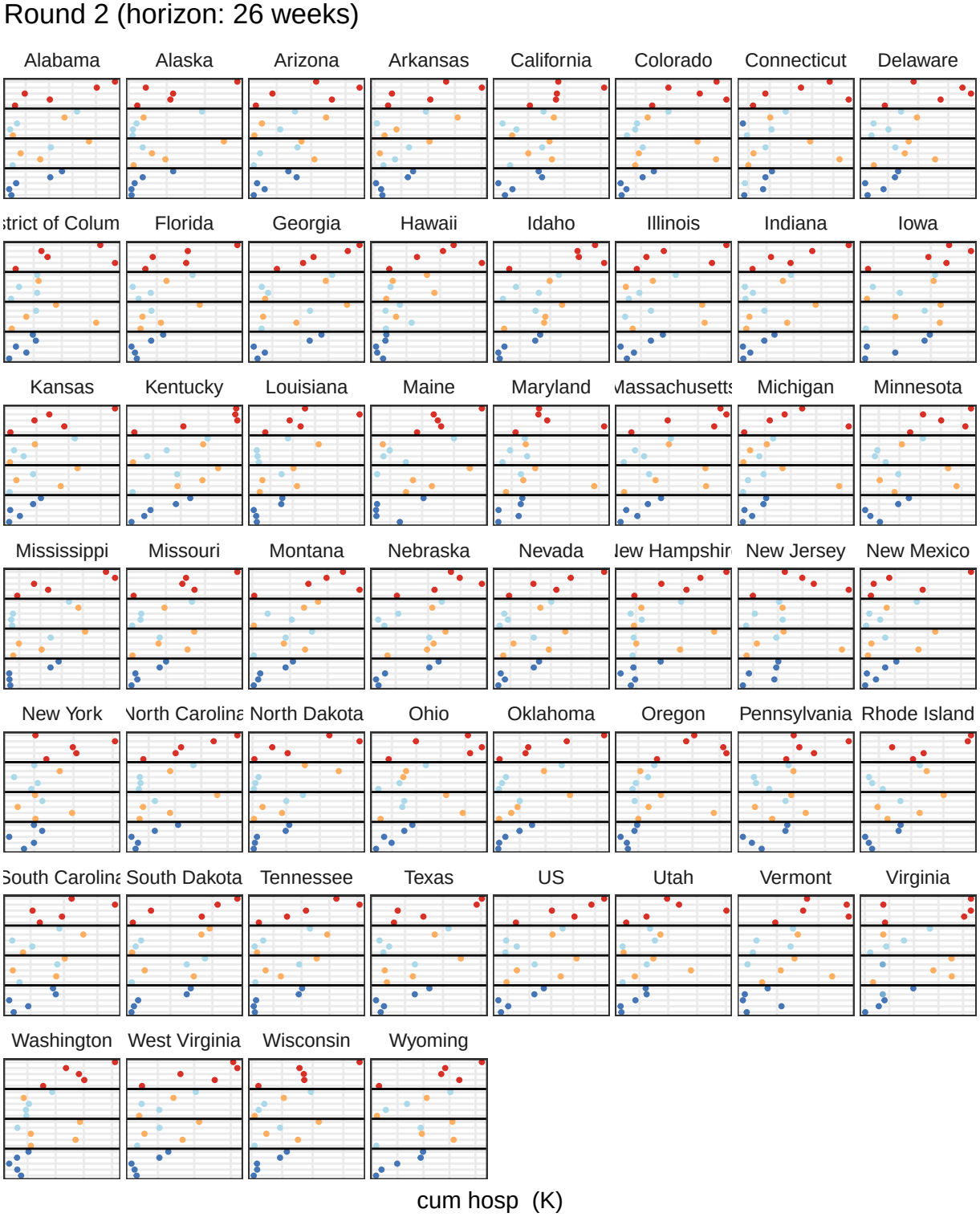


Fig. S8: COVID-19 Scenario Modeling Hub projections of cumulative hospitalizations for Round 2. Projections are collected from 5 models for four scenarios. Across locations (panels), projections are shown for each scenario (separated by horizontal black lines) from each model (individual points), points are colored based on the rank of that scenario for each model (blue is lowest projection, and red is highest projection).

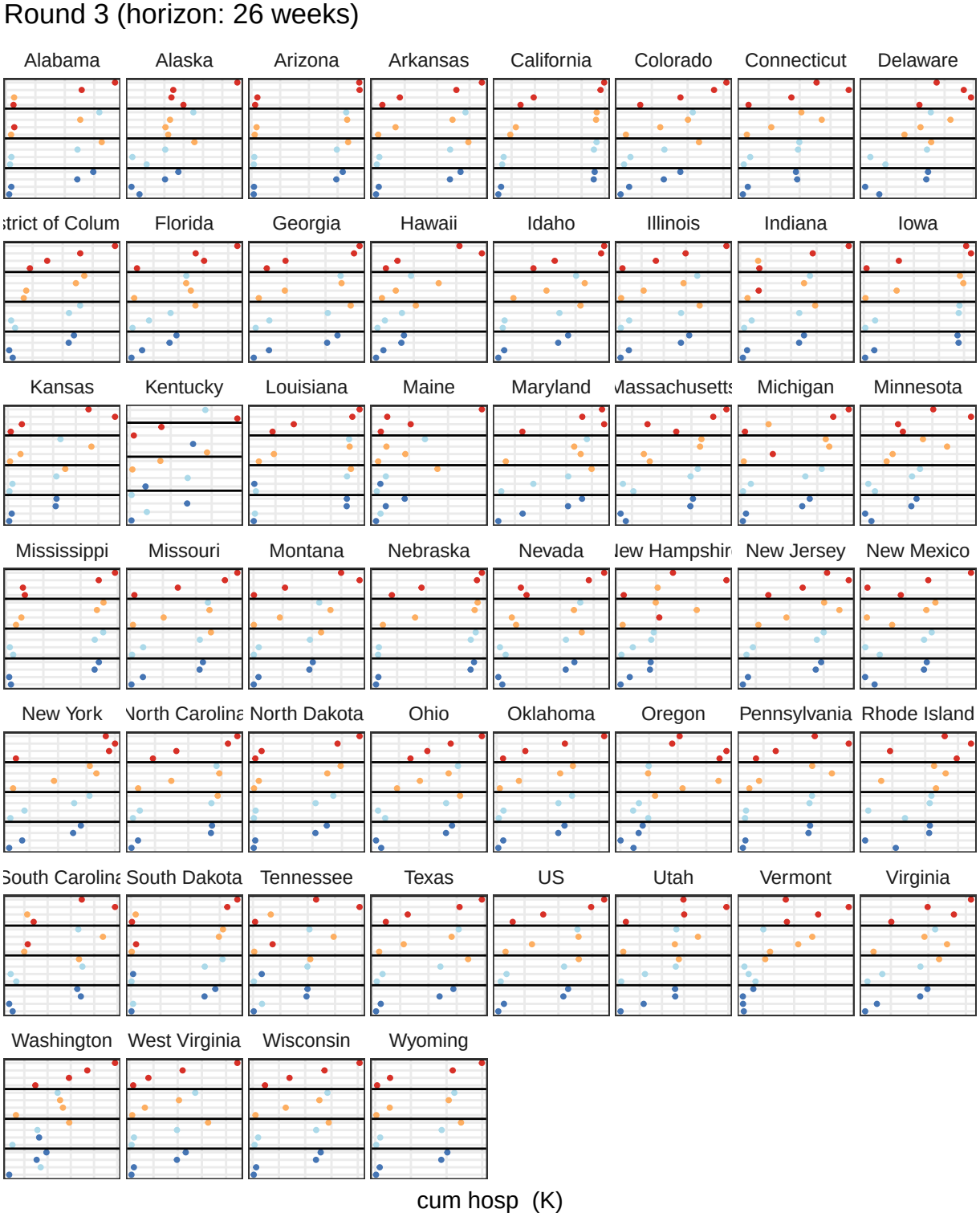


Fig. S9: COVID-19 Scenario Modeling Hub projections of cumulative hospitalizations for Round 3. Projections are collected from 4 models for four scenarios. Across locations (panels), projections are shown for each scenario (separated by horizontal black lines) from each model (individual points), points are colored based on the rank of that scenario for each model (blue is lowest projection, and red is highest projection).

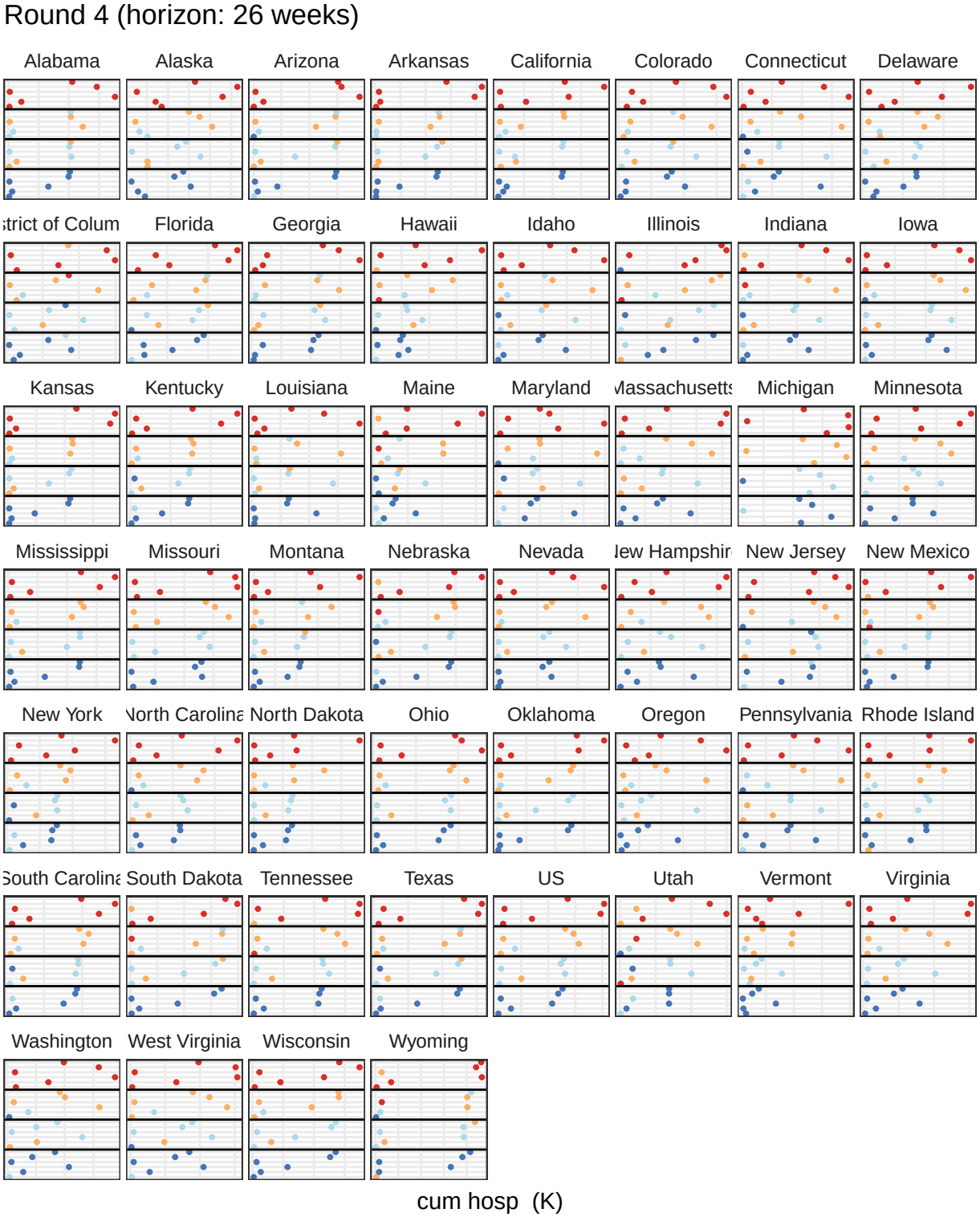


Fig. S10: COVID-19 Scenario Modeling Hub projections of cumulative hospitalizations for Round 4. Projections are collected from 6 models for four scenarios. Across locations (panels), projections are shown for each scenario (separated by horizontal black lines) from each model (individual points), points are colored based on the rank of that scenario for each model (blue is lowest projection, and red is highest projection).

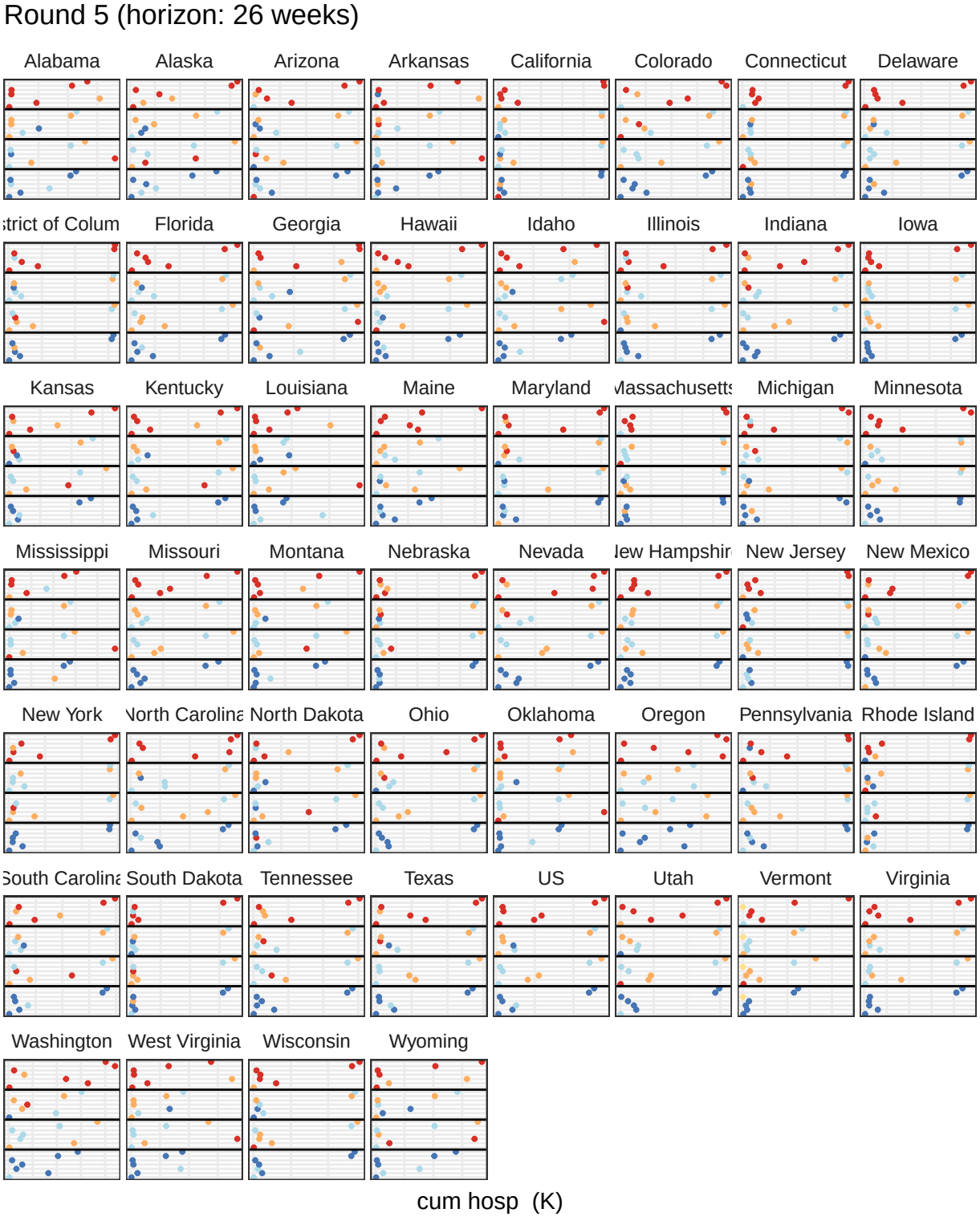


Fig. S11: COVID-19 Scenario Modeling Hub projections of cumulative hospitalizations for Round 5. Projections are collected from 7 models for four scenarios. Across locations (panels), projections are shown for each scenario (separated by horizontal black lines) from each model (individual points), points are colored based on the rank of that scenario for each model (blue is lowest projection, and red is highest projection).

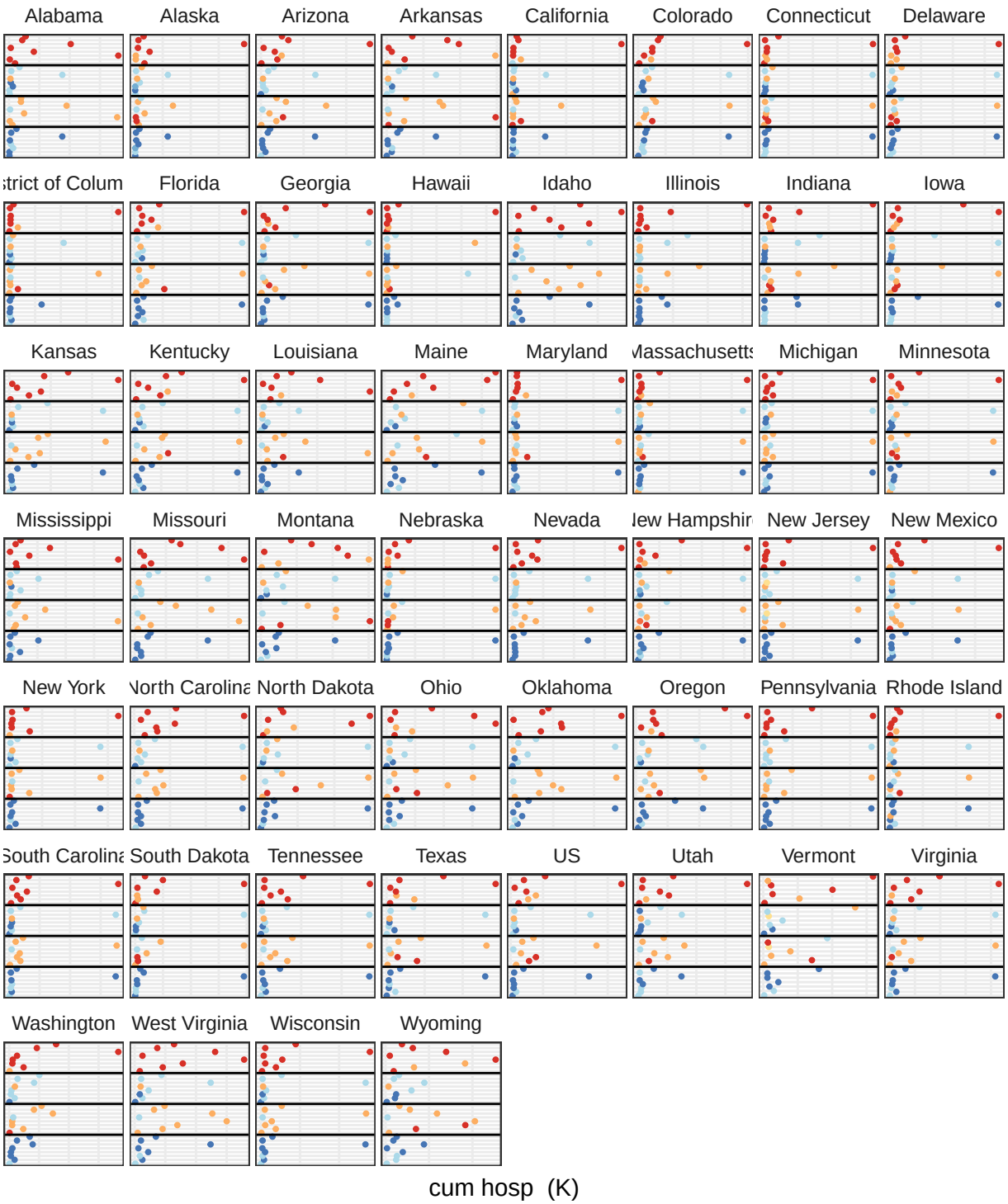


Fig. S12: COVID-19 Scenario Modeling Hub projections of cumulative hospitalizations for Round 6. Projections are collected from 8 models for four scenarios. Across locations (panels), projections are shown for each scenario (separated by horizontal black lines) from each model (individual points), points are colored based on the rank of that scenario for each model (blue is lowest projection, and red is highest projection).

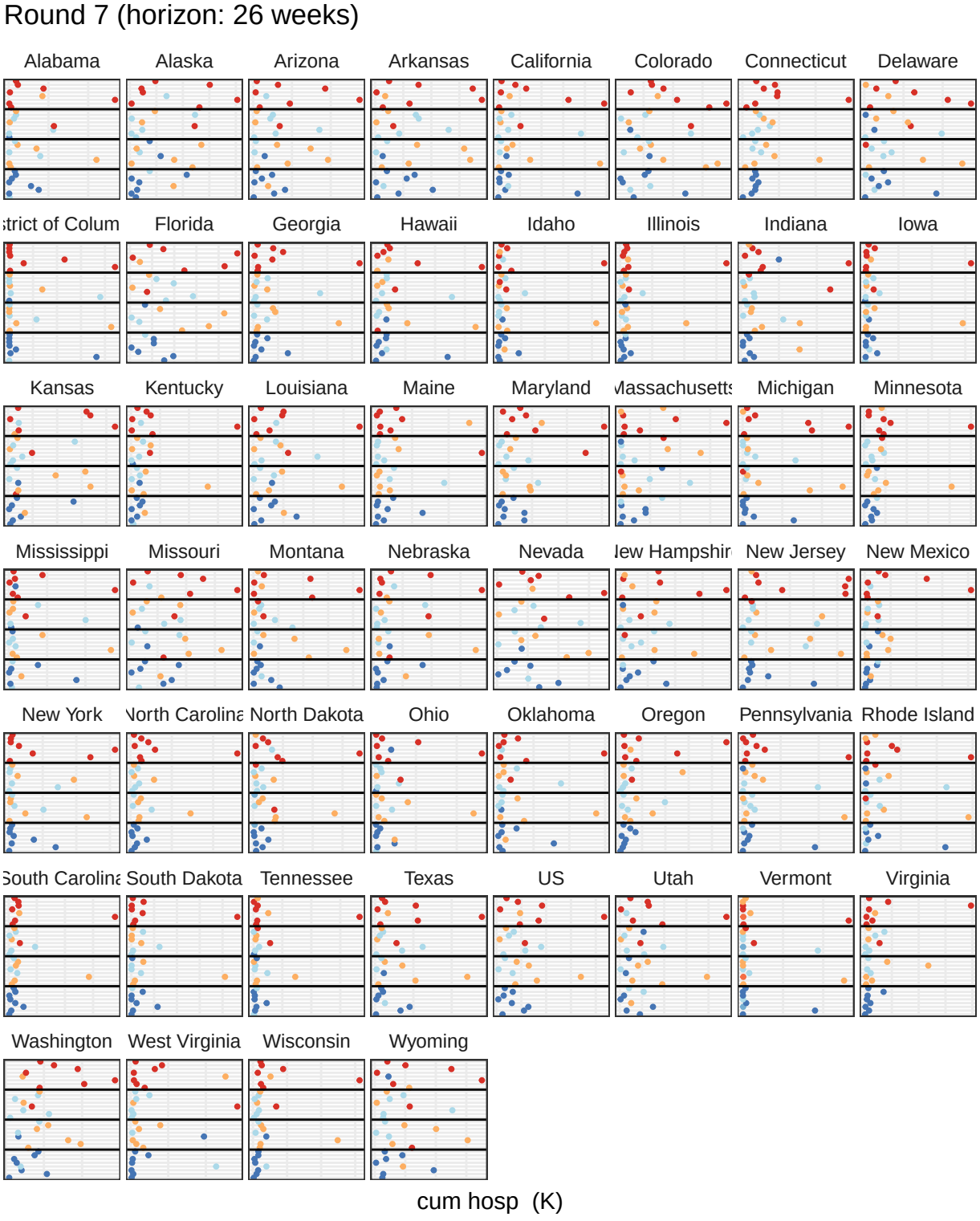
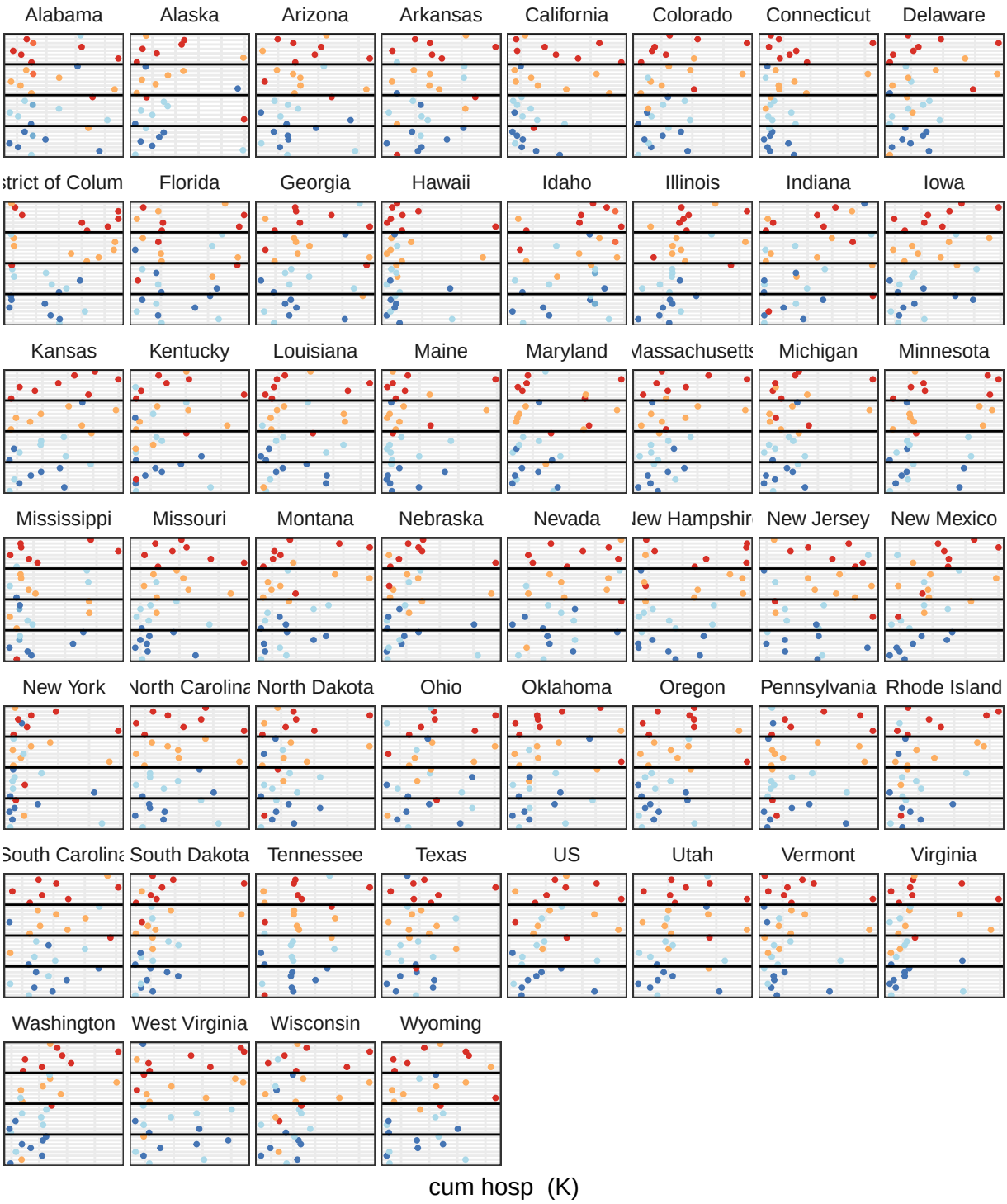


Fig. S13: COVID-19 Scenario Modeling Hub projections of cumulative hospitalizations for Round 7. Projections are collected from 8 models for four scenarios. Across locations (panels), projections are shown for each scenario (separated by horizontal black lines) from each model (individual points), points are colored based on the rank of that scenario for each model (blue is lowest projection, and red is highest projection).


Round 9 (horizon: 26 weeks)
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Missouri
Montana
Nebraska
Nevada
New Hampshir
New Jersey
New Mexico
New York
North Carolina
North Dakota
Ohio
Oklahoma
Oregon
Pennsylvania
Rhode Island
South Carolina
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US
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Virginia
Washington
West Virginia
Wisconsin
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Fig. S14: NULL

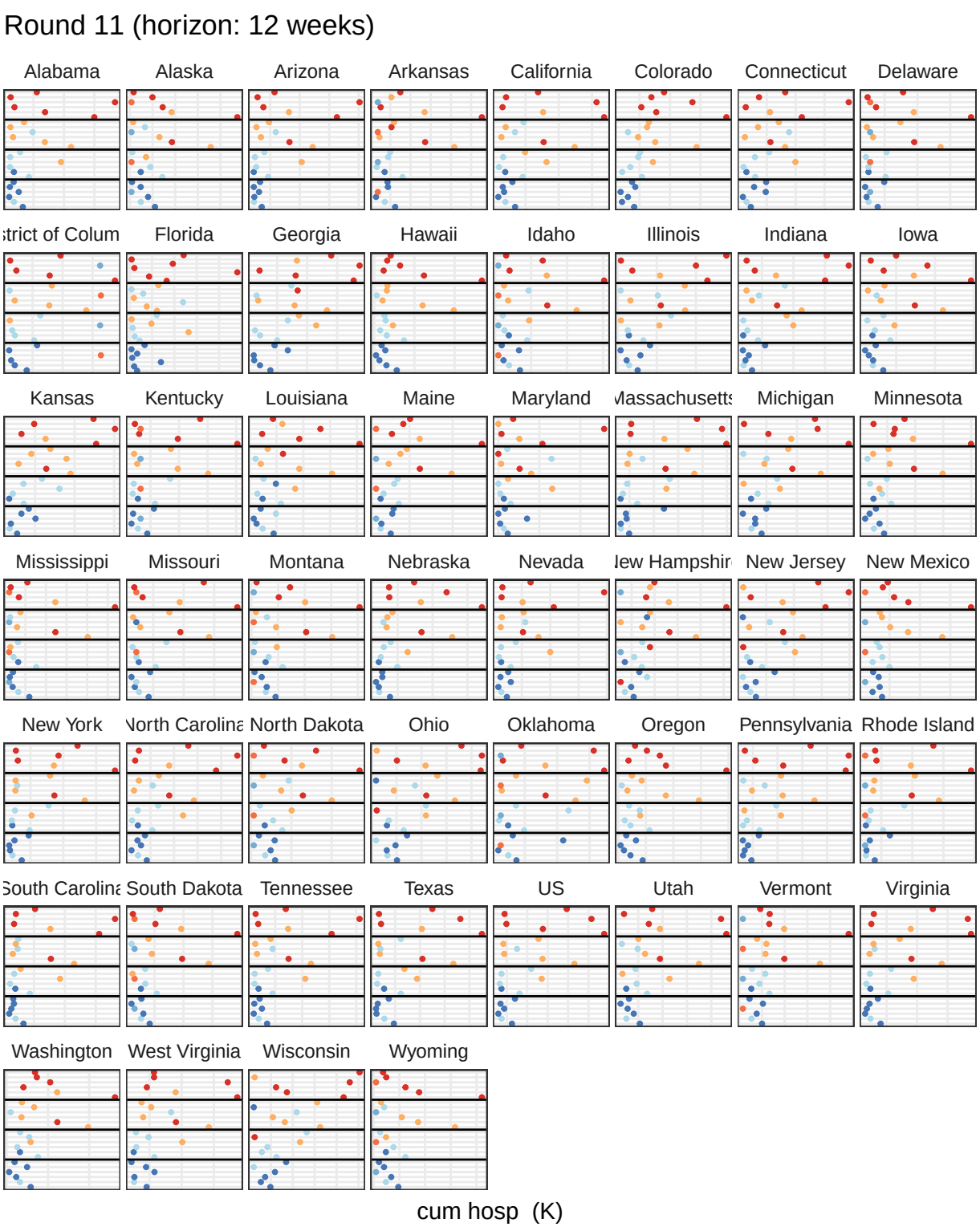
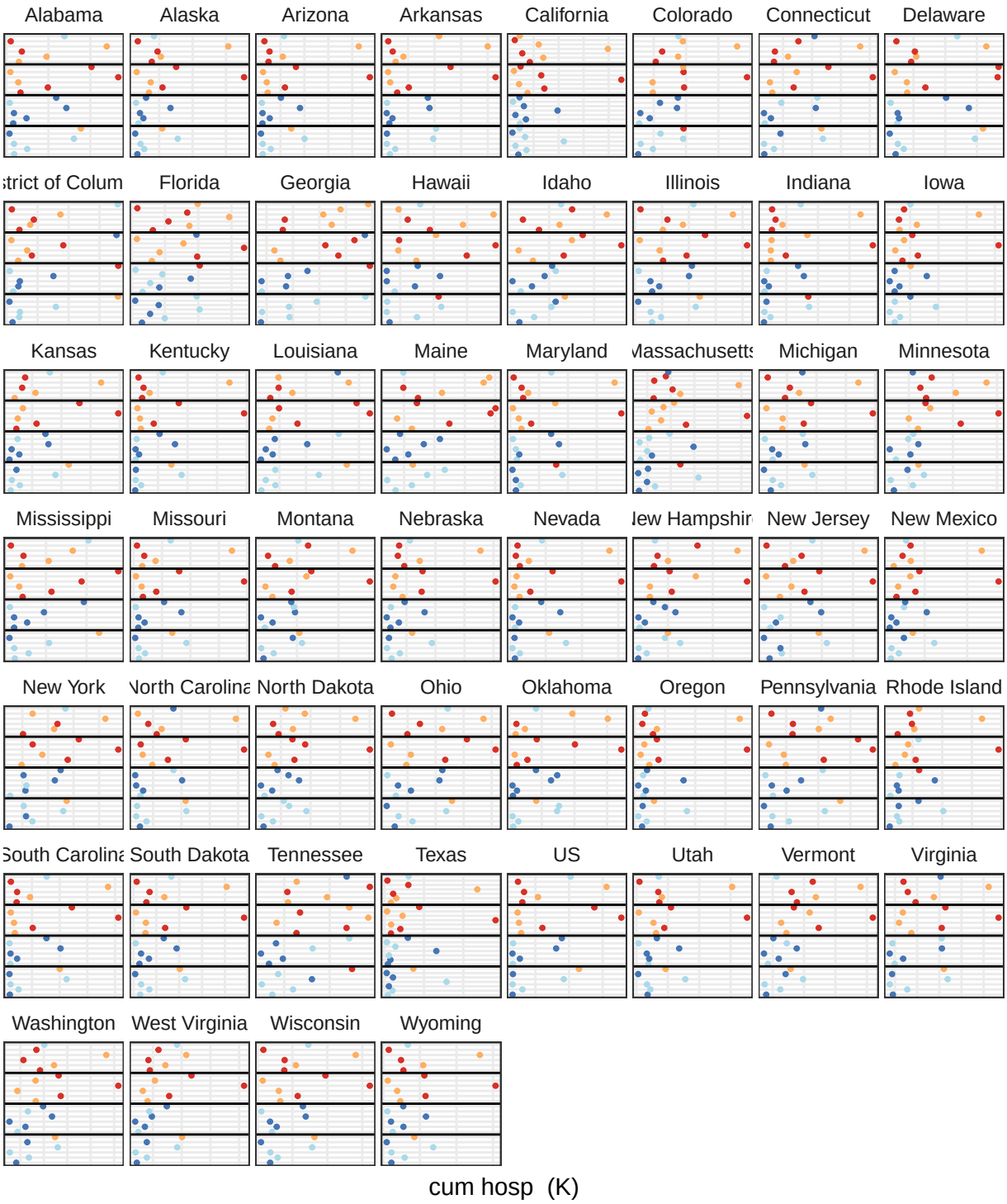


Fig. S15: COVID-19 Scenario Modeling Hub projections of cumulative hospitalizations for Round 9. Projections are collected from 8 models for four scenarios. Across locations (panels), projections are shown for each scenario (separated by horizontal black lines) from each model (individual points), points are colored based on the rank of that scenario for each model (blue is lowest projection, and red is highest projection).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Missouri
Montana
Nebraska
Nevada
New Hampshir
New Jersey
New Mexico
New York
North Carolina
North Dakota
Ohio
Oklahoma
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Pennsylvania
Rhode Island
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Utah
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West Virginia
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Fig. S16: NULL

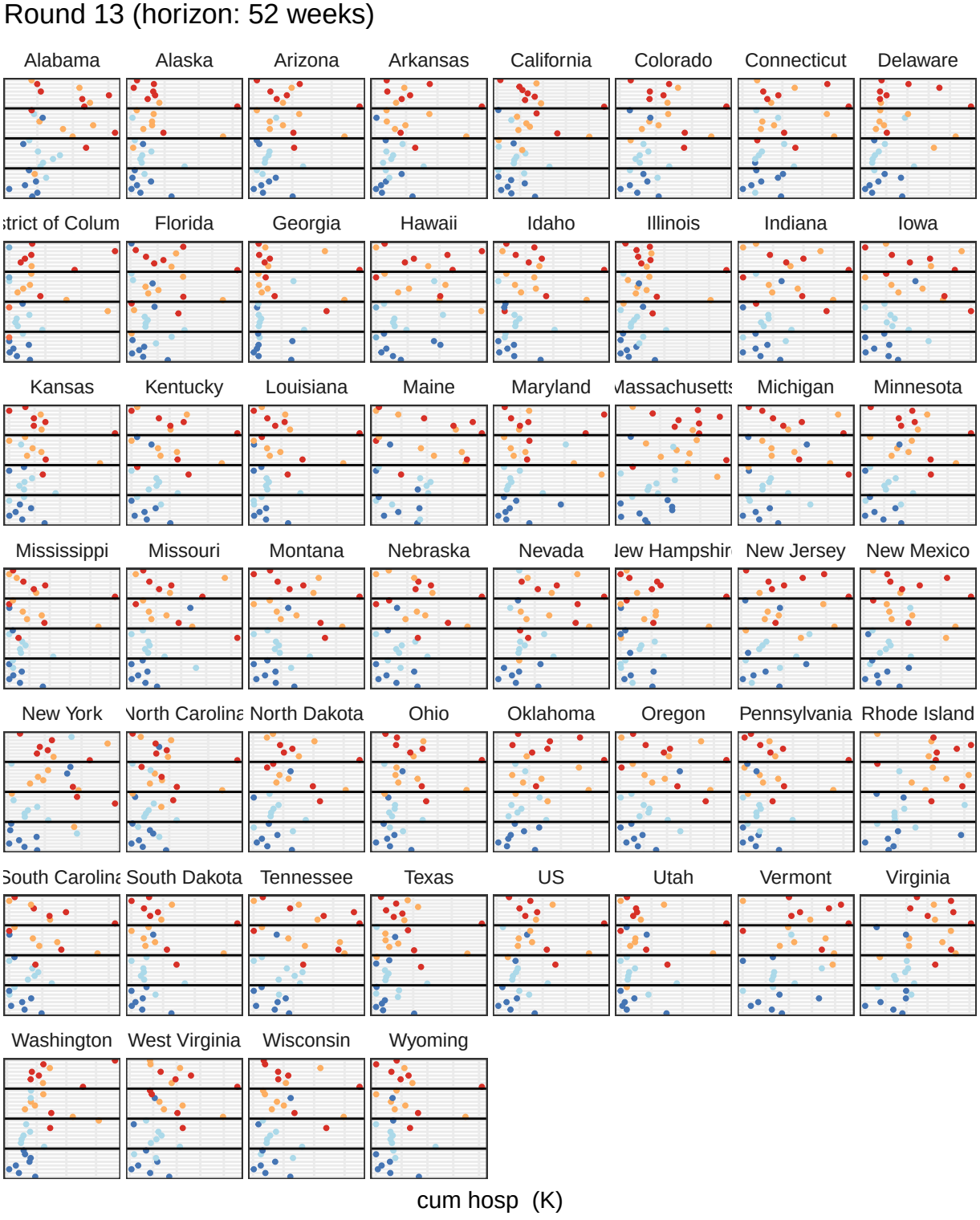


Fig. S17: COVID-19 Scenario Modeling Hub projections of cumulative hospitalizations for Round 11. Projections are collected from 6 models for four scenarios. Across locations (panels), projections are shown for each scenario (separated by horizontal black lines) from each model (individual points), points are colored based on the rank of that scenario for each model (blue is lowest projection, and red is highest projection).

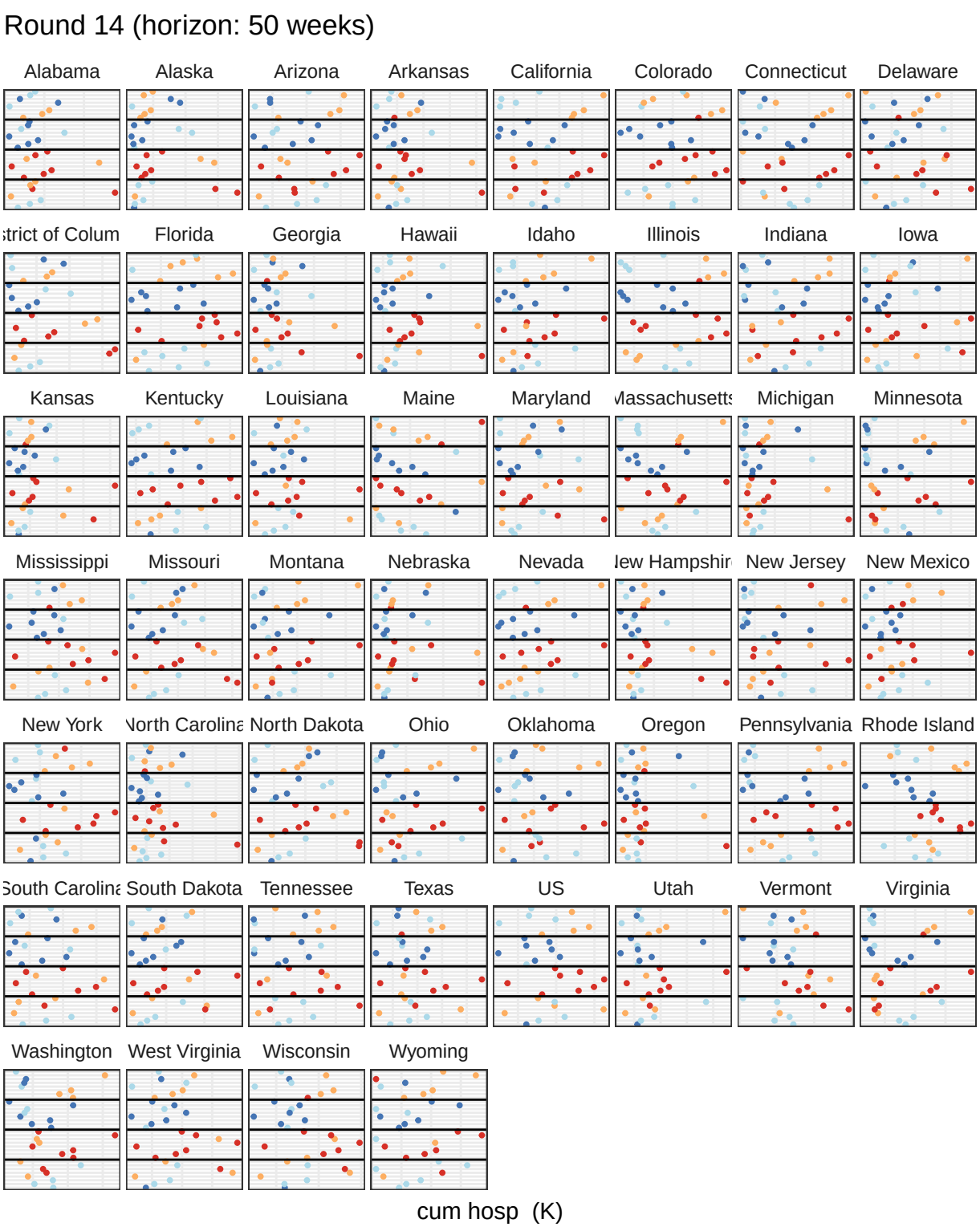


Fig. S18: COVID-19 Scenario Modeling Hub projections of cumulative hospitalizations for Round 12. Projections are collected from 6 models for four scenarios. Across locations (panels), projections are shown for each scenario (separated by horizontal black lines) from each model (individual points), points are colored based on the rank of that scenario for each model (blue is lowest projection, and red is highest projection).

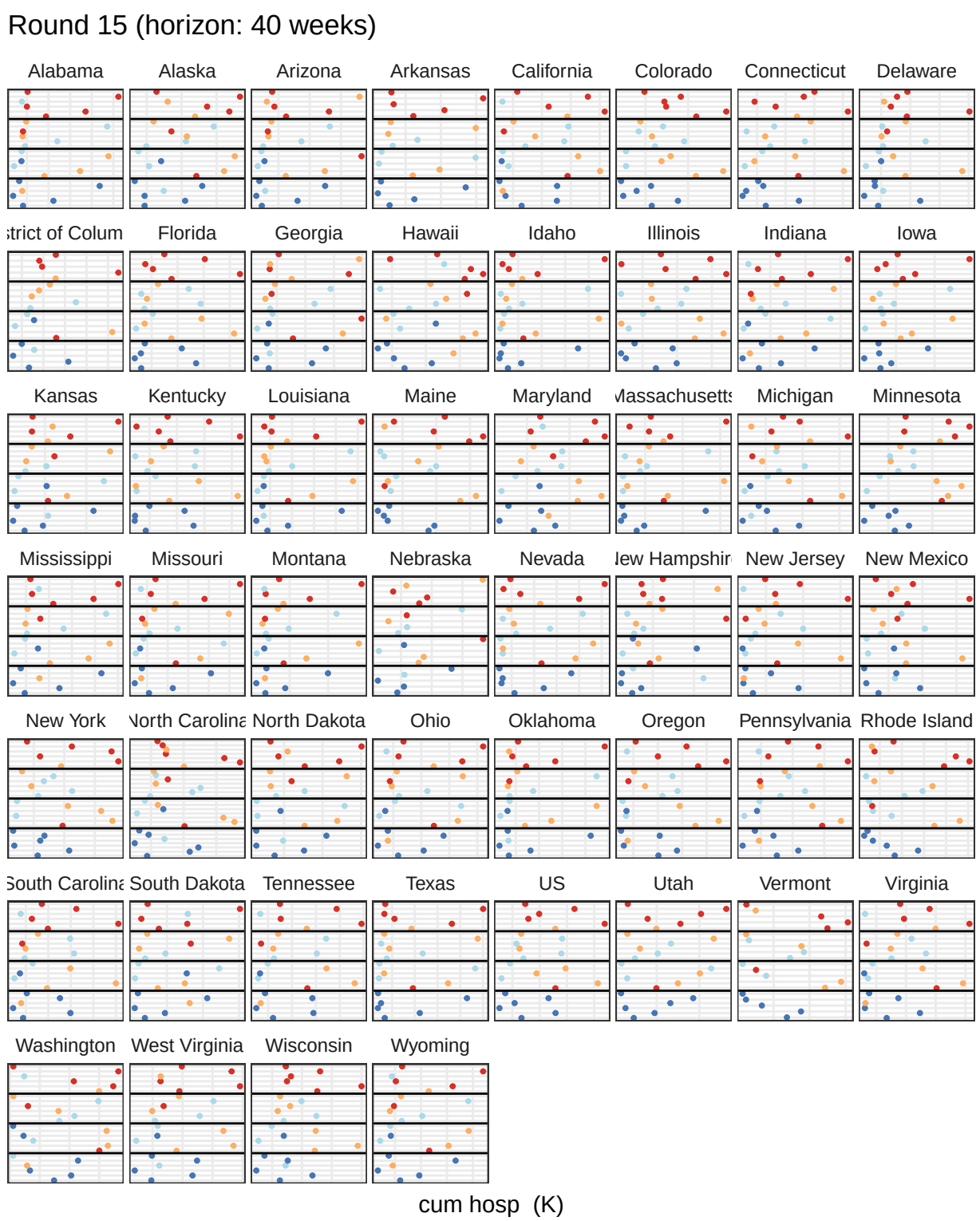


Fig. S19: COVID-19 Scenario Modeling Hub projections of cumulative hospitalizations for Round 13. Projections are collected from 8 models for four scenarios. Across locations (panels), projections are shown for each scenario (separated by horizontal black lines) from each model (individual points), points are colored based on the rank of that scenario for each model (blue is lowest projection, and red is highest projection).

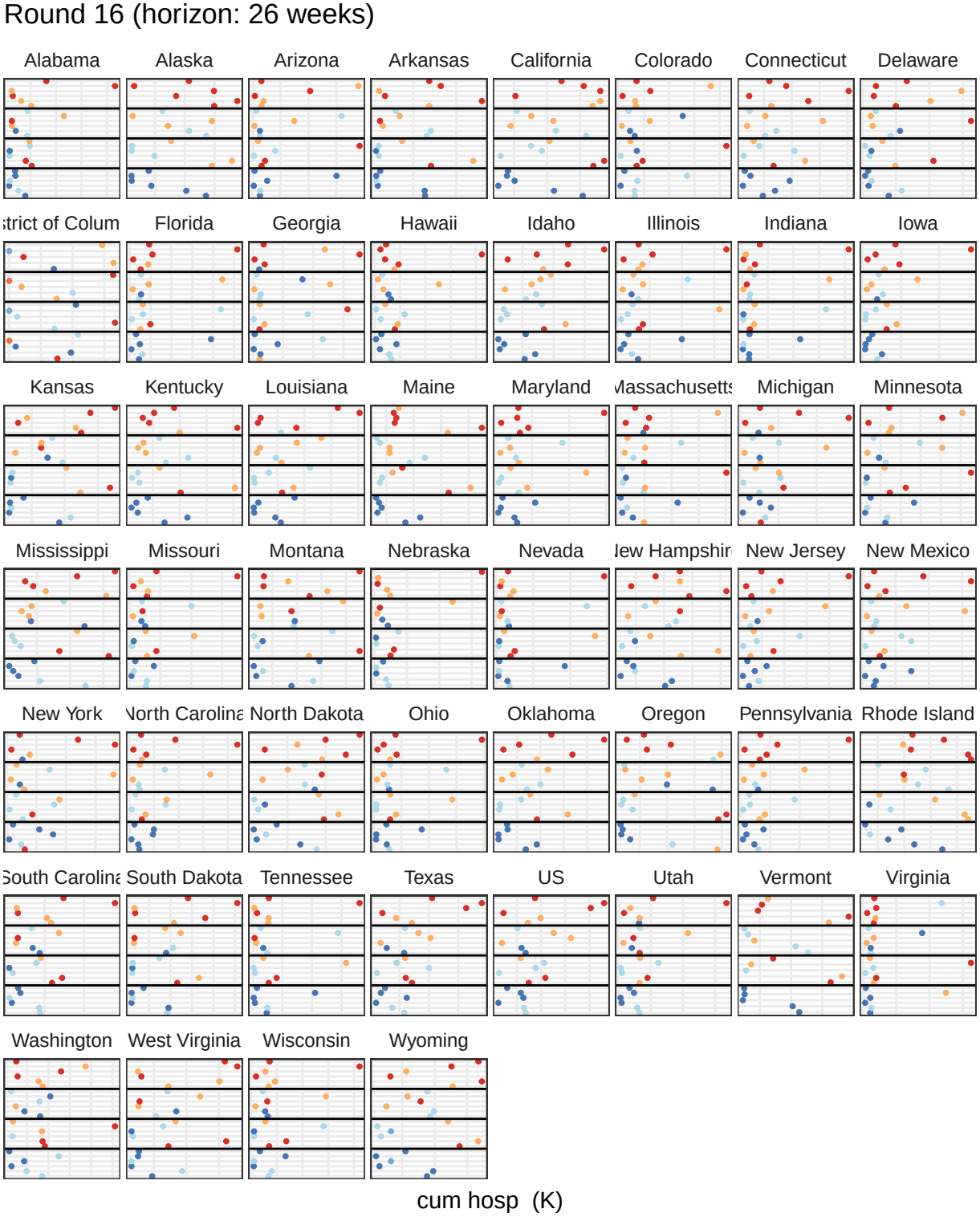


Fig. S20: COVID-19 Scenario Modeling Hub projections of cumulative hospitalizations for Round 14. Projections are collected from 8 models for four scenarios. Across locations (panels), projections are shown for each scenario (separated by horizontal black lines) from each model (individual points), points are colored based on the rank of that scenario for each model (blue is lowest projection, and red is highest projection).

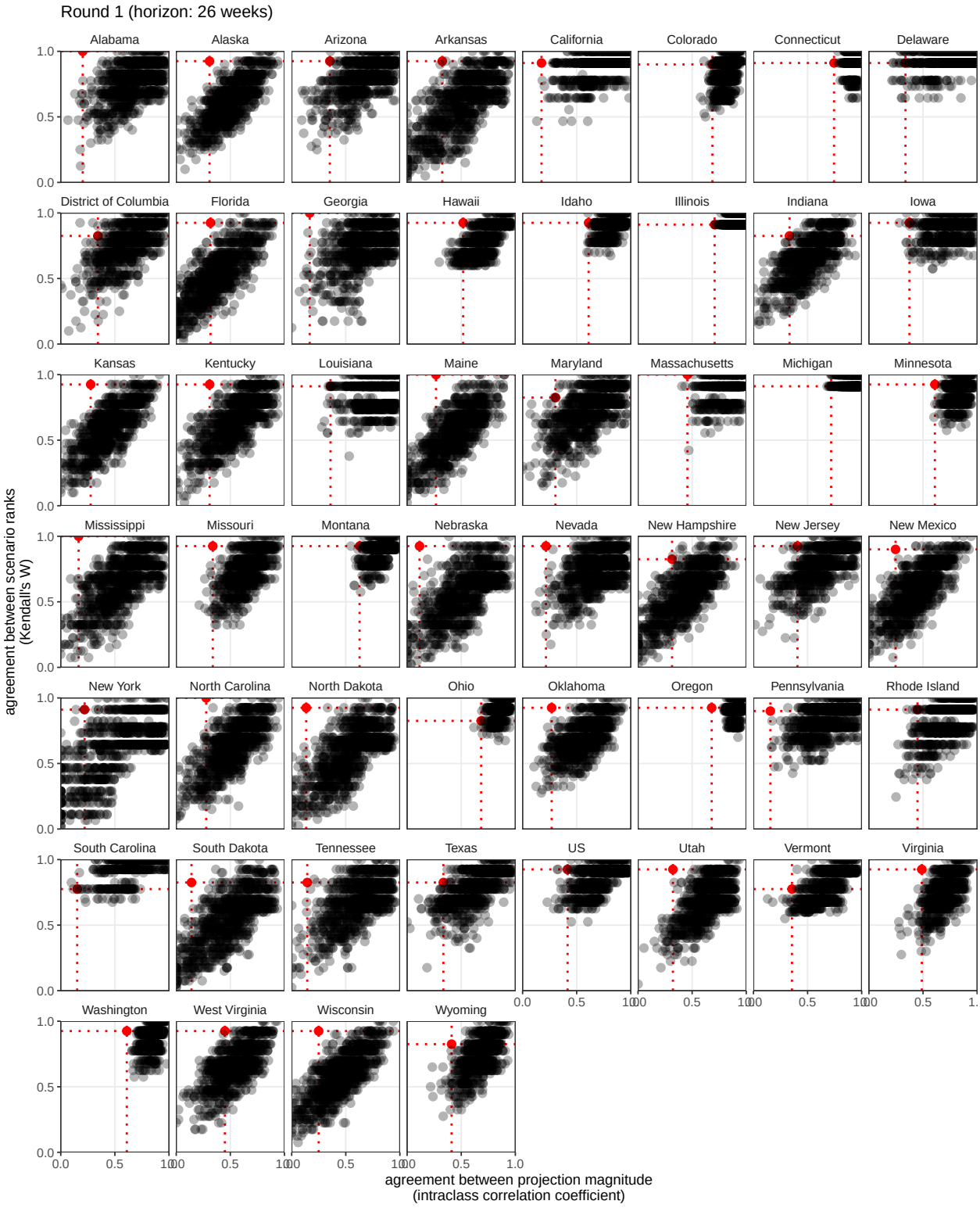


Fig. S21: Agreement for 1,000 null model simulations and the corresponding SMH projections of cumulative hospitalizations for Round 1. Agreement is calculated for projection magnitude (as measured by intraclass correlation coefficient) and scenario ranking (as measured by Kendall's W). Across locations (panels), null model results are shown with black points and SMH results are shown with a red point.

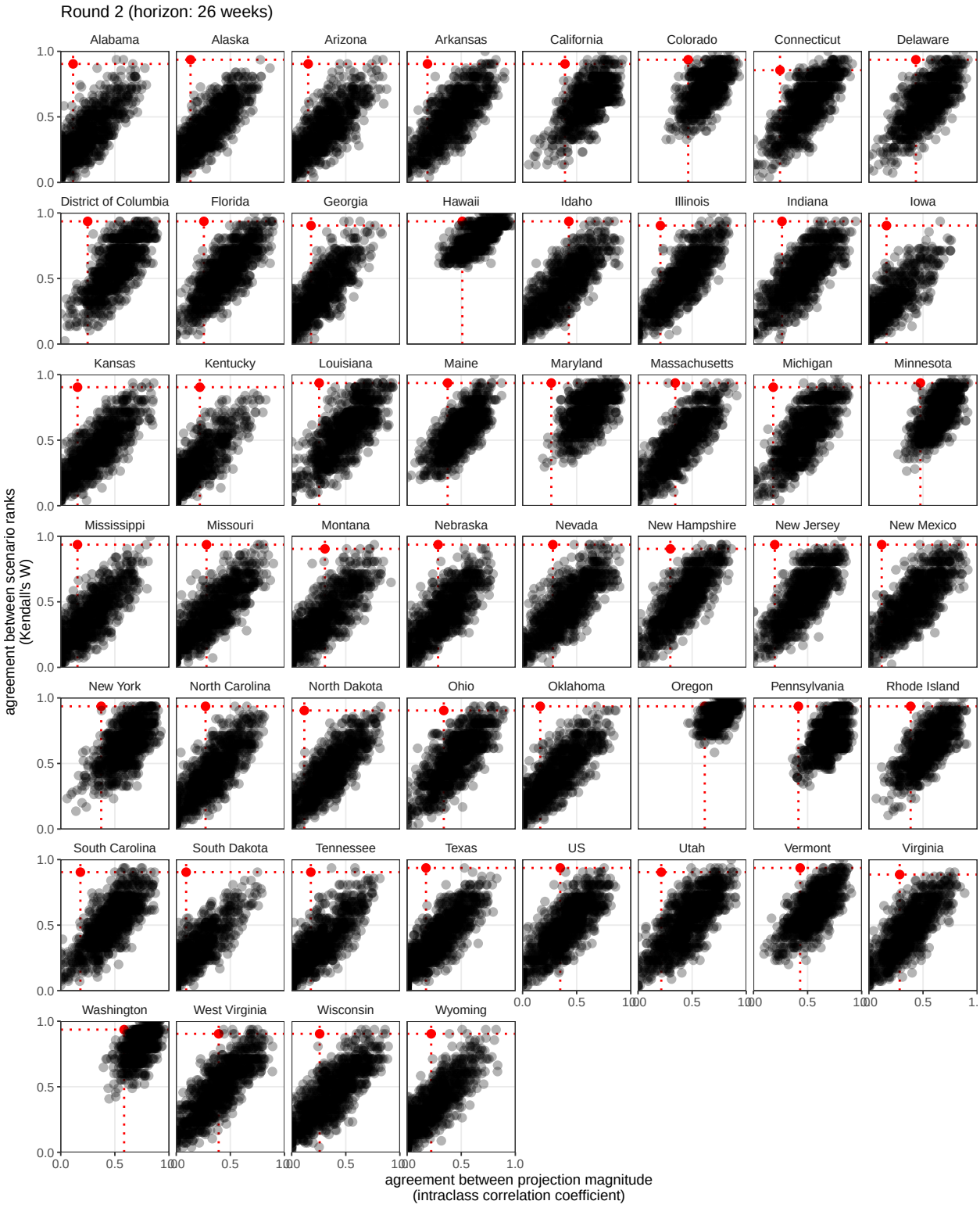


Fig. S22: Agreement for 1,000 null model simulations and the corresponding SMH projections of cumulative hospitalizations for Round 2. Agreement is calculated for projection magnitude (as measured by intraclass correlation coefficient) and scenario ranking (as measured by Kendall's W). Across locations (panels), null model results are shown with black points and SMH results are shown with a red point.

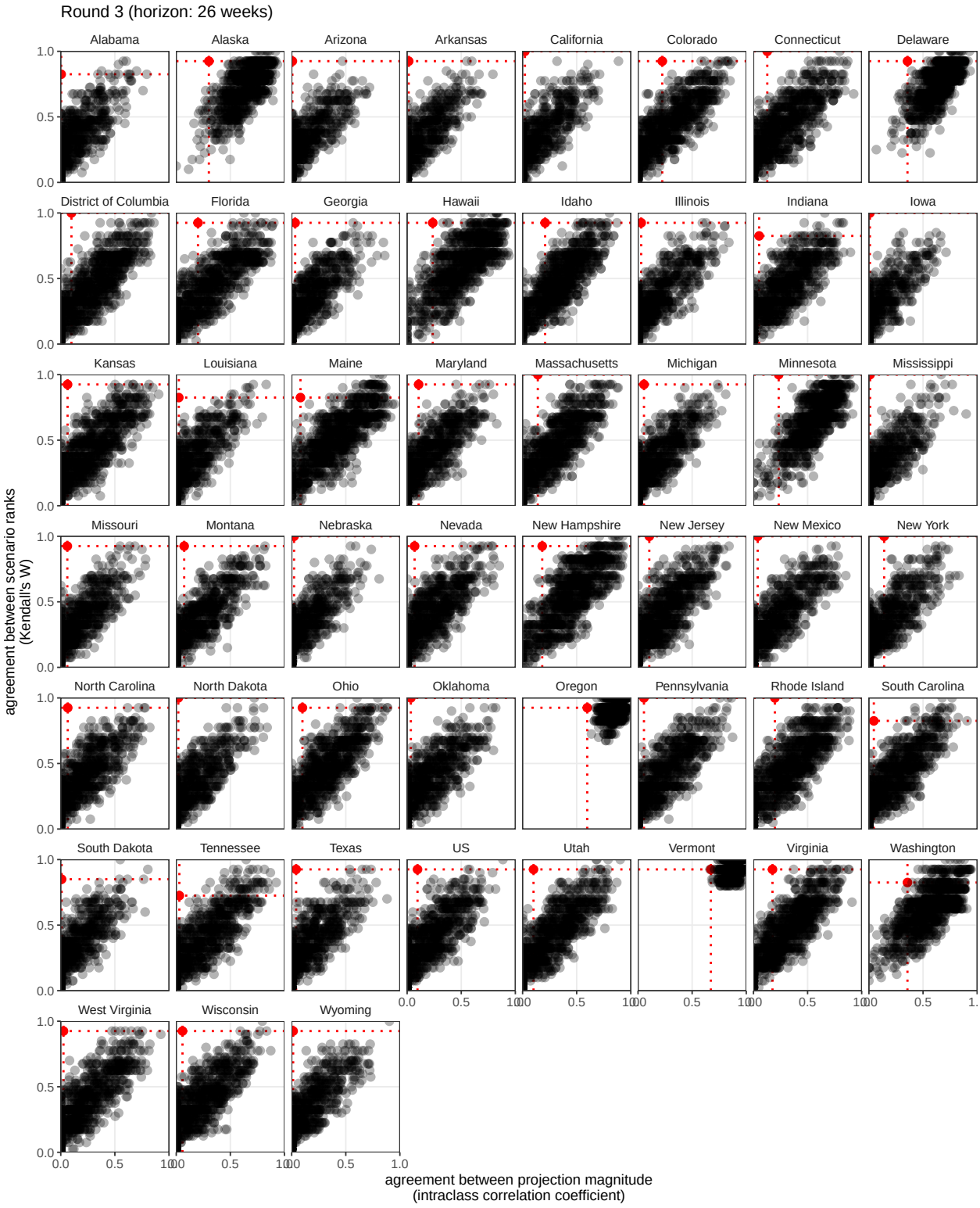


Fig. S23: Agreement for 1,000 null model simulations and the corresponding SMH projections of cumulative hospitalizations for Round 3. Agreement is calculated for projection magnitude (as measured by intraclass correlation coefficient) and scenario ranking (as measured by Kendall's W). Across locations (panels), null model results are shown with black points and SMH results are shown with a red point.

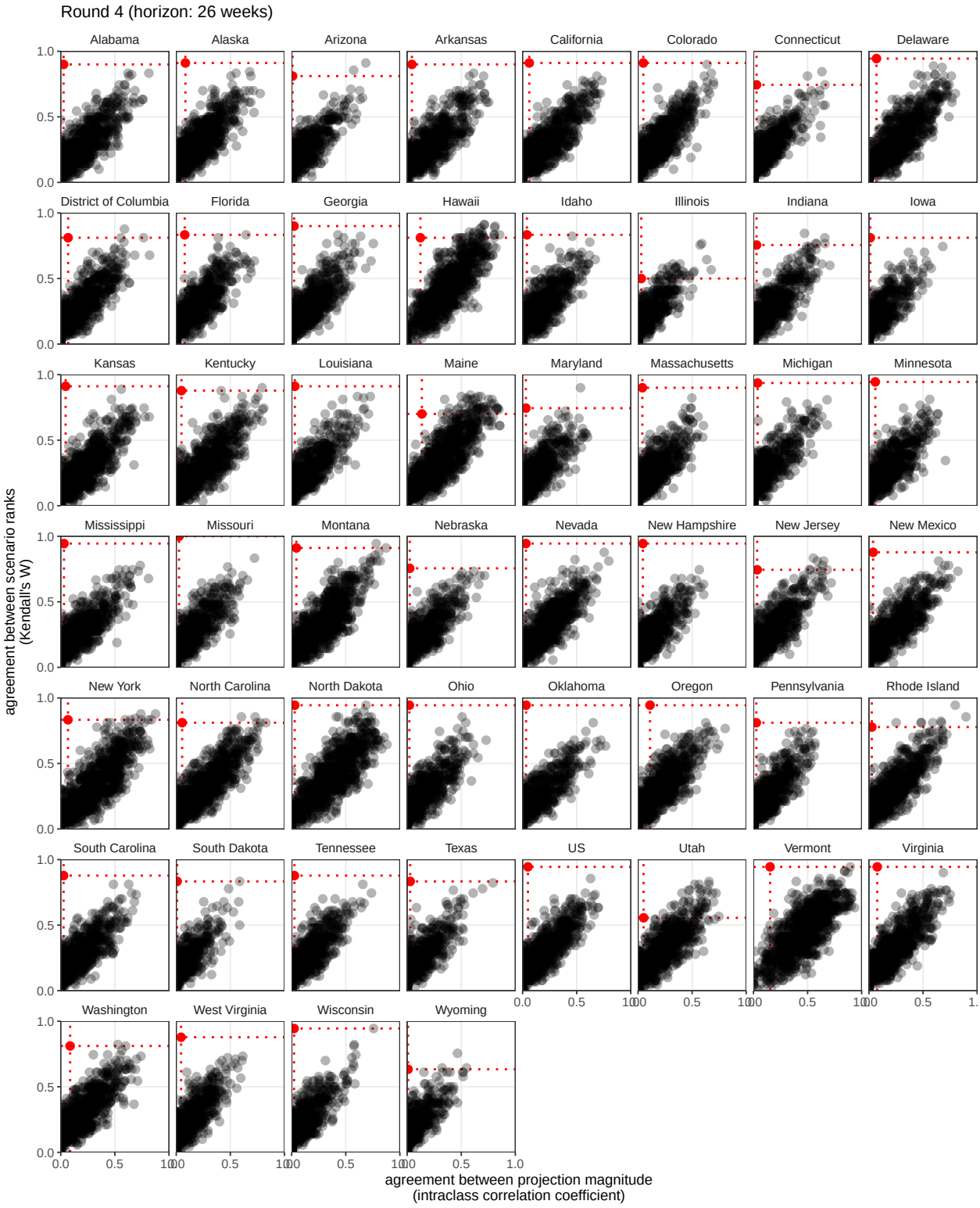


Fig. S24: Agreement for 1,000 null model simulations and the corresponding SMH projections of cumulative hospitalizations for Round 4. Agreement is calculated for projection magnitude (as measured by intraclass correlation coefficient) and scenario ranking (as measured by Kendall's W). Across locations (panels), null model results are shown with black points and SMH results are shown with a red point.

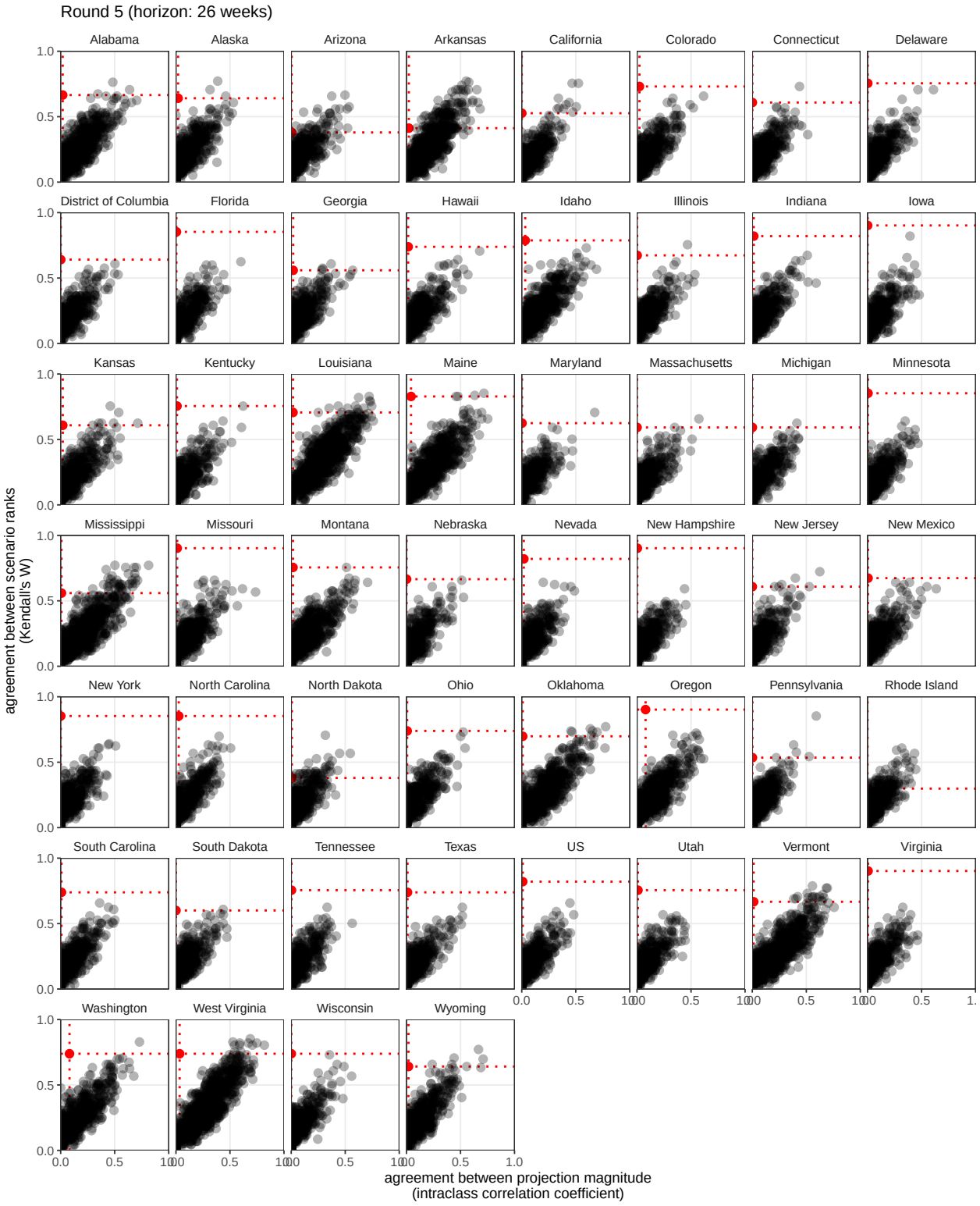


Fig. S25: Agreement for 1,000 null model simulations and the corresponding SMH projections of cumulative hospitalizations for Round 5. Agreement is calculated for projection magnitude (as measured by intraclass correlation coefficient) and scenario ranking (as measured by Kendall's W). Across locations (panels), null model results are shown with black points and SMH results are shown with a red point.

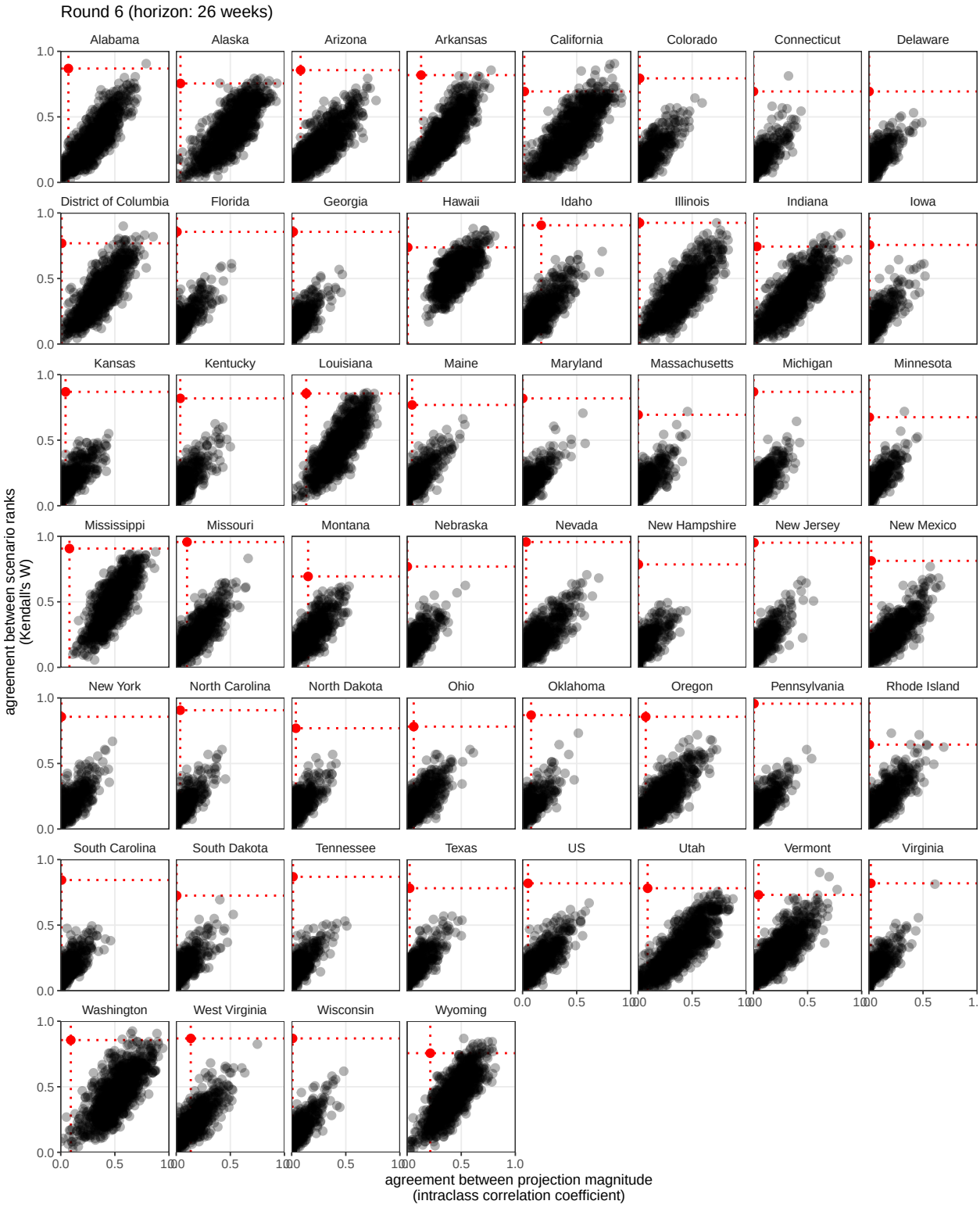


Fig. S26: Agreement for 1,000 null model simulations and the corresponding SMH projections of cumulative hospitalizations for Round 6. Agreement is calculated for projection magnitude (as measured by intraclass correlation coefficient) and scenario ranking (as measured by Kendall's W). Across locations (panels), null model results are shown with black points and SMH results are shown with a red point.

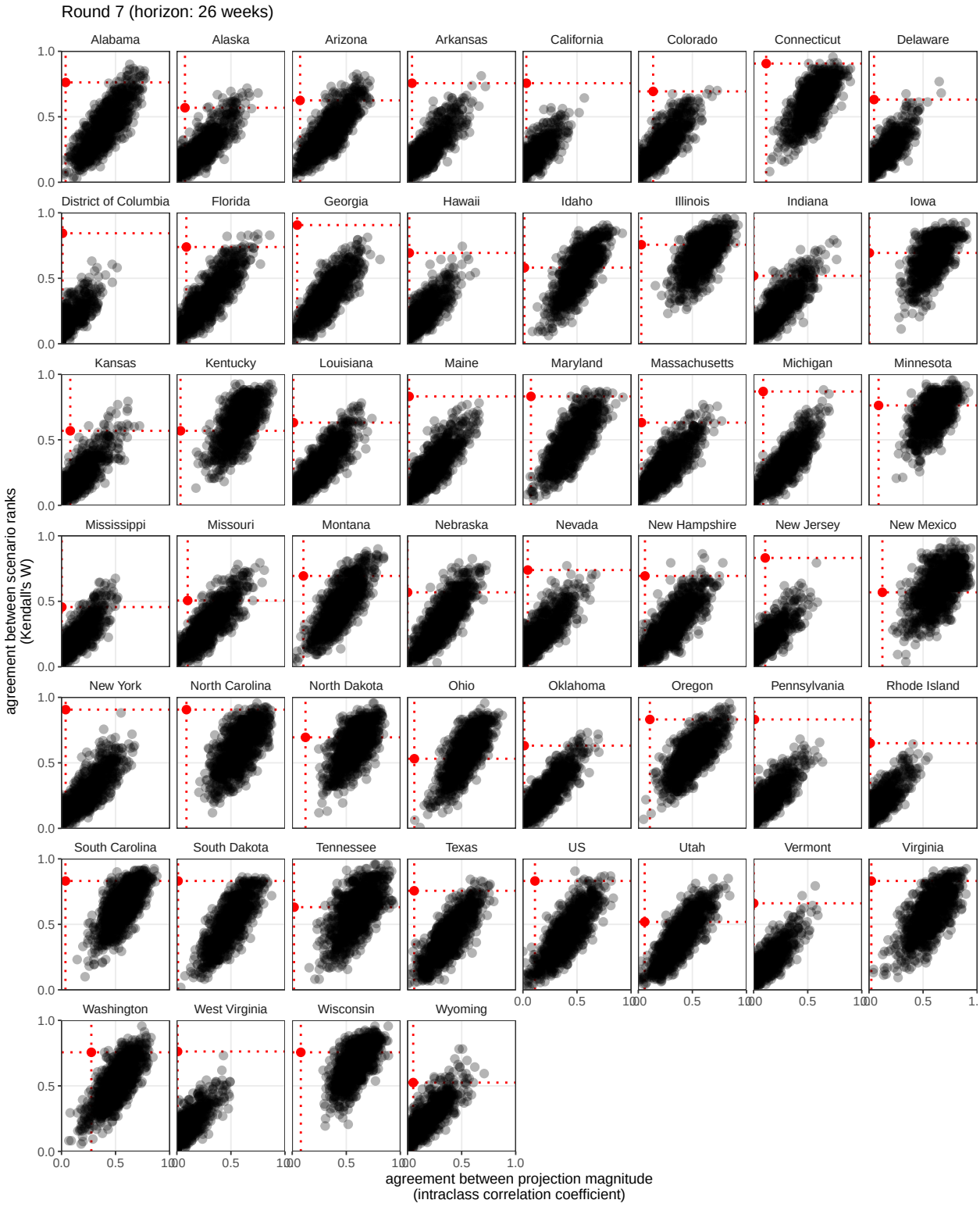
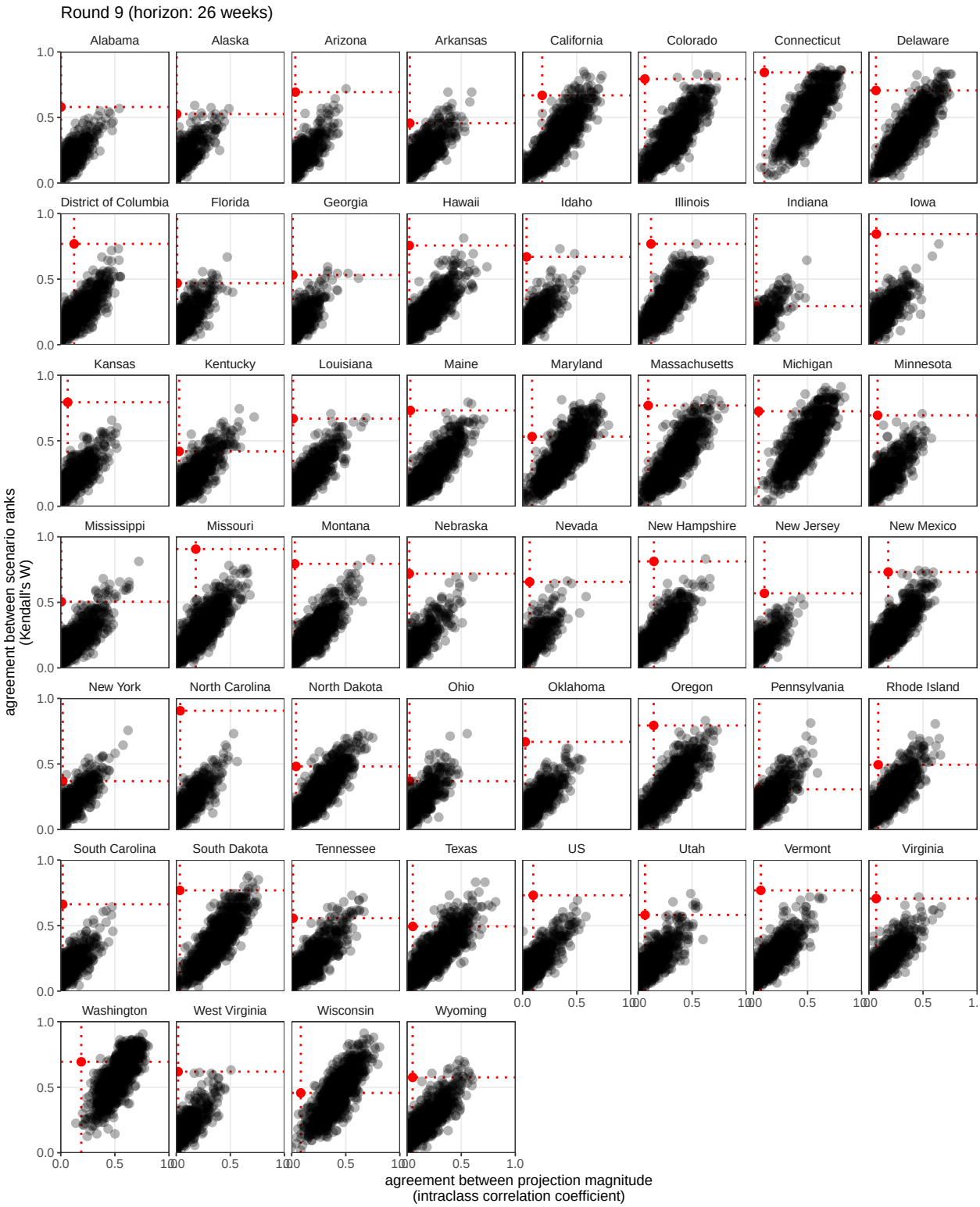


Fig. S27: Agreement for 1,000 null model simulations and the corresponding SMH projections of cumulative hospitalizations for Round 7. Agreement is calculated for projection magnitude (as measured by intraclass correlation coefficient) and scenario ranking (as measured by Kendall's W). Across locations (panels), null model results are shown with black points and SMH results are shown with a red point.


Round 9 (horizon: 26 weeks)
Alabama
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Delaware
District of Columbia
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Hawaii
Idaho
Illinois
Indiana
Iowa
Kansas
Kentucky
Louisiana
Maine
Maryland
Massachusetts
Michigan
Minnesota
Mississippi
Missouri
Montana
Nebraska
Nevada
New Hampshire
New Jersey
New Mexico
New York
North Carolina
North Dakota
Ohio
Oklahoma
Oregon
Pennsylvania
Rhode Island
South Carolina
South Dakota
Tennessee
Texas
US
Utah
Vermont
Virginia
Washington
West Virginia
Wisconsin
Wyoming
0.0
0.5
1.0
agreement between scenario ranks
(Kendall's W)
agreement between projection magnitude
(intraclass correlation coefficient)

Fig. S28: NULL

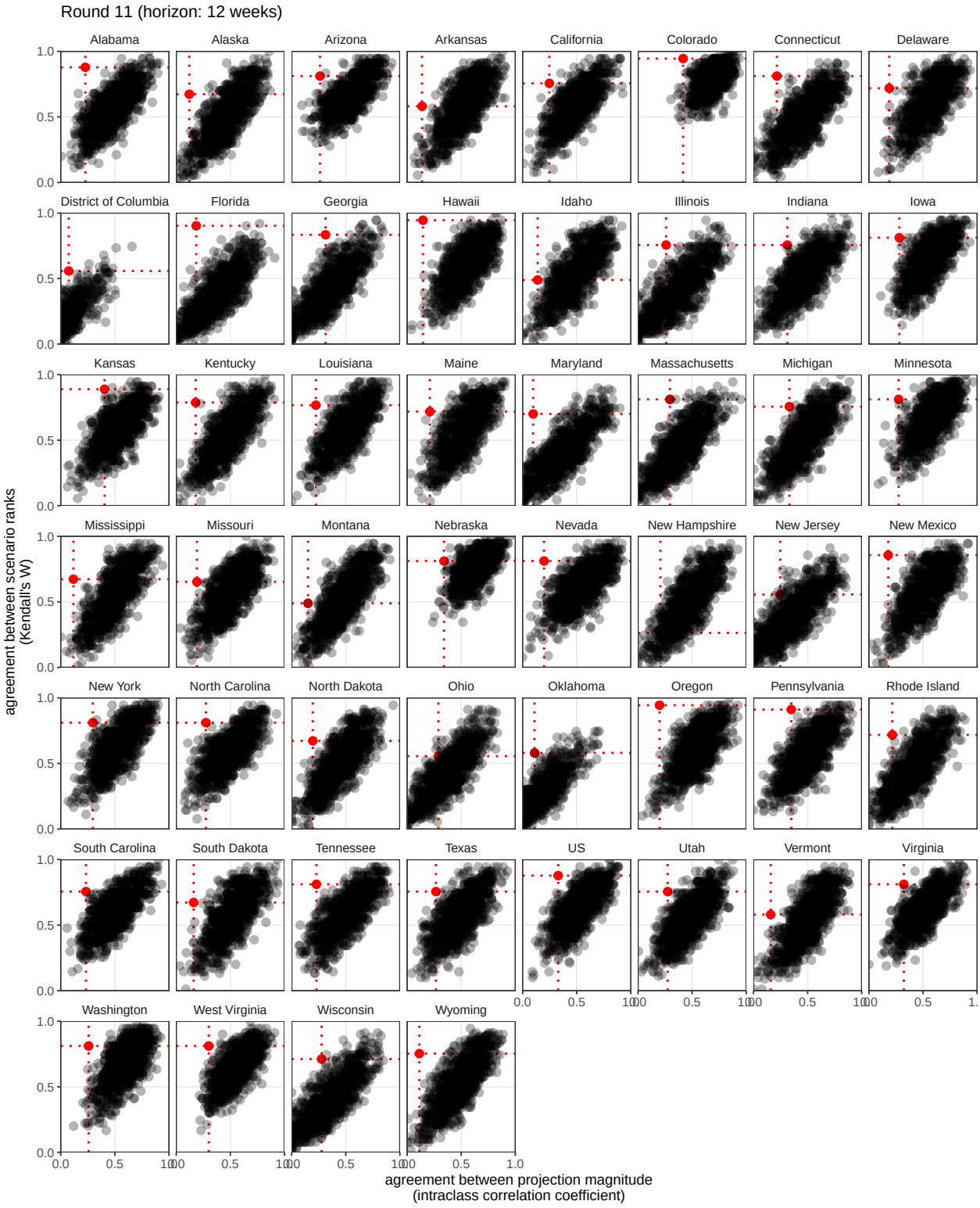
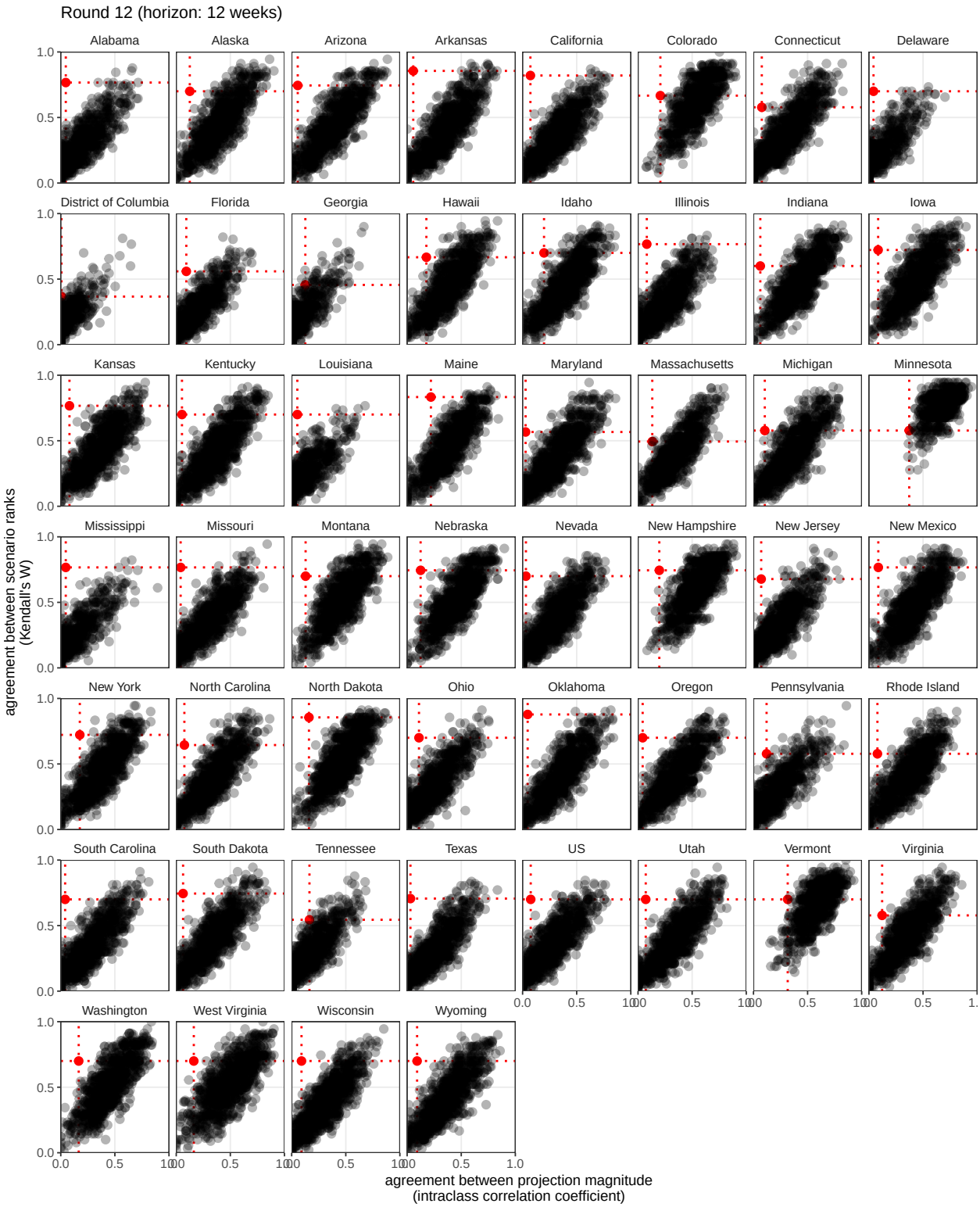


Fig. S29: Agreement for 1,000 null model simulations and the corresponding SMH projections of cumulative hospitalizations for Round 9. Agreement is calculated for projection magnitude (as measured by intraclass correlation coefficient) and scenario ranking (as measured by Kendall's W). Across locations (panels), null model results are shown with black points and SMH results are shown with a red point.


Round 12 (horizon: 12 weeks)
Alabama
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Arizona
Arkansas
California
Colorado
Connecticut
Delaware
District of Columbia
Florida
Georgia
Hawaii
Idaho
Illinois
Indiana
Iowa
Kansas
Kentucky
Louisiana
Maine
Maryland
Massachusetts
Michigan
Minnesota
Mississippi
Missouri
Montana
Nebraska
Nevada
New Hampshire
New Jersey
New Mexico
New York
North Carolina
North Dakota
Ohio
Oklahoma
Oregon
Pennsylvania
Rhode Island
South Carolina
South Dakota
Tennessee
Texas
US
Utah
Vermont
Virginia
Washington
West Virginia
Wisconsin
Wyoming
agreement between scenario ranks
(Kendall's W)
agreement between projection magnitude
(intraclass correlation coefficient)
0.0
0.5
1.0

Fig. S30: NULL

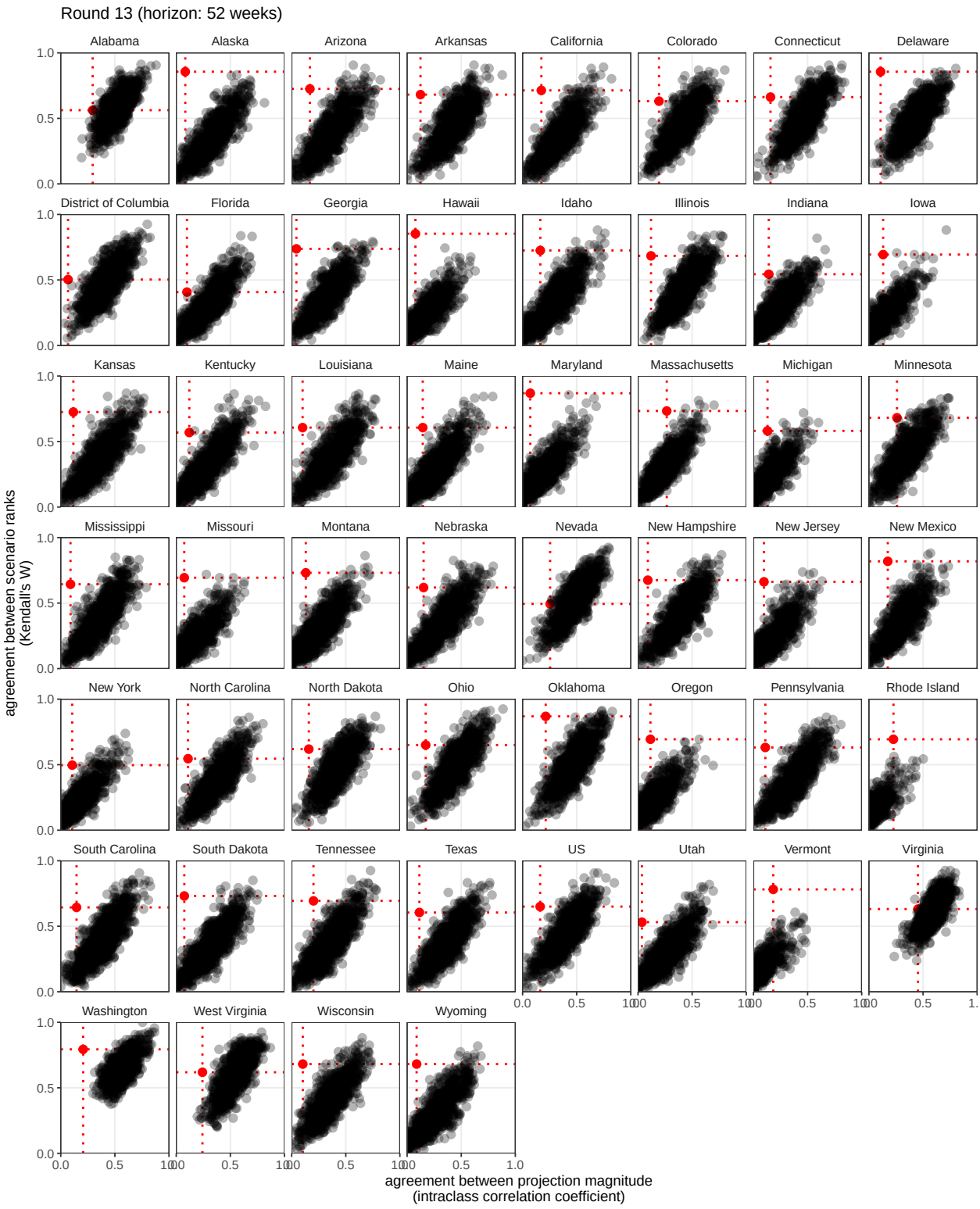

Fig. S31: Agreement for 1,000 null model simulations and the corresponding SMH projections of cumulative hospitalizations for Round 11. Agreement is calculated for projection magnitude (as measured by intraclass correlation coefficient) and scenario ranking (as measured by Kendall's W). Across locations (panels), null model results are shown with black points and SMH results are shown with a red point.

Fig. S32: Agreement for 1,000 null model simulations and the corresponding SMH projections of cumulative hospitalizations for Round 12. Agreement is calculated for projection magnitude (as measured by intraclass correlation coefficient) and scenario ranking (as measured by Kendall's W). Across locations (panels), null model results are shown with black points and SMH results are shown with a red point.

Fig. S33: Agreement for 1,000 null model simulations and the corresponding SMH projections of cumulative hospitalizations for Round 13. Agreement is calculated for projection magnitude (as measured by intraclass correlation coefficient) and scenario ranking (as measured by Kendall's W). Across locations (panels), null model results are shown with black points and SMH results are shown with a red point.

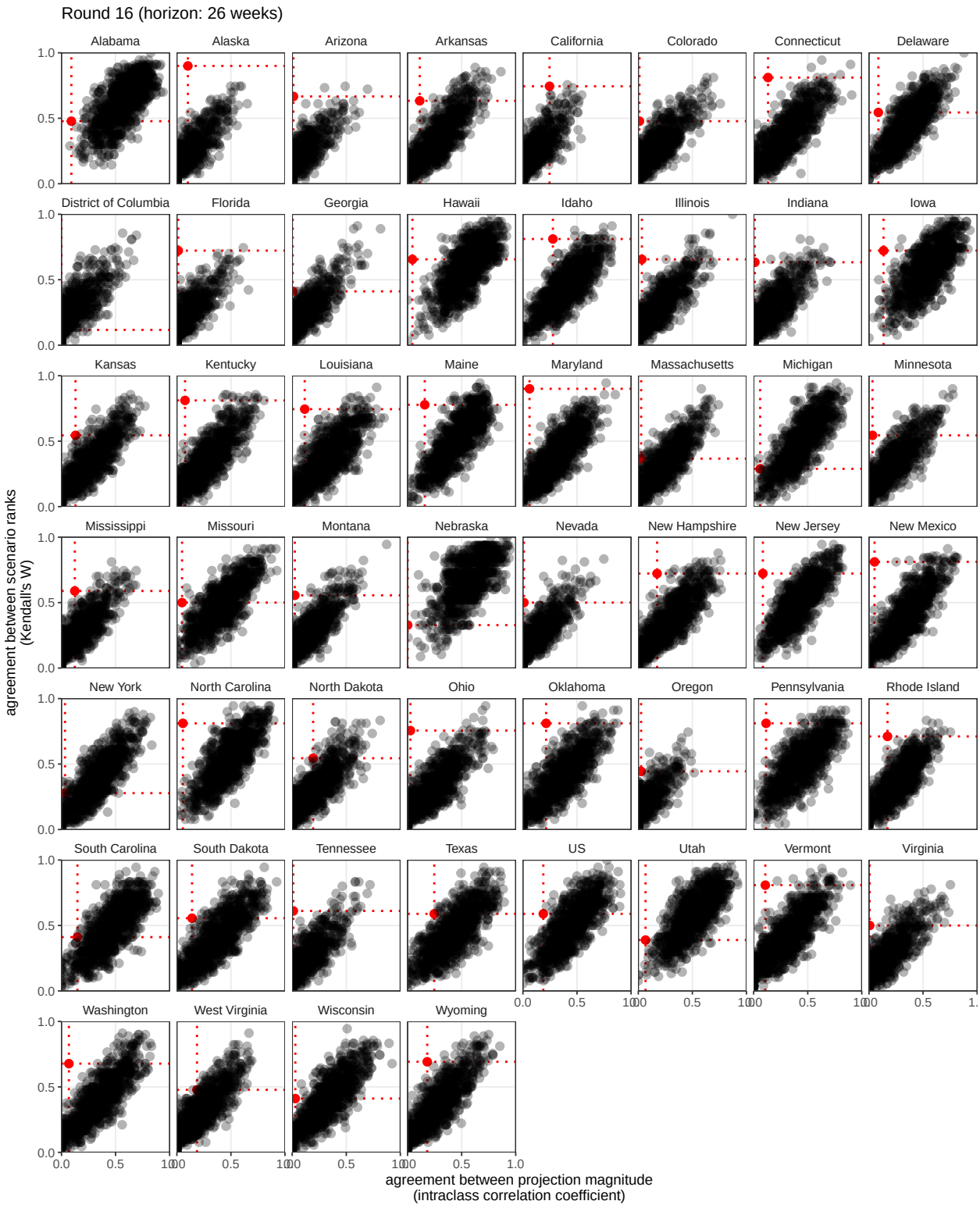

Fig. S34: Agreement for 1,000 null model simulations and the corresponding SMH projections of cumulative hospitalizations for Round 14. Agreement is calculated for projection magnitude (as measured by intraclass correlation coefficient) and scenario ranking (as measured by Kendall's W). Across locations (panels), null model results are shown with black points and SMH results are shown with a red point.