

1 **Associations between governor political affiliation and COVID-19 cases, deaths, and testing**
2 **in the United States**

3
4 Brian Neelon, PhD,^{1,2*} Fedelis Mutiso, MS,¹ Noel T Mueller, PhD, MPH,^{3,4}

5 John L Pearce, PhD,⁵ Sara E Benjamin-Neelon, PhD, JD, MPH^{6,7}

6
7 ¹ Division of Biostatistics, Department of Public Health Sciences, Medical University of South
8 Carolina, Charleston, South Carolina

9
10 ² Charleston Health Equity and Rural Outreach Innovation Center (HEROIC), Ralph H.
11 Johnson VA Medical Center, Charleston, South Carolina

12
13 ³ Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Baltimore,
14 Maryland

15
16 ⁴ Welch Center for Prevention, Epidemiology and Clinical Research, Johns Hopkins University,
17 Baltimore, Maryland

18
19 ⁵ Division of Environmental Health, Department of Public Health Sciences, Medical University
20 of South Carolina, Charleston, South Carolina

21
22 ⁶ Department of Health, Behavior and Society, Johns Hopkins Bloomberg School of Public
23 Health, Baltimore, Maryland

24

25 ⁷Lerner Center for Public Health Promotion, Johns Hopkins Bloomberg School of Public Health,

26 Baltimore, Maryland

27

28 * Corresponding author

29 Brian Neelon, PhD

30 Department of Public Health Science

31 Medical University of South Carolina

32 Charleston, SC 29425

33 E-mail: neelon@musc.edu

34 Telephone: (843) 876-1149

35

36 Word Count: 1200

37 Page Count: 13

38 Table/Figure Count: 4

39

40 **Conflicts of Interest:** Dr. Mueller was supported by the National Heart, Lung, And Blood

41 Institute of the National Institutes of Health under Award Number K01HL141589 (PI: Mueller).

42 The funder had no influence on the study's design, implementation, or findings.

43

44 **Financial Disclosure:** No financial disclosures were reported by the authors of this manuscript.

45 **Abstract**

46 **Introduction**

47 The response to the COVID-19 pandemic became increasingly politicized in the United States
48 (US) and political affiliation of state leaders may contribute to policies affecting the spread of the
49 disease. This study examined differences in COVID-19 infection, death, and testing by governor
50 party affiliation across 50 US states and the District of Columbia.

51

52 **Methods**

53 A longitudinal analysis was conducted in December 2020 examining COVID-19 incidence,
54 death, testing, and test positivity rates from March 15 through December 15, 2020. A Bayesian
55 negative binomial model was fit to estimate daily risk ratios (RRs) and posterior intervals (PIs)
56 comparing rates by gubernatorial party affiliation. The analyses adjusted for state population
57 density, rurality, census region, age, race, ethnicity, poverty, number of physicians, obesity,
58 cardiovascular disease, asthma, smoking, and presidential voting in 2020.

59

60 **Results**

61 From March to early June, Republican-led states had lower COVID-19 incidence rates compared
62 to Democratic-led states. On June 3, the association reversed, and Republican-led states had
63 higher incidence (RR=1.10, 95% PI=1.01, 1.18). This trend persisted through early December.
64 For death rates, Republican-led states had lower rates early in the pandemic, but higher rates
65 from July 4 (RR=1.18, 95% PI=1.02, 1.31) through mid-December. Republican-led states had
66 higher test positivity rates starting on May 30 (RR=1.70, 95% PI=1.66, 1.73) and lower testing
67 rates by September 30 (RR=0.95, 95% PI=0.90, 0.98).

68

69 **Conclusion**

70 Gubernatorial party affiliation may drive policy decisions that impact COVID-19 infections and
71 deaths across the US. Future policy decisions should be guided by public health considerations
72 rather than political ideology.

73

74

75

76

77

78

79

80

81

82

83

84

85

86

87

88

89

90

91 **Introduction**

92 Coronavirus disease 2019 (COVID-19) has resulted in a global public health crisis. As of
93 December 15, 2020, there have been over 16 million confirmed COVID-19 cases and 300,000
94 deaths in the US.¹ In response to the pandemic, the governors of all 50 states declared states of
95 emergency. Shortly thereafter, states began enacting policies to help stop the spread of the virus.
96 However, these policies vary and are guided, in part, by decisions from state governors.

97
98 Through state constitutions and laws, governors have the authority to take action in public health
99 emergencies. Earlier this year, nearly all state governors issued stay-at-home executive orders
100 that advised or required residents to shelter in place.² Recent studies found that Republican
101 governors, however, were slower to adopt stay-at-home orders, if they did so at all.^{3,4} Moreover,
102 another study found that Democratic governors had longer durations of stay-at-home orders.⁵
103 Further, researchers identified governor Democratic political party affiliation as the most
104 important predictor of state mandates to wear face masks.⁶

105
106 Although recent studies have examined individual state policies, such as mandates to socially
107 distance, wear masks, and close schools and parks,^{3,4,6-8} multiple policies may act together to
108 impact the spread of COVID-19. Additionally, the pandemic response has become increasingly
109 politicized.^{7,9,10} As such, political affiliation of state leaders, and specifically governors, might
110 best capture the omnibus impact of state policies. Therefore, the purpose of this study was to
111 quantify differences in incidence, death, testing, and test positivity over time, stratified by
112 governors' political affiliation among the 50 states and DC.

113

114 **Methods**

115 A longitudinal analysis examined COVID-19 incident cases, death rates, polymerase chain
116 reaction (PCR) testing, and test positivity from March 15 (March 24 for testing and test
117 positivity) through December 15, 2020 for 50 states and DC. Based on prior studies,^{3,4,6,7} it was
118 hypothesized that states with Democratic governors would have higher incidence, death, and test
119 positivity rates early in the pandemic due to points of entry for the virus,^{11,12} but that the trends
120 would reverse in later months, reflecting policy differences that break along party lines. The
121 Institutional Review Boards at the Medical University of South Carolina and Johns Hopkins
122 Bloomberg School of Public Health deemed this research exempt.

123

124 Governor party affiliation was documented for each US state; for DC, mayoral affiliation was
125 used. Daily incident cases and deaths were obtained from the COVID Tracking Project.¹³ PCR
126 testing and test positivity data came from the US Department of Health and Human Services.¹⁴
127 Potential confounders included state population density,¹⁵ census region,¹⁵ state percentage of
128 residents aged 65 and older,¹⁵ percentage of Black residents,¹⁵ percentage of Hispanic
129 residents,¹⁵ percentage below the federal poverty line,¹⁵ percentage living in rural areas,¹⁶
130 percentage with obesity,¹⁷ percentage with cardiovascular disease,¹⁸ percentage with asthma,
131 percentage smoking,⁹ number of physicians per 100,000 residents,¹⁶ and percentage voting
132 Democratic (versus Republican) in the 2020 presidential election.¹⁹

133

134 **Statistical analysis**

135 Bayesian negative binomial models were used to examine incident case, death, testing, and test
136 positivity rates. The models included penalized cubic Bsplines for the fixed and random

137 temporal effects. Models adjusted for the above covariates. Ridging priors were assigned to the
138 fixed and random spline coefficients.²⁰ Posterior computation was implemented using Gibbs
139 sampling.^{18,21} Model details, including prior specification, computational diagnostics, and
140 sensitivity analyses appear in the online Appendix.

141
142 Models were stratified by governors' affiliation, and posterior mean daily rates were graphed
143 with their 95% posterior intervals (PIs). Adjusted risk ratios (RRs) and 95% PIs were calculated
144 to compare states, with RRs > 1.00 indicating higher rates among Republican-led states.
145 Analyses were conducted using R version 3.6 (R Core Team, 2019).

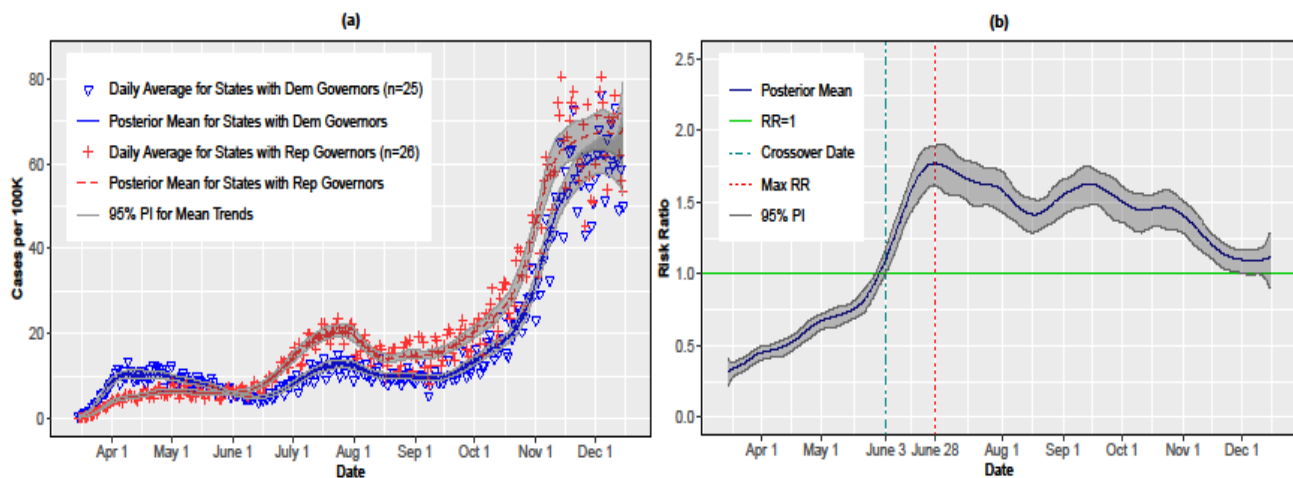
146

147 **Results**

148 The sample comprised 26 Republican-led and 25 Democratic-led states. Figures 1(a-b) present
149 incidence trends (cases per 100,000) and adjusted RRs by gubernatorial affiliation. Republican-
150 led states had fewer cases from March to early June 2020. However, on June 3 the association
151 reversed (RR=1.10, 95% PI=1.01, 1.18), indicating that Republican-led states had on average
152 1.10 times more cases per 100,000 than Democratic-led states. The RRs increased steadily
153 thereafter, achieving a maximum of 1.77 (95% PI=1.62, 1.90) on June 28 and remaining positive
154 for the remainder of the study, although the PIs overlapped 1.00 starting on December 3.

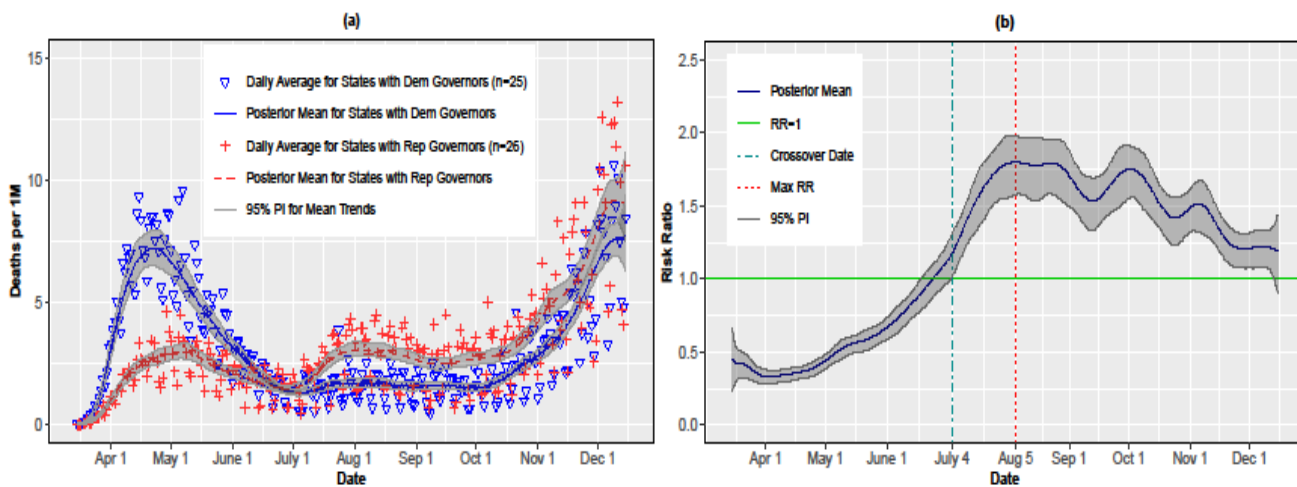
155

156 **Figure 1.** (a) Per capita COVID-19 incidence rates by governor affiliation; (b) adjusted risk
157 ratios (RRs) and 95% posterior intervals (PIs). RRs > 1 indicate higher rates for Republican
158 governors.



159
160 A similar pattern emerged for deaths shown in Figures 2(a-b). Republican-led states had lower
161 death rates early in the pandemic, but the trend reversed on July 4 (RR=1.18, 95% PI=1.02,1.31).
162 The RRs increased through August 5 (RR=1.80, 95% PI=1.57, 1.98) and the PIs remained above
163 1.00 until December 13 (RR=1.20, 95% PI=0.96, 1.39).
164

165 **Figure 2.** (a) Per capita COVID-19 death rates by governor affiliation; (b) adjusted risk ratios
166 (RRs) and posterior intervals (PIs). RRs > 1 indicate higher rates for Republican governors.

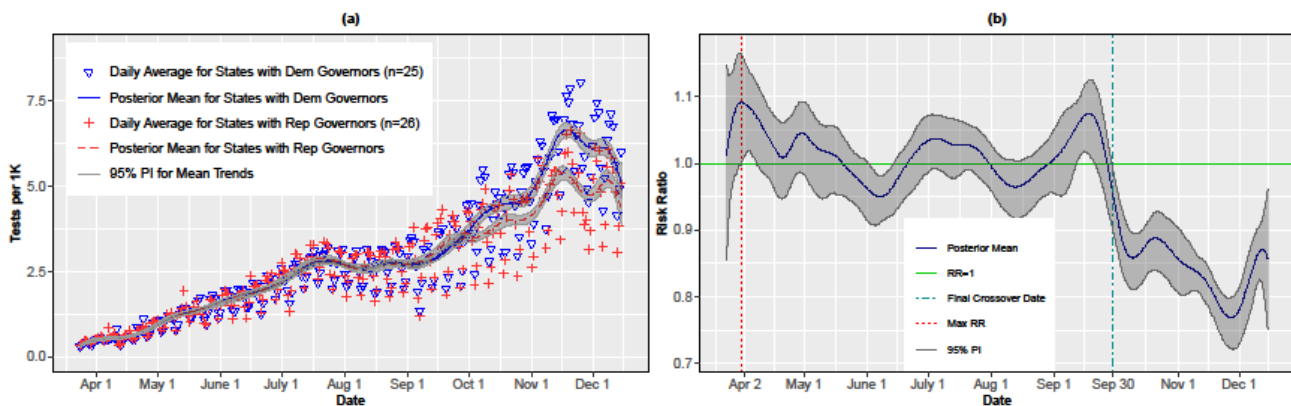


167
168 Testing rates (Figures 3a-b) tracked similarly for Republican and Democratic states until
169 September 30 (RR=0.95, 95% PI=0.90, 0.98). By November 27, the testing rate for Republican-
170 led states was substantially lower than Democratic states (RR=0.77, 95% PI=0.72, 0.80). The
171 test positivity rate (Figures 4a-b) was higher for Republican-led states starting on May 30, and
172 was 1.70 (95% PI=1.65, 1.74) times higher on June 23.

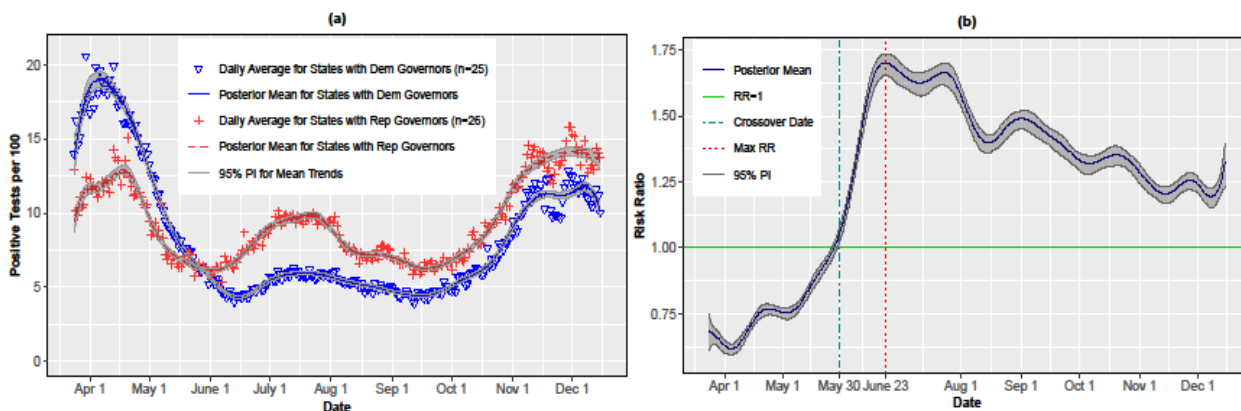
173

174

175 **Figure 3.** (a) Per capita COVID-19 testing rates by governor affiliation; (b) adjusted risk ratios
176 (RRs) and posterior intervals (PIs). RRs > 1 indicate higher rates for Republican governors.



177
178 **Figure 4.** (a) COVID-19 test positivity rates per 100 tests by governor affiliation; (b) adjusted
179 risk ratios (RRs) and posterior intervals (PIs). RRs > 1 indicate higher rates for Republican
180 governors.



181

182 **Discussion**

183 In this longitudinal analysis, Republican-led states had fewer per capita COVID-19 cases, deaths,
184 and positive tests early in the pandemic, but these trends reversed in early May (positive tests),
185 June (cases), and July (deaths). Testing rates were similar until September, when Republican
186 states fell behind Democratic states. The early trends could be explained by high COVID-19
187 cases and deaths among Democratic-led states that are home to initial ports of entry for the virus
188 in early 2020.^{11,12} However, the subsequent reversal in trends, particularly with respect to
189 testing, may reflect policy differences that could have facilitated the spread of the virus.^{3,4,6-9}

190
191 Adolph et al. found that Republican governors were slower to adopt both stay-at-home orders
192 and mandates to wear face masks.^{3,6} Other studies have shown that Democratic governors were
193 more likely to issue stay-at-home orders with longer durations.^{4,5} Moreover, decisions by
194 Republican governors in spring 2020 to retract policies, such as the lifting of stay-at-home orders
195 on April 28 in Georgia,²² may have contributed to increased cases and deaths. Democratic states
196 also had lower test positivity rates from May 30 through December 15, suggesting more rigorous
197 containment strategies in response to the pandemic. Thus, governors' political affiliation might
198 function as an upstream progenitor of multifaceted policies that, in unison, impact the spread of
199 the virus. Although there were exceptions in states such as Maryland and Massachusetts,
200 Republican governors were generally less likely to enact policies aligned with public health
201 social distancing recommendations.³

202
203 This is the first study to quantify differences over time based on governor party affiliation.
204 There are, however, limitations. This was a population-level rather than individual-level

205 analysis. Although analyses were adjusted for potential confounders (e.g., rurality), the findings
206 could reflect the virus's spread from urban to rural areas.^{11,12} Additionally, as with any
207 observational study, causality cannot be inferred. Finally, governors are not the only
208 authoritative actor in a state; governors in states like Wisconsin may have been limited by
209 Republican-controlled legislatures. Future research could explore associations between party
210 affiliation of state or local legislatures, particularly when these differ from governors.

211
212 These findings suggest that governor political party affiliation may differentially impact COVID-
213 19 incidence and death rates. Attitudes toward the pandemic were highly polarized in
214 2020.^{7,9,10,23-25} Future state policy actions should be guided by public health considerations
215 rather than political expedience²⁶ and should be supported by a coordinated federal response
216 within the new presidential administration.

217

218 **Acknowledgments**

219 Dr. Neelon is a part-time employee of the Department of Veterans Affairs. The content of this
220 article does not represent the views of the Department of Veterans Affairs or the U.S.
221 government. The article represents the views of the authors and not those of the VA or Health
222 Services Research and Development. Dr. Mueller was supported by the National Heart, Lung,
223 And Blood Institute of the National Institutes of Health under Award Number K01HL141589
224 (PI: Mueller). The funder had no influence on the study design, implementation, or findings. Dr.
225 Neelon had full access to all data in the study and takes responsibility for the integrity of the data
226 and the accuracy of the data analysis. Dr. Neelon, Dr. Mueller, Dr. Pearce and Dr. Benjamin-
227 Neelon contributed to the concept and design of the study. Dr. Neelon and Mr. Mutiso

228 contributed to acquisition, analysis, and interpretation of the data. Dr. Neelon and Benjamin-
229 Neelon drafted the manuscript, and all Dr. Mueller, Dr. Pearce, and Mr. Mutiso provided critical
230 revisions. A preprint of this manuscript is posted on *MedRxiv* at
231 <https://www.medrxiv.org/content/10.1101/2020.10.08.20209619v1>. No financial disclosures
232 were reported by the authors of this manuscript.

233 **References**

- 234 1. CDC COVID Data Tracker: United States Laboratory Testing.
235 <https://www.cdc.gov/covid-data-tracker/index.html#testing>. Published 2020. Accessed
236 December 15, 2020.
- 237 2. Gostin LO, Wiley LF. Governmental Public Health Powers During the COVID-19
238 Pandemic: Stay-at-home Orders, Business Closures, and Travel Restrictions. *Jama*. 2020.
- 239 3. Adolph C, Amano K, Bang-Jensen B, Fullman N, Wilkerson J. Pandemic Politics:
240 Timing State-Level Social Distancing Responses to COVID-19. *Journal of Health*
241 *Politics, Policy and Law*. 2020.
- 242 4. Baccini LB, A. Explaining governors' response to the COVID-19 pandemic in the United
243 States. *IZA Discussion Paper No 13137*. 20202.
- 244 5. Kosnik LR, Bellas A. Drivers of COVID-19 Stay at Home Orders: Epidemiologic,
245 Economic, or Political Concerns? *Econ Disaster Clim Chang*. 2020:1-12.
- 246 6. Adolph C, Amano K, Bang-Jensen B, et al. Governor partisanship explains the adoption
247 of statewide mandates to wear face coverings. *medRxiv*. 2020:2020.2008.2031.20185371.
- 248 7. Grossman G, Kim S, Rexer JM, Thirumurthy H. Political partisanship influences
249 behavioral responses to governors' recommendations for COVID-19 prevention in the
250 United States. *Proceedings of the National Academy of Sciences of the United States of*
251 *America*. 2020;117(39):24144-24153.
- 252 8. Matzinger P, Skinner J. Strong impact of closing schools, closing bars and wearing masks
253 during the Covid-19 pandemic: results from a simple and revealing analysis. *medRxiv*.
254 2020:2020.2009.2026.20202457.
- 255 9. Christensen SR, Pilling EB, Eyring JB, Dickerson G, Sloan CD, Magnusson BM.
256 Political and personal reactions to COVID-19 during initial weeks of social distancing in
257 the United States. *PloS one*. 2020;15(9):e0239693.
- 258 10. Jiang J, Chen E, Lerman K, Ferrara E. Political Polarization Drives Online Conversations
259 About COVID-19 in the United States. *Hum Behav Emerg Technol*. 2020.
- 260 11. Paul R, Arif AA, Adeyemi O, Ghosh S, Han D. Progression of COVID-19 From Urban to
261 Rural Areas in the United States: A Spatiotemporal Analysis of Prevalence Rates. *J Rural*
262 *Health*. 2020;36(4):591-601.
- 263 12. Wang Y, Liu Y, Struthers J, Lian M. Spatiotemporal Characteristics of COVID-19
264 Epidemic in the United States. *Clin Infect Dis*. 2020.
- 265 13. The Atlantic Monthly Group LLC. The COVID Tracking Project.
266 <https://covidtracking.com/data>. Published 2020. Accessed December 16, 2020.

- 267 14. US Department of Health and Human Services. COVID-19 Diagnostic Laboratory
268 Testing (PCR Testing) Time Series. [https://healthdata.gov/dataset/covid-19-diagnostic-](https://healthdata.gov/dataset/covid-19-diagnostic-laboratory-testing-pcr-testing-time-series)
269 [laboratory-testing-pcr-testing-time-series](https://healthdata.gov/dataset/covid-19-diagnostic-laboratory-testing-pcr-testing-time-series). Published 2020. Accessed December 16, 2020.
- 270 15. United States Census Bureau. State Population Totals: 2010-2019.
271 <https://www.census.gov/data/tables/time-series/demo/popest/2010s-counties-total.html>.
272 Published 2019. Accessed September 1, 2020.
- 273 16. Robert Wood Johnson Foundation. County Health Rankings & Roadmaps: Rankings
274 Data & Documentation. [https://www.countyhealthrankings.org/explore-health-](https://www.countyhealthrankings.org/explore-health-rankings/rankings-data-documentation)
275 [rankings/rankings-data-documentation](https://www.countyhealthrankings.org/explore-health-rankings/rankings-data-documentation). Published 2020. Accessed August 8, 2020.
- 276 17. Centers for Disease Control and Prevention. BRFSS Prevalence & Trends Data.
277 <https://www.cdc.gov/brfss/brfssprevalence/index.html>. Published 2020. Accessed.
- 278 18. Dadaneh SZ, Zhou M, Qian X. Bayesian negative binomial regression for differential
279 expression with confounding factors. *Bioinformatics*. 2018;34(19):3349-3356.
- 280 19. Cook C. The Cook Political Report. <https://cookpolitical.com>. Published 2020. Accessed
281 December 16, 2020.
- 282 20. Kneib T, Konrath S, Fahrmeir L. High dimensional structured additive regression
283 models: Bayesian regularization, smoothing and predictive performance. *Journal of the*
284 *Royal Statistical Society: Series C (Applied Statistics)*. 2011;60(1):51-70.
- 285 21. Pillow JWS, J. Fully Bayesian inference for neural models with negative-binomial
286 spiking. 2012:1898--1906.
- 287 22. Each State's COVID-19 Reopening and Reclosing Plans and Mask Requirements
288 <https://www.nashp.org/governors-prioritize-health-for-all/>. Published 2020. Accessed
289 September 30, 2020, 2020.
- 290 23. Leventhal AM, Dai H, Barrington-Trimis JL, et al. Association of Political Party
291 Affiliation With Physical Distancing Among Young Adults During the COVID-19
292 Pandemic. *JAMA Intern Med*. 2020.
- 293 24. Havey NF. Partisan public health: how does political ideology influence support for
294 COVID-19 related misinformation? *J Comput Soc Sci*. 2020:1-24.
- 295 25. Wang VH, Pagán JA. Views on the need to implement restriction policies to be able to
296 address COVID-19 in the United States. *Preventive medicine*. 2020:106388.
- 297 26. Guest JL, Del Rio C, Sanchez T. The Three Steps Needed to End the COVID-19
298 Pandemic: Bold Public Health Leadership, Rapid Innovations, and Courageous Political
299 Will. *JMIR Public Health Surveill*. 2020;6(2):e19043.
- 300