Relationship of political ideology of US federal and state elected officials and key COVID pandemic outcomes following vaccine rollout to adults: April 2021–March 2022

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Summary

Background Scant research, including in the United States, has quantified relationships between the political ideologies of elected representatives and COVID-19 outcomes among their constituents.

Methods We analyzed observational cross-sectional data on COVID-19 mortality rates (age-standardized) and stress on hospital intensive care unit (ICU) capacity for all 435 US Congressional Districts (CDs) in a period of adult vaccine availability (April 2021–March 2022). Political metrics comprised: (1) ideological scores based on each US Representative's and Senator's concurrent overall voting record and their specific COVID-19 votes, and (2) state trifectas (Governor, State House, and State Senate under the same political party control). Analyses controlled for CD social metrics, population density, vaccination rates, the prevalence of diabetes and obesity, and voter political lean.

Findings During the study period, the higher the exposure to conservatism across several political metrics, the higher the COVID-19 age-standardized mortality rates, even after taking into account the CD's social characteristics; similar patterns occurred for stress on hospital ICU capacity for Republican trifectas and US Senator political ideology scores. For example, in models mutually adjusting for CD political and social metrics and vaccination rates, Republican trifecta and conservative voter political lean independently remained significantly associated with an 11%–26% higher COVID-19 mortality rate.

Interpretation Associations between the political ideologies of US federal elected officials and state concentrations of political party power with population health warrant greater consideration in public health analyses and monitoring dashboards.

Funding This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Keywords: Congressional district; COVID-19; COVID-19 mortality rates; Intensive care unit occupancy; Political ideology; Voter political lean; US Congressional House Representatives; US Senators

Abbreviations: CD, Congressional District; ICU, Intensive care unit; ACS, American Community Survey; ICE, Index for Concentration at the Extremes; CI, Confidence interval

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Research in context

Evidence before this study

We considered the following evidence before undertaking this study: (1) the very small body of scientific research that has analyzed US health outcomes in relation to US Congressional Districts, none of which include data on the political ideology of the US Congressional representatives; (2) the small set of studies that have analyzed COVID-19 outcomes and COVID-19 policies in relation to political polarization as measured solely by voters' political lean (in the US, using state and county-level data), also without including any data on the political ideology of the elected representatives; (3) literature on how tensions between different levels of government in the US and other countries and related political conflicts can affect health policies, including for COVID-19; (4) additional US research that has analyzed Congressional votes, with party affiliation considered, on health-related legislation, but with no data on health outcomes; (5) a newly emerging but still very small literature on the health impacts of US state legislative gerrymandering, and an even smaller literature on the health impacts of US state trifectas; and (6) conceptual and empirical research more broadly focused on the political determinants of health. The literature considered included: (a) newly identified literature found by the explicit search strategies listed below, and (b) literature previously obtained for other scholarly work, prior to designing this study.

– Searches:

a) PubMed: search on 4/9/22 using the terms: (i) "US Congressional District"; (ii) "political polarization COVID-19 United States"; and (iii) "political partisanship COVID-19 United States"
b) Web of Science: search on 4/9/22 across all databases, for: (i) TS = ((health OR disease OR morbidity OR mortality OR coronavirus) AND (congressional AND district)); (ii) TS = (political AND polarization AND COVID-19 AND (United AND States)); and (iii) TS = (political AND partisanship AND COVID-19 AND (United AND States)
c) Google Scholar: search on 4/9/22 using the terms "US Congressional Districts mortality morbidity"

Added value of the study

We present the novel finding that, in the context of adult vaccine availability, the higher the exposure to conservatism across several political metrics, the higher the COVID-19 age-standardized mortality rates, even after taking into account the districts' social characteristics; similar patterns for stress on hospital ICU capacity occurred for Republican trifectas and US Senator political ideology scores. For example, in the models mutually adjusting for all political metrics and district social metrics plus vaccination data (*Model 4*): (a) Republican trifecta and conservative voter political lean independently remained significantly associated with, respectively, a 11% (99% confidence interval [CI]: 1.00, 1.24) and 24% higher (99% CI 1.18, 1.37) COVID-19 mortality rate; and (b) US Senator ideology score remained significantly and independently associated with an increase of 3.5 percentage points (99% CI 1.42, 5.50) for ICU occupancy. These patterns held for the total time period and also, separately, for the Delta and Omicron waves, including models which additionally adjusted for relevant baseline health data (CD percentage of persons diagnosed with diabetes and with obesity in 2017; *Model 5*). The added value of our study, with global salience, is that it: (1) shifts the focus from solely the political lean of voters to the political ideologies of elected representatives and concentration of political party power; and (2) addresses critical gaps in monitoring and analyzing population health profiles in relation to meaningful units of political geography (e.g., in the US, using Congressional Districts, for which scant data exist).

Implications of all the available evidence

Especially in a time of increasingly polarized politics, it is critically important to monitor and analyze population health data mapped onto meaningful units of political geography in conjunction with informative political variables that can aid ascertainment of political accountability and democratic governance.

Introduction

The COVID-19 pandemic in the United States has been notable not only for its toll – with the US as of mid-May 2022 exceeding 1 million deaths, far more per capita than other wealthy countries[1]– but also for the high degree of political partisanship and polarization affecting societal responses to and dynamics of the pandemic.[1–4] Notably, over 400,000 of the 1 million US deaths due to COVID-19 have occurred in the vaccine era, i.e., since April 2021, when all US adults became eligible for vaccination, which greatly reduces the risk of severe illness and death.[1,5]

To date, however, scant US research has analyzed COVID-19 health outcomes in relation to a fundamental unit of US political geography: the Congressional District (CD),[6] and none has done so in relation to the political votes and ideologies of their representatives. Instead, within the US and globally, quantitative research on political behaviours and COVID-19 outcomes has predominantly focused on voters' political lean or else has analyzed COVID-19 policies and management in relation to tensions within and between levels of government (e.g., federal vs. state or province).[3,7–10]

In our analyses, we shift the focus to examine relationships during the study period between COVID-19 health outcomes and political ideology, as expressed through the votes of US federal elected representatives and state-level concentrations of political power, by

party. Motivating our analyses, federal and state elected officials play key roles in obtaining and allocating resources for jurisdictions and in setting norms of institutional and social behaviours via their actions, campaign messages, and, if elected, messages to their constituents.[2–4,10,11]

The two sets of health outcomes we examine are (1) COVID-19 mortality, both to capture these deaths and, by implication, their ripple effects through the families and communities affected[1,2,12]; and (2) stress on total hospital intensive care unit (ICU) capacity, as measured by ICU occupancy (regardless of the reason for this hospitalization), given the importance in pandemic management of preventing overburdening of hospitals and averting potentially disastrous spillover effects for treatment and prevention of other causes of illness and death.[2,12] Our analyses both examine and control for voter political lean and also control for CD socioeconomic and sociodemographic characteristics pertinent to the social and spatial patterning of COVID-19 and COVID-19 health inequities in the US,[2,4,6,7,12] including vaccination rates.[1–3,12] Although we focus solely on the US, our approach is relevant to other country contexts, for which evidence of impacts of political polarization and tensions between levels of governance on COVID-19 response exists, but research on political geography, politicians' votes, and COVID-19 outcomes is lacking.[3,8,13]

Methods

Our observational cross-sectional study employed data for all 435 US CDs for the time period April 2021 through March 2022, when all US adults were eligible to be vaccinated.[1,5] All data sources (all open-access) are listed in Supplemental Table 1, and Supplemental Fig. 1 provides data on the correlations between all study variables. Sensitivity analyses for the Delta (April 2021–November 2021) and Omicron waves (December 2021–March 2022) are presented in Supplemental Table 2.

Health outcomes

We obtained county-level data for all COVID-19 deaths (underlying) that occurred between April 1, 2021, and March 31, 2022, from CDC Wonder Provisional Mortality Statistics, and employed CD population denominators from the US Census American Community Survey (ACS, 2015–2019). Because county-level death data were suppressed if the county had fewer than 10 deaths (13.8% of counties), and to avoid bias due to reported associations between counties' political lean and their rural vs. urban status,[7] we imputed suppressed county death counts using the observed state-specific rates applied to the county population and used these data to generate indirectly age-standardized rates per 100,000 person-years for April 2021–March 2022.[14] Sensitivity analyses demonstrated that imputations of rates using the extremes of 0 or 9 for suppressed county observations differed, for 95% of the CDs, by less than 2.9% and 1.6%, respectively, compared to using the state average.

To measure total stress on hospital ICU capacity, we obtained data from the U.S. Department of Health and Human Services on weekly total hospital ICU occupancy and aggregated these data to the CD level based on the geocoded address of each hospital. Occupancy of less than 4 ICU beds per week was suppressed (13.6% of weekly observations) and the non-inclusion of these suppressed data had a negligible impact on estimates of ICU capacity at the CD level.

Political metrics

To measure the political ideology of the federal elected officials, which varies both within and across political party affiliations (Supplemental Table 3), we used the DW-NOMINATE Dimension 1 score which calculates a score for each member based on how they voted in roll call votes in the 117th Congress for 2021–2022; values range between −1 (most liberal) and 1 (most conservative).[15] We used the score for each US House of Representative member and the average for each state's 2 US Senators. We obtained data from the Office of the Clerk, US House of Representatives for the four major COVID-19 relief bills passed into law during the study time period (H.R. 1651, S.937, S.1511, and H.R. 16670), and analyzed these data categorically (voted for all 4: no vs. yes, or not applicable, if the seat was vacant). We classified state trifecta status (Governor, State House, and State Senate have the same political party in control) as: Republican trifecta, Democratic trifecta, or divided government.[4] We measured voter political lean with the Cook Political Report Partisan Voter Index, based on data for the 2016 and 2020 US presidential elections. This metric captures how much the vote for a given district differed from the national average; a score of D+2 means the district on average was two points more Democratic than the nation as a whole, a score of R+4 means it was on average four points more Republican, and scores within a half point of the national average are designated as "Even."[16]

Additional social metrics and health data included as potential confounders

The US Census provided CD data, based on the ACS (2015–2019), for: population median age, per cent of the population below poverty, median household income, racial/ethnic composition, and land area. Because data on poverty does not provide insight into the income levels of those classified as "not poor" nor

the intersectional realities of residential economic and racialized segregation, we computed the Index for Concentration at the Extremes (ICE) for racialized economic segregation; a value of 1 means 100% of households are white non-Hispanic in the top US household income quintile, while a value of –1 means 100% of households are people of color in the bottom US household income quintile.[17,18] In light of racialized COVID-19 health inequities,[2,4,12,18,19] we used county-level data for the "minority status and language" theme of the CDC/ATSDR Social Vulnerability Index (SVI; using ACS 2014–2018 data), which combines data on the percent of the population that are people of color and speak English "less than well,"[19] supplemented by data on each county's group-specific racialized composition. We used CD data on population counts and land area to compute population density, a metric not subject to changing US census definitions of "urban" vs. "rural."[20] For vaccination, we used administrative data on the average percentage of adults aged 18 or older vaccinated with 2+ doses for April 2021–March 2022. We also controlled for baseline CD per cent of adults diagnosed in 2017 with obesity and with diabetes, given their associations with COVID outcomes, which could reflect confounding or, plausibly, mediation of socio-political context.[2,12]

Crosswalking county to Congressional District-level data

For those variables not available at the CD level, we used dasymetric methods (population based reweighting at the Census Block level) to generate estimates based on county-level data.[21,22] This process used the 116th Congress Block Equivalency Files from the US Census to identify: (a) the districts and counties in which blocks are located, and (b) the 2010 block population estimates, allowing us to generate reweighting matrices that convert county estimates of counts and weights to district estimates. Shapefiles for counties and CDs were obtained from the Census using the tigris package in R.[23]

Population metrics	
Population size, median (IQR) 2015–2019	740,198 (54,713)
Population density per square kilometers, mean (sd) 2015–2019	943 (2708)
Population age (years), mean (sd) 2015–2019	38·4 (3·6)
Health metrics	
Number of COVID-19 Deaths in April 2021 to March 2022, median (IQR)	838 (527)
Crude COVID-19 Mortality Rate in April 2021 to March 2022 per 100,000 Person-Years, mean (sd)	115·8 (48·4)
Indirectly Age-Standardized COVID-19 Mortality Rate in April 2021 –March 2022 per 100,000 Person-Years, mean (sd)	100·7 (39·4)
ICU Hospital Bed Occupancy (%), April 2021 to March 2022, mean (sd)	72·6 (13·0)
Percent of 18+ Adults Vaccinated with 2+ Doses, April 2021 to March 2022, mean (sd)	53·8 (13·8)
Percent diagnosed with diabetes in 2017, mean (sd)	10·0 (1·8)
Percent diagnosed with obesity in 2017, mean (sd)	29·8 (4·8)
Social metrics	
Percent Below Poverty, mean (sd) 2015–2019	17·8 (7·6)
Index of Concentration at the Extremes for Racialized Economic Segregation, mean (sd) 2015–2019	0·18 (0·13)
Social Vulnerability Index for Minority Status & Language, mean (sd) 2018	0·70 (0·25)
Percent Black, mean (sd), 2015–2019	12·24 (13·67)
Percent Asian, mean (sd), 2015–2019	5·41 (6·80)
Percent Hispanic, mean (sd), 2015–2019	17·87 (18·16)
Percent American Indian/Alaska Native, mean (sd), 2015–2019	0·66 (1·91)
Political metrics	
US House of Representative DW-NOMINATE Ideology Score, Dimension 1, mean (sd) 2021–2022	0·05 (0·46)
US Senate: state average for the two Senator DW-NOMINATE Ideology Score, Dimension 1, mean (sd) 2021–2022	0·04 (0·45)
Cook Partisan Voting index (based on 2016 and 2020 US presidential election), mean (sd)	–0·43 (16·9)
US House Representative Votes on Four COVID Relief Bills: N (%) in favor of all four April 2021 –March 2022	328 (75·4%)
Congressional Districts in Democratic Trifecta States, April 2021 –March 2022, N (%)	151 (34·7%)
Congressional Districts in Divided Government States, April 2021 –March 2022, N (%)	107 (24·6%)
Congressional Districts in Republican Trifecta States, April 2021 –March 2022, N (%)	177 (40·7%)

Note on metrics. Index of Concentration at the Extremes (ICE) for racialized economic segregation: –1 = 100% people of color low-income households (in bottom US household income quintile); 1 = 100% white non-Hispanic high-income households (in top US household income quintile). DW-NOMINATE score: <0 indicates liberal lean; >0 indicates conservative lean. Cook Partisan Voting Index: <0 indicates Democratic political lean; >0 indicates Republican political lean. Number of US states by trifecta status (Governor, State House, and State Senate controlled by same political party): Democratic = 14; Divided = 13; Republican = 23.

Table 1: **Descriptive data for the 435 United States Congressional Districts: population, health, social, and political metrics relevant to health outcomes for April 2021–March 2022.**

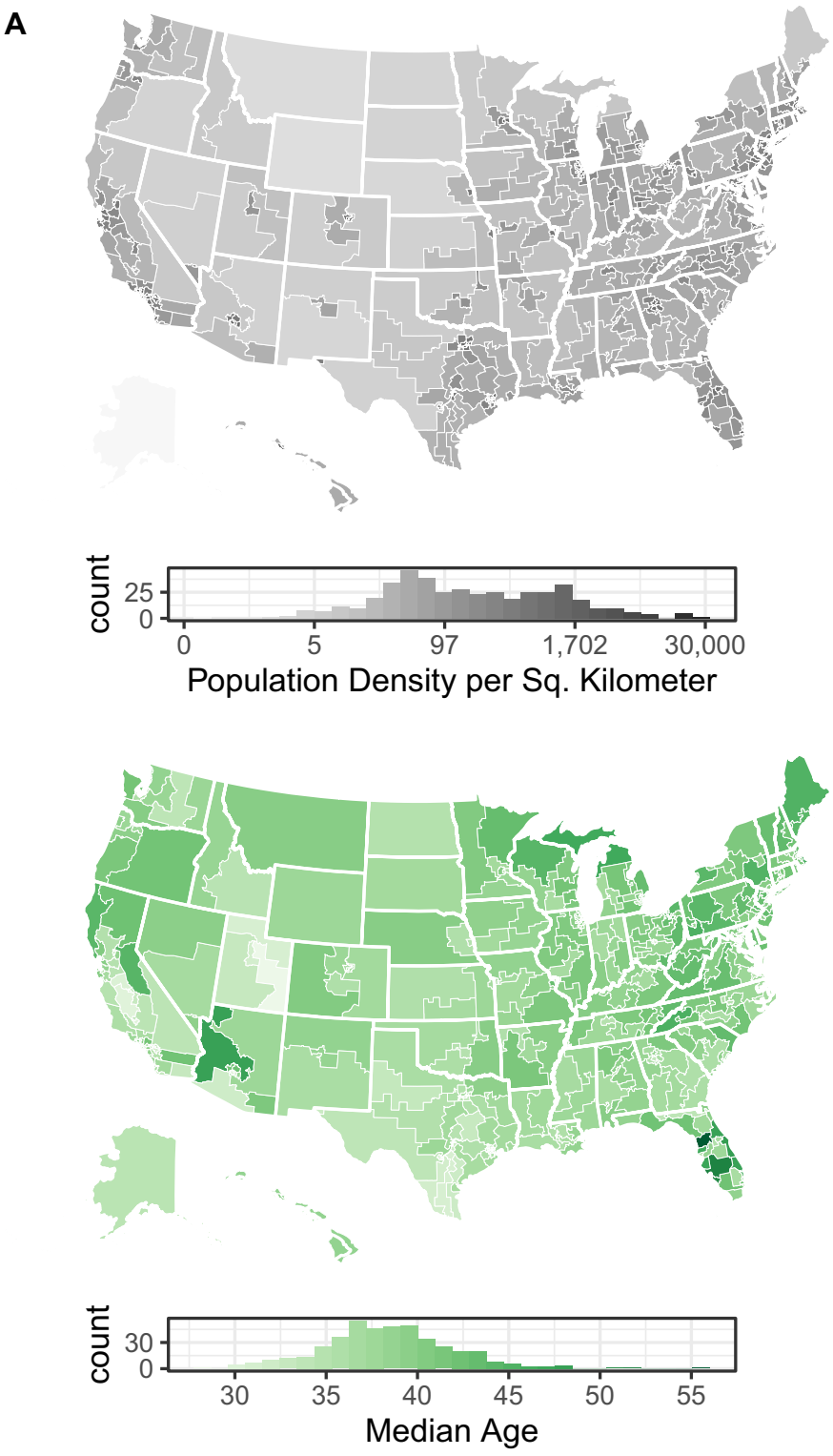


Fig. 1: **Maps for the 435 United States Congressional Districts: Population, health, social, and political metrics relevant to health outcomes for April 2021–March 2022.** Part A, Population metrics: Population Density and Median Age; Part B, Health Metrics: Crude Mortality per 100,000 Person-Years, Age-Standardized Mortality per 100,000 Person-Years, Percent ICU Occupancy, Percent of Adults with 2+ Vaccine Doses; Part C, Social Metrics: Percent Below Poverty Line, Index of Concentration at the Extremes for Racialized Economic Segregation, Social Vulnerability Index (SVI) for Minority Status and Language; Percent Black; Percent Asian; Percent Hispanic; Percent American Indian/Alaska Native; and Part D, Political Metrics: House Representatives DW-Nominate Dimension 1, Average State Senator DW-Nominate Dimension 1, Cook Partisan Voter Index 2016–2020, Support for All Four Relief Bills, State Trifecta Status.

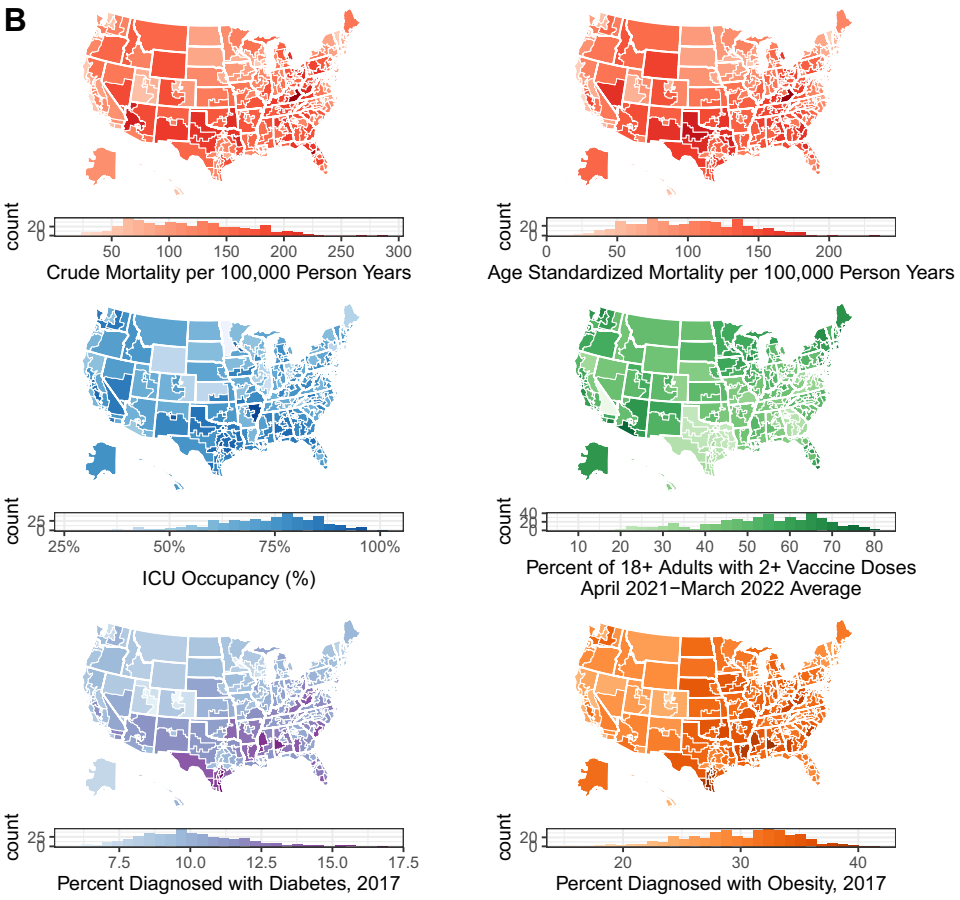


Fig. 1: Continued.

Analytic models

Quasipoisson models for indirectly age-standardized COVID-19 mortality rates were fit to account for overdispersion. Robust linear regression models for ICU capacity were fit using inverse variance weights using the MASS package in R.[24] To be conservative, given multiple comparisons, we report 99% confidence intervals (CIs); see Supplemental Textbox 1 for our approach to statistical inference with full-population counts.

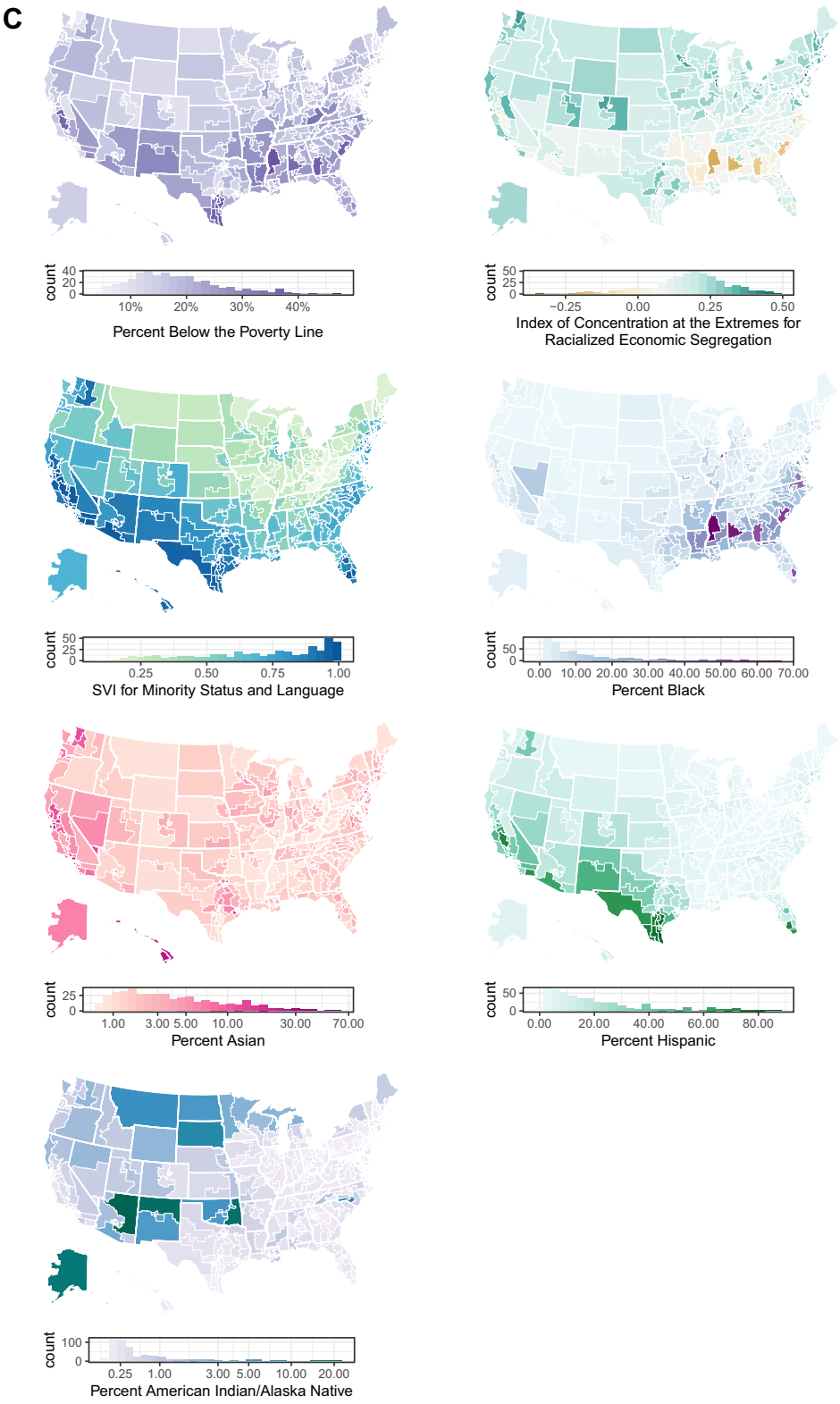
Role of the funding source

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Results

Characteristics of the 435 US CDs, for April 2021–March 2022, for the population, health, social, and political metrics, are presented in Table 1 and Fig. 1. As expected, heterogeneity among CDs was least for population size (on average, slightly over 740,000, with a standard deviation of only 55,000); moderate for COVID-19 mortality, ICU capacity, and the remaining social metrics (standard deviations reaching at most 40% of the on-average value); and far greater for the political metrics, with both the elected officials' political ideology scores (for both US House of Representatives and Senate) and voter political lean exhibiting bimodal distributions. Most (75%) but not all members of the US House of Representatives voted in favor of all four COVID-19 relief bills; additionally, 41% of the US House Representatives were located in states with Republican trifectas, 35% with Democratic trifectas, and 25% with divided state governments.

Bi-variate relationships between selected CD characteristics and the age-standardized COVID-19 mortality rates and total hospital ICU capacity rates are presented in Fig. 2, stratified by State trifecta status. As expected, COVID-19 mortality demonstrated stark inequities in relation to the Congressional Districts' median poverty, household income, and racialized economic



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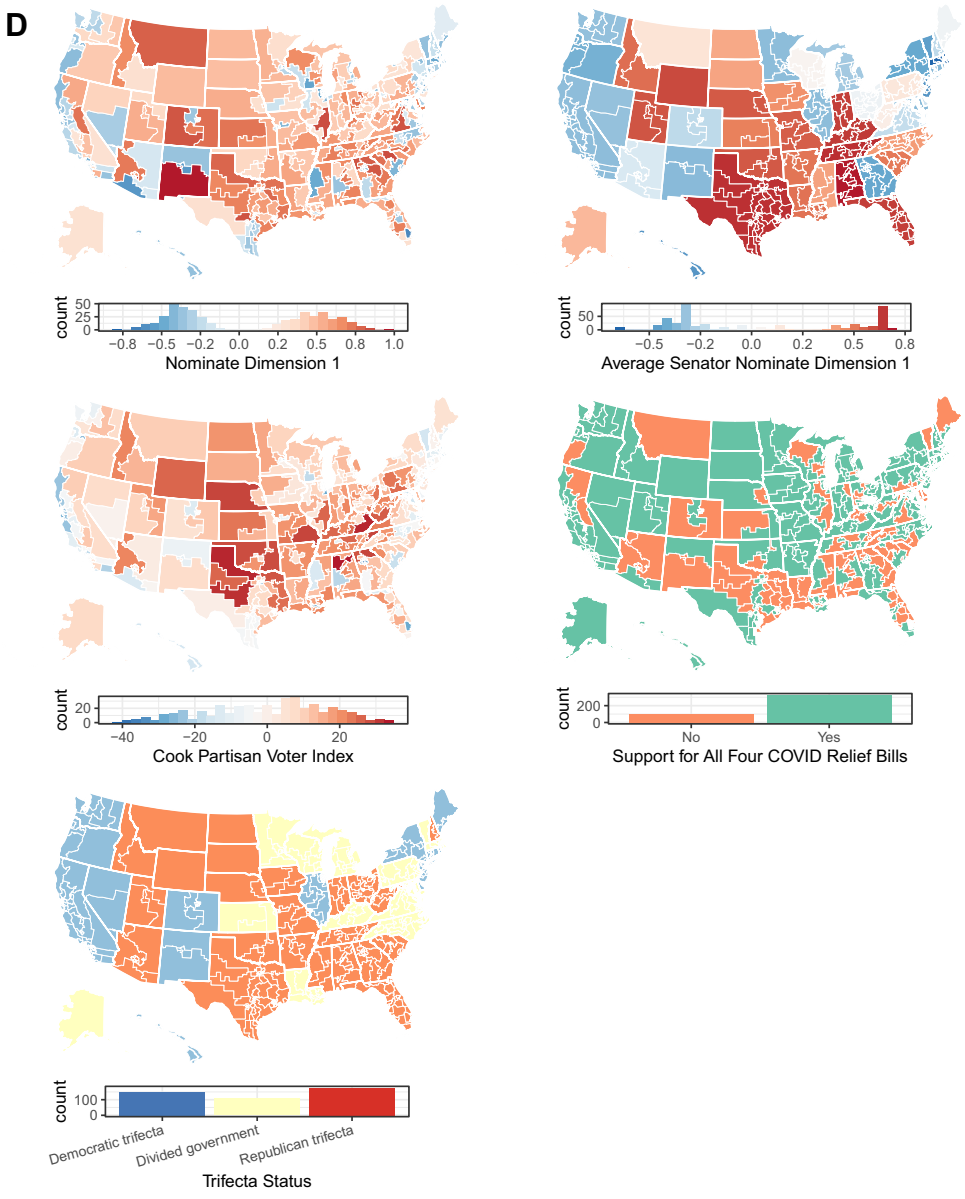

Fig. 1: Continued.

segregation; they also were positively associated with more conservative political ideology scores of the elected representatives; similar but less steep relationships were evident for ICU capacity for per cent in poverty and racialized economic segregation. For all metrics, at any given CD value, higher mortality and ICU capacity occurred in states with Republican as compared to Democratic trifectas, with differences greater for the COVID-19 mortality outcome.

Figs. 3 and 4 show the analytic results, respectively for the COVID-19 mortality rates and the total hospital ICU capacity rates, for the multivariable regression analyses; point estimates and 99% CIs are provided in Supplemental Table 2 (for the total time period, and also for the Delta and Omicron waves, which exhibited similar patterns of results).

COVID-19 mortality rates (Fig. 3) were positively associated with a more conservative political ideology of politicians, lack of support for the four COVID-19 relief bills, presence of a Republican compared to Democratic trifecta, and voter political lean (*Model 1*). Significant associations with higher age-standardized COVID-19

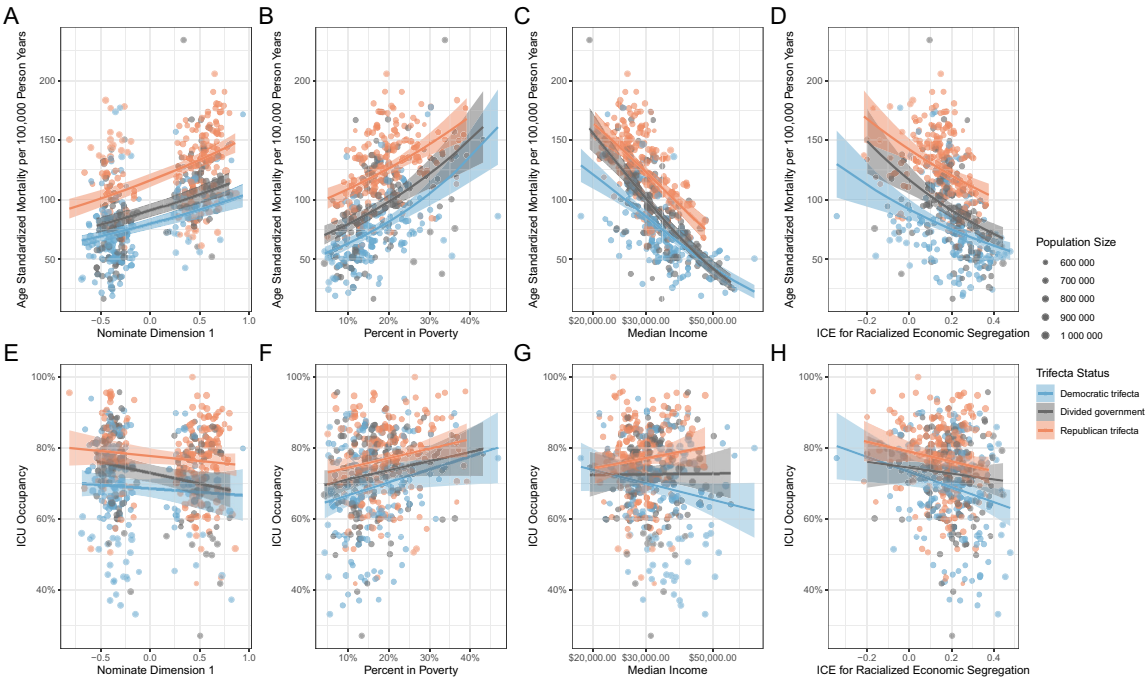

Fig. 2: **Bivariate relationship of COVID-19 age-standardized mortality rates (top row) and total hospital ICU capacity (bottom row) stratified by Republican and Democratic state trifecta status with Congressional District:** (1) US Congressional Representative political ideology score (A, E); (2) per cent of persons below poverty (B, F); (3) median household income (C, G); and (4) Index of Concentration at the Extremes for Racialized Economic Segregation (D, H).

mortality rates remained even after adjusting for the CD social metrics (*Model 2*) for: (a) political ideology scores and votes on the COVID-19 bills (elevated risks 20–40% higher), and (b) Republican versus Democratic trifecta (relative risk = 1.35; 99% CI: 1.24, 1.47). In *Model 4*, which additionally mutually adjusted for all political metrics and vaccination rates, both Republican trifecta and voter political lean remained positively and significantly associated with a higher COVID-19 mortality rate. For trifecta status, the rate was 11% higher (99% CI: 1.00, 1.23); for voter political lean, it was 26% higher (95% CI 1.19, 1.33). Further adjustment for baseline diabetes and obesity rates (*Model 5*) modestly attenuated these associations, with the voter political effect remaining significant at the 99% confidence level.

By contrast, total hospital ICU capacity rates (Fig. 4) were not associated significantly with the political ideology score for the House of Representatives, their votes on the COVID-19 relief bills, or voter political lean, in either the bivariate analyses (*Model 1*) or in analyses that adjusted for the social covariates and political metrics (*Model 3*), but were associated with a significant 1.5 to 5.4 percentage point increase in models that adjusted solely for the CD social metrics (*Model 2*). Republican versus Democratic trifecta was significantly associated with increased ICU occupancy in *Models 1–3*, and with average US Senator ideology score across all four models. For the state trifectas, the increase ranged from 3.2 percentage points (99% CI: −1.8, 8.2) in the fully adjusted analyses including all variables other than baseline diabetes and obesity prevalence (*Model 4*) to 11.8 percentage points (99% CI: 8.2, 15.4) in the model adjusting for the social metrics (*Model 2*); for the average US Senator ideology score, the significant increase ranged between 4.2 percentage points (99% CI: 2.8, 5.6) in bivariate analyses (*Model 1*) to 3.5 percentage points (99% CI: 1.4, 5.5) in *Model 4*. Additional adjustments for baseline diabetes and obesity rates (*Model 5*) increased the magnitude of these associations.

Finally, scatter plots in Fig. 5, show positive relationships, within all state trifecta categories, of COVID-19 deaths per 100,000 person-years by US Congressional Representative political ideology score (Supplemental Table 3 provides scores by location and name of the elected officials) for both the Delta (April 2021–November 2021) and Omicron waves (December 2021–March 2022).

Discussion

Our descriptive cross-sectional study provides novel evidence – using a fundamental unit of US political geography rarely employed in population health research: the Congressional District – of strong

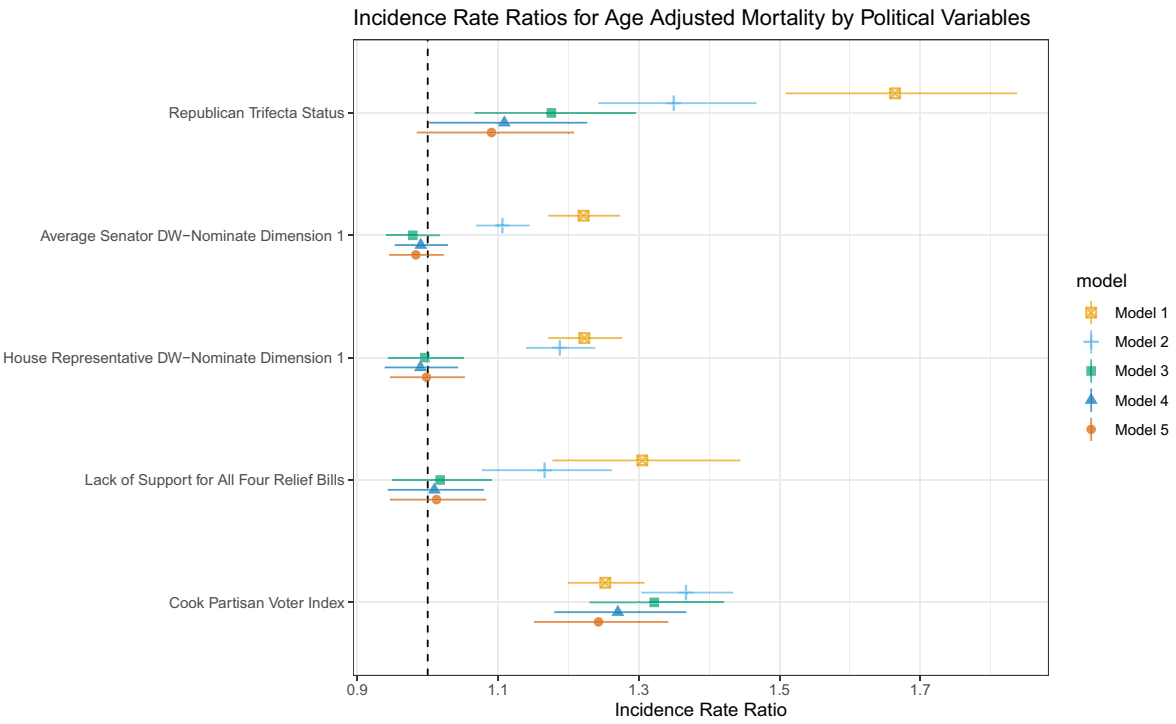

***Fig. 3*: Model results for 435 US Congressional Districts, April 2021–March 2022 for COVID-19 age-standardized mortality rates for:** *Model (1)*: bivariate analyses with each political metric* (Representative political ideology score; Representative votes on COVID-19 bills; US Senator average political ideology score; State-level trifecta; and voter political lean); *Model (2)*: each political metric adjusted for population and social metrics (median age; log population density; percent below poverty; Index of Concentration at the Extremes for racialized economic segregation; Social Vulnerability Index for "minority status and language"); Percent Black; Percent Asian; Percent Hispanic; Percent American Indian/Alaska Native; and *Model (3)*: Model 2 plus additionally mutually adjusting for the political metrics; *Model (4)*: Model 3 plus additionally mutually adjusting for average vaccination (2+ doses) in adults 18+ during April 2021–March 2022; *Model (5)*: Model 4 plus additionally mutually adjusting for CD percentage of adults diagnosed in 2017 with diabetes and CD percentage of adults diagnosed in 2017 with obesity. Results show the coefficient estimates and 99% confidence intervals.

relationships, when all US adults were eligible to be vaccinated, of both COVID-19 age-standardized mortality rates and stress on hospital ICU capacity rates with elected representatives' political ideology and votes at the US federal level, political party control for States, and voters' political lean. Specifically, the higher the exposure to conservatism on each political metric (political ideology of US federal elected representatives in the House or Senate, their lack of support for 4 COVID-19 relief bills, and Republican trifectas), the higher the COVID-19 age-standardized mortality rates, even after taking into account the districts' social characteristics, voters' political lean, and vaccination rates. Similar patterns occurred for the relationship of stress on hospital ICU capacity with Republican trifectas and US Senator political ideology scores. Additionally adjusting for baseline diabetes and obesity prevalence (potentially confounders or mediators of sociopolitical context) only marginally attenuated the associations of the political metrics with COVID-19 mortality and increased their associations with hospital ICU capacity. To our knowledge, no other population health studies, in the US or other countries, have jointly employed this range of types and levels of political metrics, whether in relation to COVID-19 or other health conditions.

A key limitation of our study is that it is a descriptive, not causal, analysis. The novel patterns of relationships that we report, however, between exposure to conservatism and elevated COVID-19 mortality rates and health care strain constitute a critical and necessary starting point for more detailed investigations designed to determine if the observed associations – linking contextual political variables that can be measured only at the CD level or State-level to the specified pandemic outcomes – reflect true causal relationships, confounding, or diverse types of bias. Guarding against confounding, our analyses included diverse social, economic, and health covariates associated with the COVID-19 burden.[2,4,12,18,19] Our modelling approach investigated each political metric separately and also mutually adjusted for each other, and took into account not only COVID-19 vaccination rates but

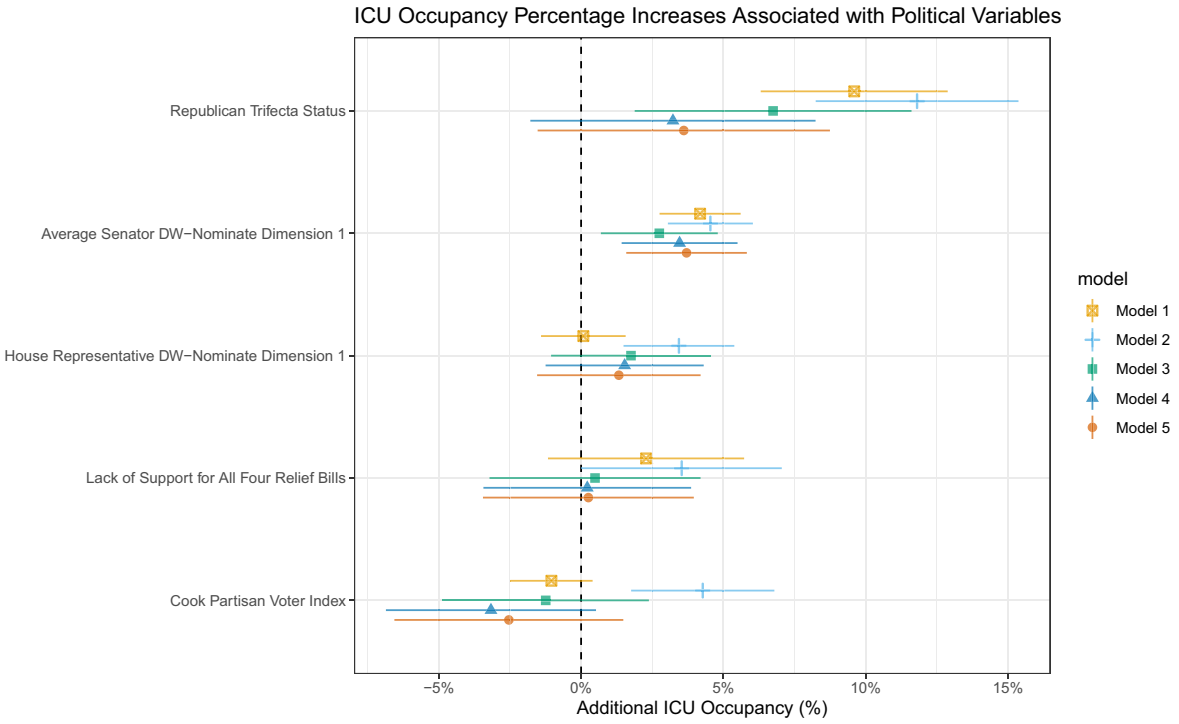

Fig. 4: **Model results for 435 US Congressional Districts, April 2021–March 2022 for average hospital ICU capacity for:** *Model (1)*: bivariate analyses with each political metric (Representative political ideology score; Representative votes on COVID-19 bills; US Senator average political ideology score; State-level trifecta; and voter political lean); *Model (2)*: each political metric adjusted for population and social metrics (median age; log population density; percent below poverty; Index of Concentration at the Extremes for racialized economic segregation; Social Vulnerability Index for "minority status and language"); Percent Black; Percent Asian; Percent Hispanic; Percent American Indian/Alaska Native; *Model (3)*: Model 2 plus additionally mutually adjusting for the political metrics; *Model (4)*: Model 3 plus additionally mutually adjusting for average vaccination (2+ doses) in adults 18+ during April 2021–March 2022; *Model (5)*: Model 4 plus additionally mutually adjusting for CD percentage of adults diagnosed in 2017 with diabetes and CD percentage of adults diagnosed in 2017 with obesity. Results show the coefficient estimates and 99% confidence intervals.

also baseline data on population prevalence of diabetes and obesity, with the latter plausibly serving as mediators (not just confounders) of pre-COVID socio-political context.[2,4]

Supporting our choice of political metrics, the speed of COVID-19 spread supports the use of temporally concurrent political metrics.[2,12,18,19] Future analyses, however, could analyze the pandemic (and other health) impacts of both temporal stasis and change in political ideology scores, state trifecta status, voter political lean, and also public health investment by the states.[4,15,16] Second, data on state trifecta status has no measurement error, and data on voter political lean (measured only among those who vote) relies on official election counts (for which evidence of inaccurate counts is minimal[4,16]). Third, although different vote-based metrics of elected officials' political ideology may exhibit some variation in the rank ordering of the politicians, they are based on actual votes, not subjective views.[15] Fourth, while average vaccination rates over time periods do not capture temporal dynamics,[19] we employed vaccination data from administrative records, not self-report data.

With regard to study outcomes, we employed data on all COVID-19 deaths (underlying) reported to CDC. The most likely bias would be an undercount of deaths, due to a lack of testing for COVID-19, with this undercount plausibly higher in states with a weaker public health infrastructure.[2,12] If so, such an undercount would deflate our risk estimates, since states with weak public health infrastructure rank more highly on conservative ideology.[2,4] Reporting of hospital occupancy data may be subject to the same bias, thereby yielding deflated, not inflated, risk estimates. A larger concern pertains to potential measurement error induced by needing to use dasymetric methods to convert data reported solely at the county-level into CD estimates.[21,22] The consequent lack of precision induced by this measurement error would likewise bias risk estimates to the null, and we have no *a priori* reason to expect there would be differential error in generating estimates by CD

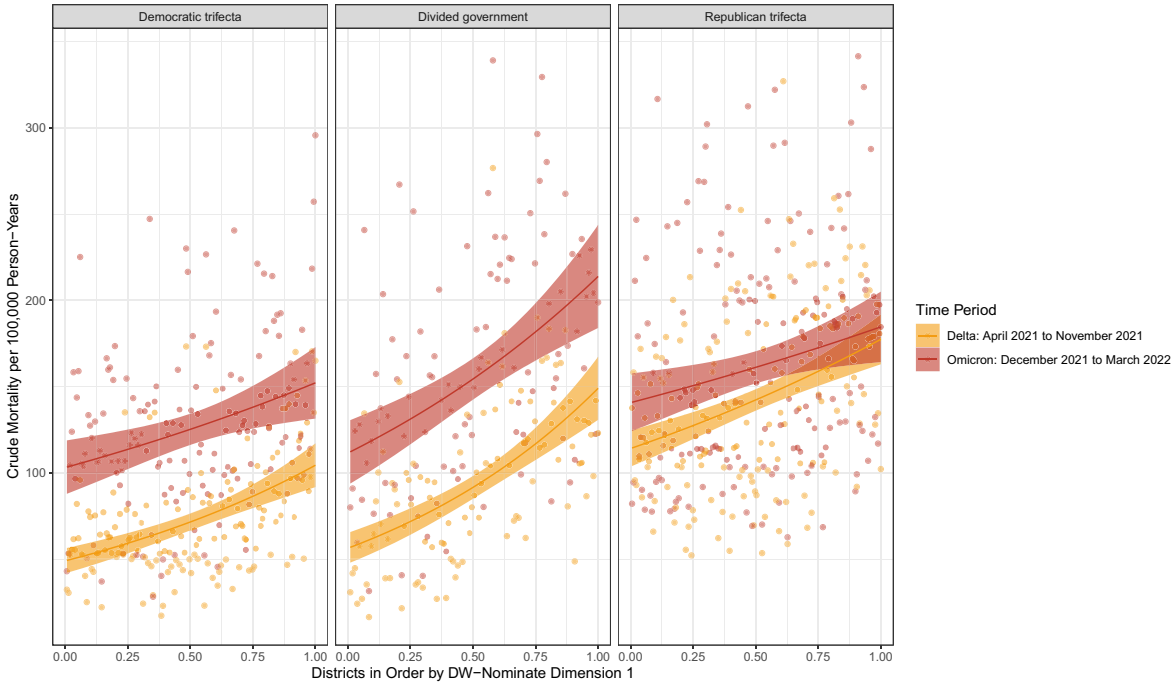

Fig. 5: **COVID-19 deaths per 100,000 person-years for the 435 US Congressional Districts:** ranked by Representative political ideology score for the Delta wave, April 2021–November 2021, and Omicron wave, December 2021–March 2022, stratified by State trifecta status (Democratic: 14 states, with 151 Congressional Districts; Divided: 13 states, with 107 Congressional Districts; Republican: 23 states, with 177 Congressional Districts).

ideology. The net implication is that our estimates of the association between the study's political metrics and health outcomes are most likely underestimates, and not inflated.

Further suggesting our results are plausible is the very small body of US research analyzing population health outcomes – focused on COVID-19, cancer incidence and mortality, other mortality, and opioid prescribing – by US CD, albeit noting that none of these studies included any measures of elected officials' political ideology, alone or in conjunction with state trifecta status or voter political lean.[4,5,21,22,25,26] This research demonstrates that health inequities detected with CD data are, not surprisingly, on par with those observed using county-level data. US research has likewise documented associations of state trifectas and extreme gerrymandering (boundaries drawn to ensure political lean) with policies pertaining to obesity, environmental protection, gun control, and other public health measures.[4,27] Other descriptive research, specific to COVID-19, has documented that the presence of a unified State-level government (i.e., trifecta) increased the likelihood of being disbursed federal COVID American Rescue Plan Act 2021 funds,[10] and that from the beginning of the pandemic, US Congressional representatives have consistently used their newsletters to communicate their views about the pandemic.[11]

Additional descriptive research, at the state and national level in the US, and also in other countries, has documented how political polarization, whether measured by voter political lean, policies passed, or rhetoric deployed, has undermined effective pandemic response.[2–4,7–9,28] Thus, likely mechanisms causally connecting the range of political variables examined in our study to pandemic impacts plausibly include the roles of federal and state politicians in (a) obtaining and disbursing resources for, and passing or blocking legislation supportive of public health infrastructure, pandemic preparedness, and medical care; (b) facilitating or hindering the range of actions and resources state and local public health departments can deploy; and (c) communicating with, shaping, and responding to the views of their political funders and constituents.[2–4,7–11,28,29] In the case of COVID-19, the salience of overall political ideology, as reflected in the total record of votes, and not solely COVID-19 votes, and also state-level concentrations of party political power, is that the politics of COVID-19 have become bound with ideological arguments over fiscal policies, social programs, personal freedom, and the extent to which governments can impose mandates on the behaviours of both the private sector and individuals in order to protect the population's health.[2–4,7–11,28,29]

Together, our study findings underscore the critical importance of analyzing and monitoring population

health mapped onto meaningful units of political geography and using informative political variables that can aid ascertainment of political accountability. Such data serve a different purpose for monitoring population health and other characteristics compared to more stable administrative geographic units, such as census tracts, which in the US were expressly created in the early 20th century CE to overcome problems with instability of geographic units for population data due to reliance on frequently changing and gerrymandered ward boundaries.[30] At issue instead is providing data relevant to informed democratic governance, which requires enabling monitoring improvements, declines, or stasis of population health and health inequities over time in relation to key units of political geography, political ideologies, and concentrations of party political power, which in the US requires attention at both the federal and state-levels.

It could accordingly be useful for US data dashboards that routinely report population health data by county to do likewise by US CDs and, by extension, state and local political districts as well, in conjunction with metrics pertaining to the political ideology of the elected representatives (based on voting records) and the concentration of political power at the state-level (i.e., trifecta). Analogous approaches could be implemented in other countries in relation to their relevant units of political geography and metrics of political ideology and power. Finally, from a policy standpoint, our study and kindred research highlight the necessity of engaging with the politics of health, which is distinct from being "partisan."[2–4,8,28–30] Instead, what is needed is ongoing monitoring and rigorous analysis of the connections between the actions and votes of elected officials and the health profiles of their constituents and the total population.

Contributors

NK led the conceptualization of the project and drafted the paper; CT obtained and analyzed the data, with assistance from JTC and AM, and CT and JTC have both directly accessed and verified the underlying data reported in the manuscript; WPH and AM contributed to identifying variables needed for the analyses; and all authors contributed to conceptualizing the paper, interpreting the data, revising the draft for important intellectual content, and have approved the final version for submission and agree to be accountable for all aspects of the work.

Data sharing statement

All data employed in this study are publicly accessible at the URLs provided in Supplemental Table 1.

Editors' note

The *Lancet* Group takes a neutral position with respect to territorial claims in published maps and institutional affiliations.

Declaration of interests

WPH has received compensation for expert witness testimony on the course of the pandemic and received stock options in BioBot Analytics. No authors have any competing interests or conflicts of interest to declare.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.lana.2022.100384.

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