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The Link between Democratic Institutions and Population Health in the American States

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Abstract

Context: This project investigates the role of state-level institutions in explaining variation in population health in the American states. Although cross-national research has established the positive effects of democracy on population health, little attention has been given to subnational units. We leverage a new dataset to understand how political accountability and a system of checks and balances are associated with state population health.

Method: We estimate error correction models and two-way fixed effects models to estimate how the strength of state-level democratic institutions are associated with infant mortality rates, life expectancy, and midlife mortality.

Findings: We find that institutions that promote political accountability are related to lower infant mortality across the states, while those that promote checks and balances are associated with longer life expectancy. We also find that policy liberalism is associated with better health outcomes.

Conclusions: Subnational institutions play an important role in population health outcomes and more research is needed to understand the linkage between democracy and health. We are the first to explore the link between democratic institutions and population health within the United States contributing to both the social science literature on the positive effects of democracy and the epidemiological literature on subnational health outcomes.

Keywords Democracy, American states, institutions, population health, representation

Epidemiologists document significant variations in health trends across the American states. For instance, several US states' life expectancies have decreased since 2010, but the largest decreases occurred in New Hampshire, Kentucky, Maine, Ohio, West Virginia, South Dakota, New Mexico, Utah, Indiana, Mississippi, and Tennessee (Woolf and Shoomaker 2019). Other states did not experience decreases in life expectancy and 13 states showed a marked increase

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(Woolf and Shoomaker 2019). When ranked across 39 different health outcomes, Mississippi, Alabama, Louisiana, and Kentucky are frequently among the least healthy states while Utah, Massachusetts, Hawaii, and Connecticut tend to be at the top (Woolf et al. 2016). The pattern of poorer health in the southern states is evident across a wide range of measures of health and well-being (Wilmoth et al. 2011) and the gap in adult mortality between the southern states and the healthier regions has widened considerably over time (Fenelon 2013). Furthermore, areas with lower levels of educational attainment have seen the dramatic rise in deaths of despair from drug overdoses and suicides (Case and Deaton 2020) These geographic patterns are consequential. By one estimate, as much as 50% of the life-expectancy gap between the United States and other high-income countries between 1980 and 2000 is attributable to the growing subnational variations in health (Wilmoth et al. 2011).

Scholars typically focus on three main approaches to explain these geographic patterns: a behavioral risk factors approach (Elo et al. 2019; Fenelon and Preston 2012; Woolf and Shoomaker 2019), a health systems approach (Finkelstein et al. 2012; Van Der Wees et al. 2013; Sommers et al. 2012), and an economic approach (Case and Deaton 2020; Monnat and Picket 2011; Pickett and Wilkinson 2015; Ruhm 2019). Despite a growing recognition that politics matters (e.g., Dawes 2020; Gamm and Kousser 2021; Greer et al. 2017), political approaches are largely absent from the literature looking at health outcomes across the American states.

We take an explicit political approach and focus on institutions that relate to the "rules of the game" that are arguably antecedent to commonly studied components of health. We estimate various models looking at the association of two continuous measures of democracy in the American states, *political accountability* and a *system of checks and balances*, and composite measures of state health outcomes over time. We find modest support for the hypothesis that

stronger democratic institutions are associated with better population health in the American states. Our models suggest that institutions that promote political accountability are related to lower infant mortality across the states while institutions that promote a system of checks and balances are related to higher life expectancy. We find additional evidence that liberal policies are correlated with improved health outcomes, although public policy does not fully account for the associations between democratic institutions and population health. Finally, additional analyses suggest that these results are largely immune to the addition of downstream effects, such as smoking behavior, health insurance, and economic inequality.

Our paper responds to recent calls by epidemiologists and medical sociologists to "scale-up" analyses of health-place relationships and consider how wellbeing is related to political conditions at the macro level (Bambra, Smith, and Pearce 2019; Gagnon et al. 2017). Our findings also contribute to the emerging literature on "public health political science" (Fafard & Cassola 2020). By providing comparative analyses of the American states, our findings point to the importance of the political context in understanding population health outcomes. The broader implication of our work is that healthy communities depend on the abundance of democratic institutions.

A Political Approach to Studying Subnational Population Health Outcomes

Studies find that democracies have longer life expectancy (Patterson and Veenstra 2016; Wigley and Akkoyunlu-Wiggley 2011), lower infant and child mortality (Okada 2018) and rates of parasitic disease (Thornhill et al. 2009), and higher levels of self-rated health (Krueger, Dovel, and Denney 2015) compared to non-democracies. Because of these studies the World Health Organization now views "effective governance" as a key social factor of health outcomes around

the world (Kickbush and Gleicher 2012). The COVID-19 pandemic has only flamed the interest in understanding how democracy is related to public health outcomes (Alon et al. 2020).

Whether democratic institutions help explain population health outcomes across the American states remains an open question. We might not immediately expect for the positive association between democratic institutions and health to generalize to the subnational level. Comparative health studies often measure democracy using a dichotomous indicator taken from the Polity IV or Freedom House dataset (Navarro et al. 2006). Other studies look at democratization (Mackenbach and Hu 2013), conflict (Iqbal 2010), corruption (Achim and Borlea 2018), and length of time a country has been a democracy (Keefer 2007). Regime type, levels of conflict or corruption, and the age of democratic governance are all non-factors within the American context. The variations in democratic institutions that do exist across the American states may be too small to contribute to geographic variations in population health.

At the same time, the vast literature in state politics shows that even slight variations in democratic institutions can lead to meaningful differences in policies and outcomes. To give one example, states with the initiative process tend to have lower taxes and spend less compared to states without the initiative process (Matsusaka 2018). Direct democracy also matters for social policies including parental abortion notification and capital punishment (Gerber 1996), same-sex marriage bans (Lewis 2011), and minority rights policies (Gerber & Hug 2002). And, in the last decade, progressive activists have been able to utilize the ballot initiative to pass their priorities on gun control, marijuana legalization, and minimum wage increases (Ferraiolo 2017). Given that liberal policies are associated with improved citizen health (Montez et al. 2020), the influence of state institutions such as the ballot initiative might well be associated with geographic trends in health.

Democratic institutions also precede public policies that are likely to impact variations in the commonly studied determinants of health. Political choices are "the causes of the causes of the causes of geographical inequalities in health" (Bambra et al. 2019 38). By having a fuller understanding of the political forces that are associated with health outcomes, public health scholars can "conduct more realistic research and evaluation," anticipate opportunities and constraints on governmental action, and "design more effective policies and programs" (Oliver 2006 195).

We focus on two concepts related to democratic institutions: political accountability and checks and balances. These concepts have origins in the vast political science literature on institutional variations across the American states as well as in studies on the global variations in health.

Political Accountability

A key difference in institutional design across the American states is the extent to which elected officials are held accountable. Institutions structure influence of public demands on elite behavior both during campaigns and while in office. Campaign finance laws (Barber 2016; La Raja and Schaffner 2015) and expansive voter registration laws (Mitchell and Wlezien 1995; Wolfinger, Rosenston, and Rosenstone 1980), for instance, force ambitious politicians during campaigns to look beyond small coalitions of support and appeal to the broader public. Stricter campaign finance rules also reduce the effect of moneyed interests by theoretically shifting the balance of power closer to the public. While in office, certain institutions, like ballot initiatives and popular referendum, allow citizens to directly communicate preferences to elites (Gerber 1996; Matsusaka 2018). There is evidence that elites adjust their positions to align with the

majority after high-profile popular vetoes (Kogan 2016; Kousser et al. 2007). Finally, differences in staffing, pay, and office resources influence the extent to which legislators learn about conditions in their district (, Maestas 2000; Squire 1993); some states have professionalized legislatures—which aid in direct contact with constituents—while others do not.

The comparative health literature suggests that one reason democracies boast better health outcomes is because of increased accountability structures. The argument here is that when accountability pressure is high, politicians are forced to respond to a larger electorate by enacting more inclusive policies that are protective of marginalized populations (Acemoglu and Robinson 2006), which leads to better health outcomes. Patterson and Veenstra (2016) find that countries with higher levels of public deliberation have lower infant mortality rates compared to countries that limit public input. Gamm and Kousser (2021) argue that electoral pressure generates incentives to improve general public health and welfare. Similarly, Case and Deaton (2020) argue that the growth of deaths of despair are at least partially driven by the disproportionate influence of moneyed interest in American politics weakened the electoral connection between working class citizens and political elites.

At the same time, we might expect for accountability institutions to increase public input at the expense of equity—particularly in the American case where the government is most responsive to wealthy citizens (Gilens and Page 2014) who are healthy (Pacheco 2021). A government that is too responsive to majoritarian opinion may be able to achieve electoral success without contributing to the overall well-being of the electorate. Analyzing institutional reforms in New York towns, Sances (2016), for example, finds that elected property assessors showed more bias against low-income residents compared to appointed property assessors. Similarly, despite increased political engagement by black residents and a larger number of

elected black officials, Mississippi remains primarily responsive to statewide majority white opinion (Grogan and Park 2017; Jones 2019). In Mississippi's case, accountability structures might actually undermine population health outcomes by enhancing the political voice of white residents who are less favorable toward expansive health policies.

A System of Checks and Balances

Distinguishable from political accountability, institutions related to a system of checks and balances also vary across the American states. Here, we are primarily interested in what Lijphart (1999) refers to as consensus-oriented institutions. When power is distributed more across separate branches of government, policy change requires a larger coalition of actors to succeed. For example, professionalized legislatures have a higher capacity to develop legislation and oversee other branches of government (Maestas 2000; 2003). Legislatures with low levels of professionalism may be reliant on outside interests or the executive branch for policy solutions (Jansa et al 2019). When house speaker power is high, the lower house can act in a more unified and coherent manner to other political actors (Clucas 2001; Mooney 2013). Similarly, governors also see significant variation in their ability to influence policy change. In some states, bureaucrats are appointed by the governor, which enables the executive branch to conduct extensive oversight (Dometrius et al 2013) and produce new regulations and policies (Beyle 1968), while in other states, power is more concentrated in the legislative branch.

States with rules that simultaneously empower both branches of government are expected to have policies that better reflect a range of governing actor interests, which may be associated with better population health outcomes, since deliberations over optimal solutions force disparate interests to reach consensus. These types of rules also prevent on actor from unilaterally

proposing legislation, which matters for health. For instance, countries with institutions that restrict the decision latitude of a unilateral actor had lower infant mortality compared to countries without this system (Patterson and Veenstra 2016). Consensus-oriented institutions are also associated with higher life expectancy (Patterson 2017).

On the other hand, a strong system of checks and balances might also lead to significant gridlock, which may be detrimental to public health. By increasing the size of the coalition needed to pass legislation, checks and balances could slow down/stop the ability to move the status quo (Tsebelis 1995). With sufficiently strong veto actors, a motivated minority may be able to block policies that would benefit the broader population, as Immergut (1990) finds in the case of medical groups that blocked reforms to Switzerland's healthcare system. If a governing actor with veto power is captured by special interests, a small group may be able to block change to protect its own interest. Even without special interest capture, Crepaz (2001) finds systems with separated powers tend to reduce the ability of the state to implement redistributive policy. A strong checks and balance system may hamper the creation of redistributive or welfare policies needed to address public health concerns.

To summarize, we argue that democratic institutions within the American states—particularly political accountability structures and a system of checks and balances—are potentially important factors related to geographic health outcomes. Yet, the divergent literatures from comparative political science and population health lead us to opposite expectations. Strong political accountability structures may be related to better population health, but may also lead to perverse health outcomes. While a strong checks and balance system suggests that policy change must have broad consensus (which could benefit general welfare), it also increases opportunities for a small group to stop policy change. Further complicating this story is a question of whether

the status quo is desirable. If the status quo improves population health, then a robust checks and balance system may preserve an optimal policy, but if the status quo is sub-optimal it will also be difficult to move. Overall, we do not have a clear expectations for the association between either political accountability or a system of checks and balance system and population health outcomes in the states.

Measuring Democratic Institutions in the Fifty States

We use subnational democracy scores developed by LaCombe (2021). LaCombe uses a Bayesian exploratory factor analysis on state institutional and electoral data from 1975-2016 to identify two democratic institutions across the states: *accountability pressure* and *checks and balances*.[1] Institutions related to accountability pressure include those that affect state elections (e.g., campaign finance regulations, voter registration laws, etc.) as well as those that affect the pressure for elected officials to respond to constituents (the ballot initiative, legislative professionalism, term limits, etc.).[2] The checks and balances measure includes institutions that affect the relative power of different branches of government (speaker power, gubernatorial power, veto override rules, etc.).[3] The measures are standardized with a mean of 0 and are normally distributed. Higher scores indicate a stronger accountability structure and a stronger

[1] See LaCombe 2021 for more details on both the data collection process and measurement strategy.
[2] LaCombe combines the first two dimensions because they are parts of the same underlying concept of accountability, but as a robustness check we have replicated all models in the Online Appendix with the disaggregated accountability pressure scores (see Online Appendix). Inferences are largely unchanged.
[3] While some institutions included in this concept are picking up on the size of the gridlock interval (Krehbiel 1996), most of the institutions in this measure refer to the distribution/concentration of power rather than negative agenda control. The chief contributing institutions to the measure, including legislative professionalism, ballot initiative, and gubernatorial power may increase policy making activity in the states as citizens can effectively use the threat of initiatives to force legislative action (Gerber 1996; LaCombe and Boehmke 2021). To test if the checks and balance system is associated with less policy change, we correlated this measure with Boehmke et al's measure of policy innovation across 800 state policies. We find a small, negative correlation (-.05). This suggests that checks and balances are not associated with rates of policy adoption and if anything decrease the probability of innovations.

checks and balance system. Descriptive statistics are included in Table 1. In a multivariate analysis these scores are unrelated to state income per capita and the percentage of the population with at least a bachelor's degree, which helps alleviate fears of a spurious relationship between institutions and health.

[Table 1 about here]

Measuring Population Health Outcomes in the Fifty States

We use three common outcomes to characterize health across the fifty states: infant mortality from 1995 to 2016, life expectancy at birth from 1975 to 2016, and midlife all-cause mortality from 1999 to 2016. Infant mortality rates come from the CDC's National Center for Health Statistics (Ely and Driscoll 2021), while life expectancy at birth and midlife all-cause mortality come from Woolf and Shoomaker (2019). Infant mortality is the rate of death of an infant before his or her first birthday per every 1,000 live births. It is calculated by taking the number of infant deaths per state year and dividing by the number of live births per state year. Life expectancy at birth is an estimate of the number of years a newborn is predicted to live based on period life table calculations (see Woolf and Shoomaker 2019 for more details). Midlife mortality refers to the death rate of adults aged 25 to 64 years per 100. Figures A2-A5 in the Online Appendix show variation across states on these measures; descriptive information is shown in Table 1. ANOVA analyses confirm significant variation at both units of analyses with 28%, 64%, and 5% of the variance occurring within states for infant mortality, life expectancy, and midlife mortality. This descriptive information is helpful for determining our empirical strategy as we describe in the next section.

Methodological Approach

There is complexity in estimating models that account for both unit heterogeneity and autocorrelation for cross-sectional time series data (see Beck and Katz 1995; 2011). Proper identification of the modeling strategy requires an understanding about the source of variation in the dependent and independent variables as well as the limitations of the data. As we have already indicated in the ANOVA analyses, the source of variation for the dependent variables differs with some variables (life expectancy) having a majority of variance between states and others (mortality) having a majority of variance within states. We have data for all three outcomes for all 50 states (N=50), but for infant mortality there are 22 years (T=22), for life expectancy there are 41 years (T=41), and for mortality there are 18 years (T=18). In all cases, T is large enough to capture dynamic patterns and asymptotics exist in both N and T (see Wooldridge (2010) for more information). Our measures of political accountability and a system of checks and balances also vary across time (35% and 27% of the variance is within states, respectively), although they are sluggish and slow to change (Plumper and Troeger 2007).

Beck and Katz (2011) advise analysts to first model the dynamics appropriately before dealing with cross-sectional issues because correctly modeling dynamics may eliminate the need for unit fixed effects. To this end, Fisher-type unit root tests based on an augmented Dickey-Fuller test indicate that the null hypothesis that all panels contain unit roots can be rejected for life expectancy, but not for infant mortality or midlife adult mortality. The correlation between all three variables and lagged values is high.[4]

[4] The correlation between infant mortality$_t$ with infant mortality$_{t-1}$, infant mortality$_{t-2}$, and infant mortality$_{t-3}$ is .87, .86, and .86, respectively. The correlation between life expectancy$_t$ with life expectancy$_{t-1}$, life expectancy$_{t-2}$, and life expectancy$_{t-3}$ is .99, .99, and .98, respectively. The correlation between mortality$_t$ with mortality$_{t-1}$, mortality$_{t-2}$, and mortality$_{t-3}$ is .99, .98, and .97, respectively.

A major concern with time series cross sectional data is that systemic factors (e.g., national level policies) or unit specific forces (e.g., state economics) that are not included in the model lead to omitted variable bias. Systemic factors can be controlled away with variables that capture time trends while unit fixed effects account for unit heterogeneity. These solutions are atheoretical and may lead to an over-parameterization of the model (Achen 2005). There is also concern that including unit fixed effects with a LDV creates biased estimates (e.g, Nickell 1981) although others suggest this bias is small when *T* is greater than 5 (Beck and Katz 2011). Still others advise against unit fixed effects when the researcher wishes to include unit-invariant covariates or predictors that change gradually over time (Clark and Linzer 2015). In these cases, a random effects estimator may be preferable, even in the presence of bias, to reduce variance (Clark and Linzer 2015). The larger point is that alternative model specifications often lead to drastically different conclusions (Wilson and Butler 2007) and, in the absence of perfect theory and data, it is difficult to decide which model specification is closest to the "truth."

We report results using multiple model specifications. First, we model the dependent variables as the 1-year *difference* and include a lagged dependent variable (LDV) to correct for autocorrelation (Beck and Katz 1995).[5] More specifically, we estimate an Error Correction Model (ECM) with panel corrected standard errors. Modeling our dependent variables as first differences has two benefits. First, these types of models essentially purge the regression of any unobserved state-specific fixed effects. ANOVA analyses on the differenced dependent variables confirm that virtually all the variation is within states (99%, 98%, and 95% for differenced infant mortality, differenced life expectancy, and differenced midlife mortality). Second, we are able to

[5] The correlation between *differenced* infant mortality$_t$ with infant mortality$_{t-1}$, infant mortality$_{t-2}$, and infant mortality$_{t-3}$ is -.49, .009, and .03, respectively. The correlation between *differenced* life expectancy$_t$ with life expectancy$_{t-1}$, life expectancy$_{t-2}$, and life expectancy$_{t-3}$ is -.26, .08, and .09, respectively. The correlation *differenced* between mortality$_t$ with mortality$_{t-1}$, mortality$_{t-2}$, and mortality$_{t-3}$ is -.16, .11, and .13, respectively.

allow for the possibility that the treatment effect of democratic institutions on health requires some extended period of time. An ECM allows for the estimation of both short and long-term effects of independent variables and tells us how quickly the system returns to equilibrium or the overall mean after being disrupted. Since both of our democratic variables are time varying, we include differenced and lagged versions.[6] We also include fixed effects of year to capture common trends. For these dynamic models, we decide against state fixed effects because the differenced outcomes are already purged of the between state variation and because our main independent variables, while dynamic, are slow to change (see Clark and Linzer 2015). [7]

Not including state fixed effects, however, may result in biased coefficients due to an omitted variable. It is possible that some unobserved factor impacts both democratic institutions and population health outcomes. As a result, we present a second set of models that attempt to describe the between state association of democratic institutions and population health outcomes. This type of model specification is especially important to include for dependent variables when the majority of the variance is between units as is the case for midlife mortality. For these models, the estimates of the effect of democratic institutions are contemporaneous and non-time varying. We still control for common time trends by including fixed year effects.

We initially present models without extensive control variables since we argue that democratic institutions set up the "rules of the game," which likely impact the public policy process and the types of policies that are enacted. Policies in turn impact commonly studied correlates of state health including behavioral risk factors (such as percent smoking or obesity),

[6] The coefficient on the differenced independent variable gives the short-term effect on the dependent variable, while the coefficient on the lagged independent variable gives the long-term effect on the dependent variable. To get the estimated short-term effect of a unit change in X, we simply multiply this effect with the coefficient on the differenced independent variable. To get the estimated long-term effect of a unit change in X, we divide the coefficient by the error correction rate and then multiple it by a unit change in X (see De Boef and Keele 2008).
[7] We also footnote when inferences change with the inclusion of state fixed effects for the dynamic models.

health systems (such as percent insured), and economic conditions (such as educational attainment and income inequality). Empirically, our first step is to determine whether an association exists between democratic institutions and population health outcomes. Including factors that are causally subsequent to and likely correlated with these democratic institutions prevents us from identifying these direct associations (see for instance, Achen 2005; Lenz & Sahn 2021).

Results: Democratic Institutions and State Population Health Outcomes

Table 2 shows the results from estimating an ECM with panel corrected standard errors on the first differences of infant mortality, life expectancy, and midlife mortality. Table 3 presents the results from two-way fixed effects models. We begin with the dynamic model in Table 2. Recall that the coefficient on the LDV gives the error correction rate with a value closer to zero indicating a slow return to equilibrium. As shown in Table 2, the coefficient on the LDV for infant mortality, life expectancy, and adult mortality is -.185, -.008, and -.002, suggesting that the three population health outcomes are slow—and in some cases very slow—to return to equilibrium when disrupted.

[Tables 2 and 3 about here]

Turning to the coefficients shown in Table 2, there is modest empirical support that stronger democratic institutions are associated with improved population health in the states. Results suggest that as political accountability increases, infant mortality decreases, however, this association takes time to materialize. The model predicts that a .77 increase in political accountability (which is roughly two standard deviations above the mean change) *is associated with decreases* in infant mortality rate by .21 (e.g., (.77/.185)*-..05), although this association is

distributed gradually over the long run. The coefficient on political accountability fails to reach statistical significance in all other instances.

Table 2 also shows that a system of checks and balances is related to state health outcomes. Specifically, the model predicts that as a system of checks and balances increases, both infant mortality and adult mortality decrease and life expectancy increases. There is variation in how long it takes the effects to materialize. The model predicts that a .65 increase in a system of checks and balances (which is roughly 2 standard deviations about the mean change) is associated with a *decrease* in the infant mortality rate by .52 (e.g., (.65/.185)*-.15), an *increase* in life expectancy by 2.28 years (e.g., (.65/.008)*.028), and a *decrease* in the adult mortality rate by 429 (e.g., (.65/.002)*-1.319) although these relationships are distributed gradually over the long run. The model does not predict any immediate effects of checks and balances on population health outcomes.[8]

None of these estimated effects are trivial. To put these numbers in perspective, in 2018, there were 3.79 million live births in the US although this varied across states (CDC 2020). A deduction by .21 and .52 in the infant mortality rate would equate to roughly 21 and 52 fewer infant deaths for every 100,000 annual live births, respectively. Likewise, in 2018, there were approximately 164 million people aged 25-64 living in the United States (Census Bureau's American Community Survey). A deduction of 429 in the all-cause mortality rate adults aged 25 to 64 is a substantively large effect. US life expectancy reached 78.7 years in 2018; an increase by 2.28 years would also be significant.

[8] The coefficient for both versions of the political accountability measure remains statistically significant with the addition of state fixed effects for infant mortality (β= -.53* for differenced version; β= -.88*** for lagged version). The coefficients for a system of checks and balances for life expectancy and mortality fail to reach statistical significance with the inclusion of state fixed effects.

Table 3 provides additional empirical evidence of an association between democratic institutions and population health outcomes in the states. Recall that the model presented in Table 3 is a two-way fixed effects model and controls for heterogeneity across states and time. As shown in Table 3, political accountability is associated with infant mortality and midlife mortality and checks and balances is associated with life expectancy and midlife mortality. Substantively the model predicts that for every unit increase in political accountability structures, there is an associated .711 decrease in infant mortality and 13.9 decrease in midlife mortality. Likewise, a unit increase in institutions that promote checks and balances leads to a .376 increase in life expectancy and 18.18 decrease in the all-cause mortality rate among residents aged 25-64.

Liberal Policy as an Intermediate Factor

Above we find moderate support that political accountability structures and a system of checks and balances are associated with population health outcomes in the American states. We suspect that if democratic institutions improve citizen health it is likely because they create environments that promote certain types of policies. Liberal policies, like regulations on unhealthy behaviors, laws that expand access to and affordability of healthcare, and redistributive policies that provide a wider social safety net, are associated with improved citizen health (Montez et al. 2020). Can these policies help explain the association between democratic institutions and population health outcomes in the states?

To answer this question, we add state policy measures to the previous analyses. Specifically, we use Caughey and Warshaw's (2016) yearly measure of state policy liberalism, which was created by using a dynamic latent variable model on data on 148 state policies. Policy domains in this measure include abortion (e.g., parental notification), criminal justice (e.g., the

death penalty), drugs and alcohol (e.g., marijuana decriminalization), education (e.g., per pupil education spending), the environment (e.g., clean air laws), civil rights (e.g., gay marriage), gun control (e.g., handgun regulation), labor (e.g., right-to-work laws), social welfare (e.g., AFDC/TANF), taxation (e.g., income tax rates), and other miscellaneous laws including fireworks bans and bicycle helmet laws (Caughey and Warshaw 2016). Most important for our analyses, policies related to democratic institutions as well as policy outcomes (e.g., infant mortality rates) are excluded from this measure. Because this variable is dynamic, we include both differenced and lag versions in the time series models. Higher values indicate more liberal state policies.

We also include measures of state partisan control for two reasons. First, there is growing evidence that partisan control is related to population health outcomes. Rodriquez et al. (2021a), for instance, find that states with Republican administrations had lower infant mortality rates compared to states with Democratic administrations particularly after the Political Realignment of the 1960s (see also Rodriquez et al. 2021b). States where the majority of residents voted for the Democratic presidential candidate had better childhood health outcomes compared to states that supported the Republican presidential candidate (Paul et al. 2021) and Democratic counties had lower COVID-19 death rates compared to Republican counties (Chen and Karim 2021). Second, there is extensive evidence showing that partisan control is related to the ideology of public policies as well as the adoption of health policies. Caughey, Xu, and Warshaw (2017), for instance, find that democratically controlled states had more liberal policies compared to Republican controlled states; there is evidence that this relationship has grown stronger in recent years (see also Erikson, Wright, and McIver 1993). States controlled by the Democrats spend more on Medicaid (Kousser 2002), are more likely to adopt ACA state exchanges early on

(Rigby and Haselswerdt 2013) and expand Medicaid under the ACA (Barrilleaux and Rainey 2014). Evidence suggests that partisan control also played a large role in the adoption of mitigation policies for COVID-19 (Warner and Zhang 2021).

We measure partisan control using data from the Correlates of State Policy Dataset (Grossman et al 2021). A 1 on this measure indicates that the state legislature and governor are both controlled by Democrats, a 0 indicates that party control is divided between the parties, and a -1 indicates Republican control in both the legislature and governor's office.

Results: Liberal Public Policies as Intermediate Factors

Results are presented in Tables 3 and 4.[9]

[Table 4 about here]

As shown in Table 4, state policy liberalism is related to all three measures of population health while partisan control is only related to infant mortality albeit in the opposite direction. The model predicts that a .20 increase in policy liberalism (which is roughly two standard deviations above the mean change) decreases the infant mortality rate by .10 (e.g., (.20/.28)*-.16), increases life expectancy by .24 (e.g., (.20/.021)*.025), and decreases mortality by 12.5 (e.g., (.20/.019)*-.1.13), although these effects are distributed gradually over the long run. The positive association between policy liberalism and population health is largely consistent with Montez et al. (2020). The association between political accountability and population health remains largely unchanged with the addition of state policy liberalism and partisan control. Similar to results presented in Table 2, political accountability is associated with a decrease in

[9] The sample sizes for life expectancy and midlife mortality are reduced with the addition of the policy liberalism measures because they are only available until 2016.

infant mortality, but is unrelated to life expectancy and midlife mortality. A system of checks and balances remains significant in all three models using conventual levels.[10]

We see similar results in Table 3, which presents the two-way fixed effects model. Policy liberalism is positively associated with life expectancy and negatively associated with midlife mortality, but not infant mortality. Partisan control is unrelated to our public health outcomes with this specification. Substantively the model predicts that for every unit increase in state policy liberalism, there is an associated .66 increase in life expectancy and 13.26 decrease in midlife mortality. With the addition of the policy liberalism score, neither political accountability nor a system of checks and balances are significantly associated with midlife mortality, providing some evidence that state policy liberalism may be a mediating factor. At the same time, the model shows that a system of checks and balances is still positively associated with life expectancy. We interpret the results in Tables 3 and 4 as providing mixed evidence that liberal policies account for the association between democratic institutions and population health outcomes.

Results: Including Intermediate Factors from Public Health

As we stated above, previous research has focused almost exclusively on the influence of intermediate factors, such as behavioral risk factors, health systems, and socioeconomic conditions, on population health. How do our inferences about the role of democratic institutions and state policy liberalism change once we control for these important factors? To answer this question, we include covariates that tap into these three intermediate factors. To measure behavioral risk factors, we include the percentage of adult smokers. We include smoking

[10] The coefficient for the political accountability measure remains statistically significant with the addition of state fixed effects for infant mortality (β= -.57* for differenced version; β= -.84*** for lagged version).

behavior as opposed to other risk factors (e.g., obesity rates) because of previous research (Fenelon and Preston 2012) and data availability. This measure is available from 1995-2017 and is obtained from the CDC's Behavioral Risk Factor Surveillance System (BRFSS) Prevalence and Trends Dataset (CDC 2020). We account for the health systems approach by including a measure of the proportion of adults who are insured (either privately or publicly) using data from the Annual Social and Economic (ASEC) survey from the Current Population Survey (CPS) from 1988 to 2016. While health insurance is only part of the health systems approach, we believe it accurately captures an important dimension of quality health care. Finally, we include a measure of state-level income inequality -the Gini index- to account for economic conditions (Frank 2009). The Gini index measures the relative wealth distribution of a state's residents with higher values indicating high levels of inequality. Here again, there are multiple measures that we could include to capture economic conditions; we believe that state-level income inequality is most aligned with previous work in this area (Pickett and Wilkinson 2015).

As before, we estimate an ECM with a lagged dependent variable and panel corrected standard errors as well as a two-way fixed effects model that includes contemporaneous independent variables. Since all of the covariates tapping into intermediate factors are time varying, we include differenced and lagged versions in the ECM. Results are shown in Tables 5 and 6.

[Tables 5 and 6 about here]

As shown in Table 5, democratic institutions related to political accountability are no longer associated with changes in population health outcomes in the states once we control for percent smokers, percent insured, and state Gini index. On the other hand, a system of checks and balances, however, remains statistically significant and in the expected direction for infant

mortality and life expectancy. Table 6 points to similar inferences. As shown in Table 6, the coefficient on political accountability is statistically significant and in the expected direction for infant mortality, even with the addition of the policy liberalism measure and other intermediate factors related to behavioral risks, the health system, and socioeconomic conditions. A system of checks and balances fails to reach statistical significance.

Limitations

Observational data analyses are plagued by two threats to inference: endogeneity and omitted variable bias. We are less concerned about endogeneity given that our goal is to explore associations—not identify causal relationships—between democratic institutions and population health. In addition, many of the institutions in the dataset were adopted over 100 years ago and preceded many of the large gains in wellbeing seen in the 20th century. We suspect that endogeneity—even if we were identifying causal relationships—is a small concern. Omitted variable bias is more of an issue. It is possible that some unobserved factor is responsible for the observed positive association that we find between democratic institutions and population health outcomes. Our two-way fixed effects models (in Table 3 and Table 6) may be enough to quell these concerns, yet these models hinge on the assumption that there are no state-specific time-varying confounders. The most obvious state-specific time-varying confounder is past state health outcomes. We control for path dependency directly by including lagged dependent variables (shown in Tables 2, 4, and 5); in many of these model specifications, the positive association between democratic institutions and health outcomes remains significant. Other state-specific time-varying confounders include party control and policy liberalism; we control for

both of these factors in our models. Nonetheless, it is possible that we have not fully controlled for important state-specific time-varying confounders.

Conclusions

Democracy is a dominant and valued principle of the modern world that is promoted within the international community and across the United States. Democratic institutions are expected to be related to citizen well-being and population health. While US states offer less variation than cross national research, there is still significant variation in state level institutional design. Overall, we believe that our empirical analyses provide evidence that (1) there is an association between democratic institutions and population health outcomes in the American states, but also that (2) *how* and *why* democratic institutions are related to population outcomes is complicated and ripe for future research. We estimated over 15 different model specifications and in almost every model at least one of our measures of democratic institutions reached statistical significance. The most consistent finding is that institutions that promote checks and balances are positively related to life expectancy; the next most consistent finding is that institutions that promote accountability are negatively related to infant mortality.

We encourage additional research on the identification of mechanisms linking democratic institutions to population health at the subnational level. A fruitful extension of this research would be to look at how democratic institutions relate to health inequalities within states across demographic characteristics, such as gender, race, socioeconomic status, and immigration status. If political accountability promotes the diversity of participation and voice in the political process, we might expect a reduction in health disparities. On the other hand, if majoritarian institutions amplify the voices of the most advantaged at the expense of others, we might expect

for these same institutions to be associated with larger health gaps. Interestingly, in preliminary analyses, we find empirical support for the latter scenario. We find that the ratio between black/white life expectancy is higher in states with strong political accountability structures, meaning there are greater disparities between black and white life expectancy in these states. This is suggestive evidence that gains in public health outcomes associated with stronger political accountability may come at the expense of black residents. Clearly, more research is needed to confirm these preliminary results.[11]

Additionally, future research might focus less on generalized measures of population health, such as life expectancy, infant and child mortality, adult mortality, or levels of reported self-rated health. While important, studies that look at generalized measures of population health do little to inform public health scholars about the role of democratic institutions during public health crises. We would expect for democracies to not only have better health overall than other types of governments, but to also respond to emerging public health crises in more effective and equitable ways. Exploring how political accountability and a system of checks and balances are related to COVID-19 health outcomes across the states would be particularly enlightening.

Finally, we cannot ignore the fact that institutions are malleable and ever changing especially in a federalist system such as in the United States. As democratic laboratories, states are continually experimenting with their institutional frameworks and these experiments have consequences for the distribution of political power, resources, and voice. Furthermore, given the growing polarization of American politics, future work should focus on how partisan control can moderate potential institutional associations on population health. Our results suggest that these types of institutional changes have the potential to impact population health and explain

[11] See Online Appendix for model of life expectancy by race.

geographic heterogeneity within the American states. And, healthy communities might very well depend on an abundance of democratic institutions.

■■■

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Table 1 Descriptive Statistics

Variable	Observations	Mean	SD	Min	Max
Infant Mortality	1,150	6.69	1.39	3.47	11.46
Life Expectancy	2,100	76.28	2.210	70.2	81.7
Mortality	950	351.47	67.59	241.6	567.9
Political Accountability	2,100	-.002	1.20	-3.33	3.20
Checks and Balances	2,100	.013	.79	-2.37	1.40
Percent Smoker	1,199	2.6	3.95	8.8	32.6
Proportion with Insurance	1,550	.87	.04	.74	.97
GINI Index	2,050	.55	.05	.43	.71
Policy Liberalism	2,000	.04	1.1	-2.53	2.81
Dif. Infant Mortality	1,100	-.07	.72	-3.62	3.44
Dif. Life Expectancy	2,050	.14	.26	-.9	1.3
Dif. Mortality	900	.22	9.84	-38.4	43
Party Control	1,960	1.12	.68	0	2

Table 2 Panel Corrected Standard Error Models with Institutional Measures and Lagged DV

	Infant Mortality 1996-2016	Life Expectancy 1975-2016	Midlife Mortality 1999-2016
Lagged DV	-.19***	-.01	-.002
	(.04)	(.01)	(.01)
D.Accountability	.12	-.04	-1.82
	(.29)	(.07)	(5.01)
L.Accountability	-.05*	.004	-.46
	(.03)	(.01)	(.63)
D.Checks and Balance	-.08	.08	11.70
	(.32)	(.08)	(6.90)
L.Checks and Balance	-.15***	.03**	-1.32*
	(.04)	(.01)	(.63)
Constant	1.11***	.88*	.05
	(.28)	(.36)	(2.63)
Observations	1050	2050	850
R-squared	.13	.34	.24

Panel corrected standard errors in parentheses. Models include fixed effects for year.
* $p < .05$, ** $p < .01$, *** $p < .001$

Table 3 Two Way Fixed Effects Models with Institutional and Policy Liberalism Measures

	(1) Infant Mortality	(2) Life Expectancy	(3) Midlife Mortality	(4) Infant Mortality	(5) Life Expectancy	(6) Midlife Mortality
Accountability	-.71*	-.03	-13.95	-.43	.01	-7.44
	(.28)	(.23)	(13.54)	(.32)	(.17)	(15.03)
Checks and Balance	.24	.38*	-18.18	-.12	.41**	-6.25
	(.29)	(.17)	(18.65)	(.32)	(.14)	(21.75)
Policy Liberalism- CW				.13	.65***	-13.26
				(.23)	(.15)	(11.43)
Democratic Control				-.02	.01	1.35
				(.07)	(.05)	(2.27)
Constant	9.61***	7.85***	447.72***	9.56***	72.10***	445.69***
	(.39)	(.39)	(32.70)	(.55)	(.49)	(41.00)
Observations	1100	2100	900	980	1960	784
R^2	.848	.956	.961	.849	.965	.967

Standard errors in parentheses. All models include fixed effects for state and year and clustered standard errors by state

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 4 ECM with Institutional and Policy Liberalism Measures

	Infant Mortality	Life Expectancy	Midlife Mortality
Lagged DV	-.27***	-.02**	-.02
	(.05)	(.01)	(.01)
D.Accountability	.02	-.02	.55
	(.30)	(.06)	(4.52)
L.Accountability	-.05*	.00	-.32
	(.03)	(.01)	(.65)
D.Checks and Balance	.22	.14	3.69
	(.30)	(.08)	(7.52)
L.Checks and Balance	-.15***	.03**	-1.73*
	(.04)	(.01)	(.79)
L.Policy Liberalism	-.16***	.03***	-1.13*
	(.04)	(.01)	(.46)
D.Policy Liberalism	-.28	.06	.32
	(.22)	(.05)	(3.58)
L.Democratic Control	.08*	-.01	.41
	(.03)	(.01)	(.55)
D.Democratic Control	-.04	-.01	.03
	(.06)	(.02)	(.92)
Constant	1.78***	1.83***	6.22
	(.38)	(.50)	(3.95)
Observations	931	1911	735
R^2	.181	.350	.215

Panel corrected standard errors in parentheses. Models include fixed effects for year.
* $p < .05$, ** $p < .01$, *** $p < .001$

Table 5 ECM with Additional Determinants of Health Outcomes

	(1) Infant Mortality 1996-2016	(2) Life Expectancy 1975-2016	(3) Midlife Mortality 1999-2016
L.Infant Mortality	-.29***	-.04***	-.03**
	(.05)	(.01)	(.01)
D.Accountability	.05	.02	.39
	(.30)	(.08)	(4.33)
L.Accountability	-.04	.004	-.19
	(.03)	(.01)	(.63)
D.Checks and Balance	.33	.06	5.57
	(.27)	(.10)	(7.08)
L.Checks and Balance	-.10**	.03*	-1.21
	(.03)	(.01)	(.79)
L.Policy Liberalism	-.15***	.04***	-.96*
	(.03)	(.01)	(.46)
D.Policy Liberalism	-.25	.08	.91
	(.23)	(.07)	(3.56)
L.Percent Smoker	.03**	-.01**	.54**
	(.01)	(.004)	(.18)
D.Percent Smoker	-.01	-.01	.49
	(.02)	(.01)	(.29)
L.Proportion Insured	.26	.12	-15.91
	(.51)	(.20)	(11.62)
D.Proportion Insured	.56	-.60	24.37
	(1.63)	(.47)	(24.24)
L.Gini Index	-.37	.37	-18.40
	(.72)	(.27)	(1.08)
D.Gini Index	1.05	-.25	87.46*
	(2.18)	(.88)	(34.41)
L.Democratic Control	.07*	-.01	.31
	(.03)	(.01)	(.52)
D.Democratic Control	-.03	.003	.08
	(.06)	(.02)	(.89)
Constant	1.25	3.33**	23.87
	(.74)	(1.04)	(14.56)
Observations	-.29***	-.04***	-.03**
R^2	(.05)	(.01)	(.01)

Panel corrected standard errors in parentheses. Models include fixed effects for year
* $p < .05$, ** $p < .01$, *** $p < .001$

Table 6 Two Way Fixed Effects model with Additional Determinants of Health Outcomes

	(1) Infant Mortality 1996-2016	(2) Life Expectancy 1975-2016	(3) Midlife Mortality 1999-2016
Accountability	-.41	.33	-6.79
	(.32)	(.30)	(13.91)
Checks and Balance	-.12	-.03	-8.61
	(.34)	(.31)	(21.10)
Policy Liberalism	.10	.40*	-1.52
	(.24)	(.20)	(1.14)
Percent Smoker	.01	-.08***	3.03***
	(.02)	(.02)	(.75)
Proportion Insured	1.84	-.52	47.10
	(1.80)	(1.61)	(69.23)
Gini Index	-.17	.32	-4.12
	(1.31)	(.91)	(36.46)
Democratic Control	-.03	-.01	1.27
	(.07)	(.05)	(2.07)
Constant	7.84***	76.67***	353.36***
	(1.60)	(1.90)	(95.47)
Observations	979	979	783
R^2	.849	.972	.970

Standard errors in parentheses. Fixed Effects for State and Year
* $p < .05$, ** $p < .01$, *** $p < .001$