Which States and Cities Protect Residents from Water Shutoffs in the COVID-19 Pandemic?

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Abstract:

Many U.S. states and cities have imposed water disconnection moratoriums during the COVID-19 pandemic. Using logistic and Cox Proportional-Hazards models, we assess factors that differentiate which governments imposed moratoriums. States which have economic regulation of private water utilities were more likely to impose moratoriums, and those with higher COVID-19 case rates imposed moratoriums earlier. States with unified Republican Control and cities with more 2016 Trump voters were less likely to impose moratoriums on water disconnection. Cities in states without statewide moratoriums, were more likely to impose moratoriums if they had higher income, more minority residents, and more income inequality.

Highlights:
35 states and almost 500 cities implemented moratoriums on water disconnections during the COVID-19 pandemic.

Moratoriums were more likely in states with higher COVID-19 case rates and cities with greater need and capacity.

Moratoriums were less likely in states and cities with Republican control.

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Introduction

The COVID-19 crisis has brought to light the urgency of recognizing water access is a public health priority. Water affordability was recognized as a growing problem in U.S. cities well before the pandemic, and is particularly pronounced for low-income groups and communities of color (Baird, 2010; Butts and Gasteyer, 2011). Immediately after the pandemic was declared, on March 11, 2020, some states and cities began imposing moratoriums on water service disconnection as a way to ensure water access (State Response Tracker, 2020; Lauf and Peters, 2020; Food and Water Watch, 2020). Using logistic and Cox Hazard regression models, we analyze the factors that differentiate states that imposed a water disconnection moratorium and the time taken to impose it. In states that did not impose a moratorium, we assess the factors that differentiate cities that placed moratoriums on water service disconnections during the current COVID-19 crisis.

The COVID-19 pandemic brings forth the urgency of ensuring access to safe drinking water, as it is fundamental for effective handwashing, sanitation, and overall public health. The water affordability crisis is a result of increasing water cost and community poverty rates, with communities of color hardest hit by these factors (Gasteyer et al., 2016; NAACP, 2019; Swain et al., 2020, Lakhani, 2020). The inability of households to access running water has obvious negative consequences for public health, particularly under the crisis conditions. Lack of water access may be one factor that contributes to the disproportionate impact of COVID-19 on communities of color in the US.

The problems of disconnection and potential alternatives are not new (Beecher, 1994). However, prior to the COVID-19 pandemic, mechanisms for ensuring water access, such as temporary bans on disconnections for low-income residents in the United States, were few (Hauter and Grant, 2018). A national study using survey data from 2015 found only eight percent of responding municipalities protected low-income households from disconnection (Homsy and Warner, 2020). The lack of universal service obligations and disconnection protections in the

United States stands in stark contrast to Europe, where countries implement a variety of mechanisms to ensure access to water. These mechanisms range from providing a minimum subsistence service level to households (following the World Health Organization guidelines), service provision at discounted rates (like social tariffs or social funds), to full-fledged water disconnection bans (EurEau, 2016). Some cities in the U.S., —such as Baltimore, Chicago, Pittsburgh, and Philadelphia, have implemented water disconnection bans. These are often in response to community-based requests in the context of rising water service prices (Swain et al. 2020), and the increased adoption of the human right to water framework as part of civil society water campaigns (Brown et al. 2016).

Water access requires a multilevel perspective as water is provided by various types of local utilities. Most water is provided by publicly owned utilities in the United States (US EPA 2017). Forty-five states implement economic regulation of privately owned water utilities (Beecher 2018); to varying degrees, some states also regulate nonprivate water utilities (Beecher 2018, Environ. Finance Center 2017). States may be the best level for providing income assistance (Swain et al., 2020), but in some states, policies make it difficult for local governments to do so without legal challenge (Environ. Finance Center 2017).

The water sector professional associations also play a role in supporting water shutoff protections since they can influence water utilities' actions. For example, The American Water Works Association, the sector's leading professional organization, provides guidance to water utilities. They issued emergency preparedness statements before COVID19 (Sowby 2020), and also recommended water shutoff protections during the pandemic (AWWA, 2020).

While voluntary protections by utilities are important, this paper focuses on mandatory disconnection protection as a way to ensure access to water during the COVID-19 pandemic. Mandatory moratoriums appear to be an appropriate policy response given high disconnection rates, which might be an indicator that financial assistance programs are not sufficient to guarantee water access (Swain et al. 2020). Understanding the factors that lead states and cities to implement water shutoff protection policies is of crucial importance for public health policy during the current COVID-19 crisis.

Data and Method

We use data on water shutoff moratoriums from the Food and Water Watch (FWW) database, which was created to track state and local moratoriums since the COVID-19 pandemic was declared on March 11, 2020. We supplement the data with variables on COVID-19 cases, water governance, socioeconomic, demographic, and political characteristics for each state and city. As of April 30, 2020, according to the FWW database, 35 states and 483 cities had imposed moratoriums.[1] We are interested in identifying factors that differentiate states and localities that have implemented water shutoff moratoriums from those that did not.

On March 13, 2020, Louisiana, Wisconsin, Pennsylvania, New York, and Connecticut were the earliest states to impose moratoriums, two days after COVID-19 was defined as a pandemic by WHO. About half of the 35 states imposed a moratorium within one week, and 17 states imposed the moratoriums only on commission-regulated water systems (see Figure 1). We created a dummy variable for state-imposed moratoriums on shutoffs. We also created a start-date variable to measure (in days) how long it took each state to act after the COVID-19 pandemic was declared.

[1] We also identified a similar data base, collected by the National Governor's Association (Lauf and Peters 2020), on state level moratoriums on water shutoff. We conducted an analysis with this data and found similar results. Because the NGA data lacked data on city action, we use the FWW data to enable both the state and city level of analysis according to our research design. We acknowledge, however, that FWW is an interest group and not a governmental agency or research organization.
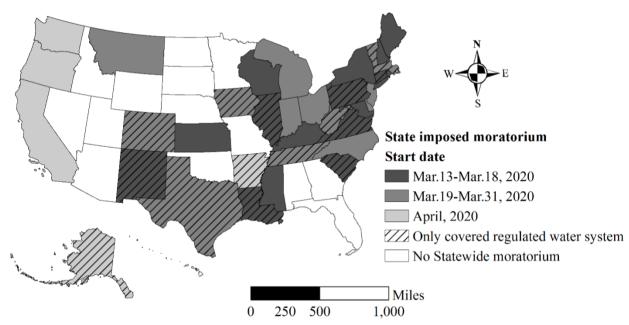
Figure 1 State-imposed water shutoff moratoria during the COVID-19 pandemic
Data Source: Water Shutoff Moratorium Data Base (Food and Water Watch, 2020)

In our city model, we only analyze cities in states without moratoriums, as city action in other states is superseded by state action. Of the 15 states without a statewide moratorium (see supplemental Appendix Table), only Hawaii had no cities imposing a moratorium, so Hawaii was left out of the city level analysis. In the remaining 14 states, 135 cities had imposed their own moratoriums on water shutoffs as of April 30, 2020. We compared cities imposing moratoriums with other cities within these 14 states to examine what factors differentiate these cities. We used the minimum population (733) in the 135 cities as the threshold to exclude smaller cities. This resulted in a sample of 2,818 total cities, of which 2,684 cities did not have a moratorium, and 135 did (see Figure 2, city-level model).
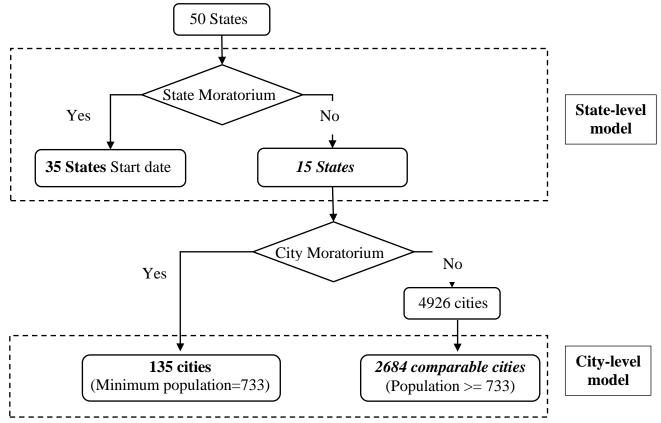
Figure 2 Research framework

Our independent variables include nongovernmental ownership of water utilities, state regulation of utilities, partisan political control at the state level, socioeconomic factors, COVID-19 cases, and community health. Descriptive statistics for the model variables are in Table 1.

Table 1 Descriptive statistics, US States and Cities

Variable	Obs	Mean	SD	Min	Max	Data source
State level						
State Moratorium	50	0.7	0.46	0	1	FWW 2020
Moratorium Start date	50	23.94	19.17	2	50	FWW 2020
Private ownership (1-5)	50	2.24	1.27	1	5	FWW 2016
PUC Regulates Private Utilities	50	0.9	0.3	0	1	Beecher 2018
Unemployment rate (%, March 2020)	50	4.16	1.14	2.20	6.90	BLS
Poverty rate (%)	50	13.59	2.92	7.87	20.75	ACS 2018
Percent of urban population (%)	50	73.59	14.57	38.70	95.00	Census 2010
Percent of minority population (%)	50	30.89	15.65	6.62	77.88	ACS 2018
COVID-19 March and April confirmed cases/total tests (%)	50	12.50	8.89	2.05	48.58	NYT 2020
Unified Republican Control	50	0.44	0.5	0	1	NCSL 2020
City level						
City moratorium	2,818	0.05	0.21	0	1	FWW 2020
Per capita income (ln)	2,818	10.13	0.37	7.59	12.28	ACS 2018
Unemployment rate (%)	2,818	5.79	4.13	0	32.44	ACS 2018
Percent minority population (%)	2,818	26.69	22.96	0	100	ACS 2018
Gini index (0-100)	2,818	42.68	6.08	23.52	73.77	ACS 2018
County level						
Percent population with health insurance (%)	2,818	88.93	6.33	54.46	100	ACS 2018
COVID-19 March and April confirmed cases per 1000 population	2,818	1.53	2.67	0	39.65	NYT 2020
Voted for Trump in 2016 (%)	2,818	61.54	15.84	13.16	89.96	TH 2016
Community health (0-100)	2,818	44.19	14.95	1	88	AARP 2018

Note: FWW- Food and Water Watch, BLS-U.S. Bureau of Labor Statistics, ACS 2018-American Community Survey (2014-2018), NYT-The New York Times COVID-19 Tracker, NCSL - National Conference of State Legislatures, State Partisan Composition, TH-voting rate is published by Townhall.com, county level, AARP-AARP livability index, county level

Data on the share of nongovernmental ownership of water utilities in each state is drawn from the EPA Safe Drinking Water Information System. Food & Water Watch aggregated the EPA data to the state level (Food & Water Watch, 2016). The variable is coded based on the level of nongovernmental ownership of community water systems by service population in 2014. Nongovernmental ownership is measured at the state level: 1=less than 5%, 2=5-15%, 3=15-25%, 4=25-35%, 5=more than 35%.

Forty-five states regulate private (and sometimes other) water utilities through their Public Utility Commission (PUC) (Beecher, 2018). We created a dummy variable at the state level to explore if PUC regulation of water utilities impacts the state moratorium. Among the five states that do not implement economic regulation of water utilities (Georgia, Michigan, Minnesota, North Dakota, and South Dakota), only Michigan imposed a statewide moratorium.

Partisan political control could affect the decision of a state to impose a moratorium, as prior research has found that Republican-controlled governments are less likely to protect low-income consumers from water disconnection (Homsy and Warner 2020). We create a variable, unified Republican control, for states where both the state legislature and the Governor's office are Republican. Data come from the National Conference of State Legislatures (2020) for each state. Eighty percent of states without a moratorium have unified Republican control, compared to 60% of states with a moratorium. To capture partisanship in the city model, we used the percentage of the population having voted for Donald Trump in the 2016 presidential election. The data is published on Townhall.com (nd).

We are interested in whether state and city moratoriums are related to demographic structure, poverty, unemployment, and percentage of health insurance coverage. The data are from the American Community Survey (2014-2018), except for the state-level unemployment rate in March 2020, which is from the Bureau of Labor Statistics (2020).

We control for the COVID-19 cases in March and April, because state and city moratoriums are mainly a response to the pandemic. Data are drawn from The New York Times COVID-19 Tracker (2020). In the state-level model, the COVID-19 variable is calculated as the total number of confirmed cases in March and in April, divided by the total number tested in March and April. In the city model, COVID-19 is measured by the total number of confirmed cases in March and April divided by the total population in the city's home county because data on the number of tests is not available at the city level.

In the city model, we control for community health, using the health category in the AARP livability index (2018). This is measured at the county level and has been used in other studies of

public health (Zhang et al., 2020). The health category is an index on a scale of 0 to 100, which captures prevention, access, and quality at the county level. The community health index includes three subcategories: healthy behaviors (smoking prevalence, obesity prevalence, and access to exercise opportunities), access to health care (health care professional shortage areas), and quality of health care (preventable hospitalization rate and patient satisfaction).

We ran a logit regression on whether a state or city imposed a moratorium before April 30, 2020. In the state-level model, we also ran a Cox Proportional-Hazards model (using survival analysis) to explore the relation between the distribution of the start date of the moratorium and the covariates. The Cox Proportional-Hazards regression analyzes the time it takes for a hazard event to occur (Cox, 1972), which in this study is how many days it takes a state to impose a moratorium. In the city-level level analysis, we ran a multi-level regression model controlling for the county effect. We ran the models on April 30, 2020. For states that did not impose a moratorium by that date, we coded the start date as 50 (the number of days since the pandemic was declared on March 11, 2020 and the date we ran our models). Models are calculated in STATA 14.

Results

Model results at the state level are shown in Table 2. Logit regression[2] results show that states with economic regulatory authority of utilities are more likely to impose a moratorium on water disconnection. States which impose moratoriums are also less likely to have unified Republican control. However, the level of nongovernmental water utility ownership, socioeconomic

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[2] In the logit regression, an odds ratio larger/smaller than 1 means that the increase/decrease in the odds of imposing a moratorium is related to a one-unit increase in the state or city characteristics. In the survival analysis, a hazard ratio larger than 1 means the state characteristics are related to a higher hazard, which is an early start date; while a hazard ratio lower than 1 means state characteristics are related to a later start date. This study uses the 95% confidence interval for the coefficients. If the p value is smaller than 0.05, then the state/city attributes are significantly related to the moratorium.

conditions in the state, and the level of COVID-19 cases are not related to the decision to impose a statewide moratorium. The results of the survival analysis show that the COVID-19 confirmed case rate reduces the times it takes a state to impose a moratorium, while unified Republican control delays a state's action[3].

Table 2 US States Imposing Moratoriums on Water Shutoffs in the COVID-19 Pandemic, 2020

	State moratorium (Logit regression)		Early start date (Survival analysis)	
	Odd Ratio (SE)	p	Haz. Ratio (SE)	p
Private ownership (1-5)	1.338 (0.586)	0.507	0.832 (0.146)	0.294
PUC Regulates Private Utilities	134.314* (318.633)	0.039	9.552* (10.163)	0.034
Unemployment rate (%, March 2020)	1.626 (0.819)	0.334	1.244 (0.262)	0.298
Poverty rate (%)	1.157 (0.280)	0.546	1.141 (0.112)	0.177
Percent of urban population (%)	0.855 (0.070)	0.054	0.967 (0.020)	0.105
Percent of minority population (%)	1.026 (0.048)	0.574	0.980 (0.021)	0.339
COVID-19 March and April confirmed cases/tests (%)	1.253 (0.146)	0.053	1.072** (0.026)	0.004
Unified Republican Control	0.012** (0.019)	0.007	0.205** (0.090)	0.000
Constant	18.375 (111.483)	0.631		
N	50		50	
Pseudo R2	0.543			
Log likelihood			-104.738	

Note * $p<0.05$, ** $p<0.01$
Author analysis of Water Shutoff Moratorium Data Base (Food and Water Watch, 2020)

The logit regression results at the city level are shown in Table 3. We ran a baseline model first to explore the relationship between imposing a moratorium and city socioeconomic conditions. The results are shown in the left two columns of Table 3. Then, we added county-level measures to examine the impact of COVID-19 cases, partisan politics (voted for Trump in 2016), and community health (the right two columns in Table 3). Results show that imposing a moratorium is more likely to happen in cities with higher per capita income, a higher percentage of minority

[3] This is a one-time cross-sectional analysis. The dependent variable is the start date of the moratorium; all the independent variables are cross-sectional. We also did t test on states with and without moratorium. The t test results show that among the group of states imposing a moratorium, there is a significantly lower percent of unified Republican controlled states (29% vs. 80%, p<0.05), and a significantly higher percent of states that regulate private utilities (97% vs. 73%, p<0.05). Although these states also have a higher percent of COVID-19 cases in March and April, this difference is not significant (14% vs. 9%, p=0.0554).

residents, and higher income inequality. After adding the county measures, the percent voting for Trump in 2016, the COVID-19 case rate and community health are significant factors. Cities in counties with a higher COVID-19 case rate and a higher percentage of the population having voted for Trump and are less likely to impose a moratorium. Cities that impose a moratorium are more likely to be in counties which rank higher in community health. Although per capita income is not significant in the second model, the minority population percentage, and the Gini index are still positively related to imposing a moratorium.

Table 3 US Cities Imposing Moratoriums on Water Shutoffs in the COVID-19 Pandemic, 2020

	City moratorium[1]		City moratorium[1,2]	
	Odd Ratio (SE)	p	Odd Ratio (SE)	p
City level measures				
Per capita income (ln)	4.018** (1.175)	0.000	1.468 (0.626)	0.368
Unemployment rate (%)	0.979 (0.028)	0.458	0.982 (0.035)	0.610
Percent minority population (%)	1.027** (0.005)	0.000	1.021** (0.008)	0.005
Gini index (0-100)	1.036* (0.017)	0.027	1.084** (0.023)	0.000
Percent population with health insurance (%)	0.988 (0.018)	0.518	0.994 (0.024)	0.796
County level measures				
COVID-19 March and April confirmed cases per 1000 population			0.836* (0.075)	0.045
Voted for Trump 2016 (%)			0.966** (0.011)	0.003
Community health (0-100)			1.032* (0.013)	0.011
Constant	0.000** (0.000)	0.000	0.000** (0.000)	0.015
N	2818		2818	
Pseudo R2	0.074			
Log likelihood			-441.303	

Note: Logistic Regression Results * p<0.05, ** p<0.01
[1]N= 2684 cities in 14 states without a statewide moratorium (Hawaii had no cities with moratoria)
2. Multilevel logit regression controlling for the county effect
Author analysis of Water Shutoff Moratorium Data Base (Food and Water Watch, 2020)

Discussion

This analysis explores the factors that differentiate states and cities, which have imposed moratoriums on water disconnection in the COVID-19 pandemic. Recognition of the public health value of water access and protection of low-income households from disconnection is

more common in states with economic regulatory authority of utilities and less common in states with unified Republican control. States that imposed moratoriums earlier had higher COVID-19 case rates and were less likely to be under Republican control[4]. Other demographic factors did not differentiate state action. Policy recognition of the importance of water access during the COVID-19 pandemic is significantly associated with state regulatory authority and political partisanship.

In states that did not impose statewide moratoriums, some cities chose to impose local bans on disconnection. These cities had higher incomes, more minority residents, and more inequality, so they had both the need and capacity to act. Although city-led moratoriums appear more likely to in wealthier cities, city action is also more common under conditions of greater income inequality and the presence of more minority residents. These cities were also in counties with better community health, lower COVID-19 case rates and lower rates of having voted for Trump. These results show city-led moratoriums require the capacity and political will to act. Given concerns about affordable access, local capacity is relevant in differentiating cities in their response. Statewide moratoriums are also related to capacity (PUC regulation), need (COVID-19 case rate) and political will (partisan control.)

The U.S. response to COVID-19 has been differentiated by political partisanship. Republican voters tend to view the pandemic as less of a concern (NPR/PBS/Marist 2020), and Republican governors re more likely to reopen their states before they meet CDC guidelines (Godfrey 2020; Warner and Zhang 2020). Our analysis shows that states and cities with more Republican control are less likely to protect public health by ensuring water access.

Conclusion

Access to safe drinking water is critical for public health. In the context of the COVID-19 pandemic, many U.S. states have imposed moratoriums on water disconnection for low-income

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[4] The measure of COVID-19 confirmed case rate could be biased toward states with higher testing capacity, especially in March. Because the COVID-19 confirmed case rate is noisy, we average across March and April.

households. U.S. states are the best positioned to protect residents' access to water (Swain et al. 2020, EFC 2017), but in the absence of state action, and given the role of the municipal water utilities, cities play an important role. Voluntary action by utilities is important, but mandatory moratoriums give force to shutoff protection. If U.S. states and cities were to keep moratoriums in place when the pandemic is over, this would help move the United States toward policies found elsewhere around the world. A recognition by states and localities of the critical role of water access to public health, may help shift away from the commodity focus of U.S. water policy (Beecher 2020). This requires building political will to recognize the human right to water and to identify the best approaches to address affordability access over the long term.

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