The Level of Democratic Development of States and Health across 67 Countries: A Multilevel Analysis*

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ABSTRACT

Although prior research has identified an association between countries' political functioning and the health of their populations, that research is limited by the use of data from small sets of countries or only aggregate data. We extend prior research by using multilevel data from 67 countries in the World Health Suvey, and find that the association between democratic development persists after adjusting for both individual and country level confounders. We also find that economic inequality mediates the association between democracy and population health, although investments in public health do not.

Over the past decade, much research has focused on the role of nations' political functioning in health and mortality outcomes. Some evidence suggests that more democratic societies—as indicated by open and free elections, protection of civil liberties, lower levels of corruption, and freedom of the press—are associated with lower rates of mortality, healthier behaviors and better self-rated health (1-8). The importance of this research is clear—encouraging the development of stronger and more vibrant democracies around the world may provide dividends not only in terms of political and human rights, but also in improving population health.

Despite the importance of considering the political organization of society as a factor in shaping the health of populations, prior research is marked by three notable limitations. First, few studies have examined the association between countries' political functioning and the health of residents using data from all regions of the world. Numerous studies rely on data from European countries (3, 9-10); rely on case-studies of how some authoritarian regimes may impose health promoting policies, regardless of their popular appeal (11-12); or examine health behaviors among those in single countries who have been exposed to political transitions (13-14). Studies that rely on countries from specific regions or single countries may not generalize to diverse regions of the world that have heterogeneous disease profiles and socio-cultural systems.

Second, the studies that examine countries from broad regions of the world rely solely on country-level data (7-8, 10, 15-16). Studies of aggregate data offer important insights into the association between political variables and population health that might generalize to all regions of the globe. Nevertheless, studies that utilize only aggregate data cannot account for individual level confounders that vary within countries, and cannot examine whether the association between political variables and health varies within populations, say, by gender or education.

Third, to our knowledge, only three papers (7-8, 16) test mediators of the association

between political functioning and population health. Besely and Kudamatsu (8) find that public health interventions mediate the association between political functioning and health, and Klomp et al. (7) find that both the public health interventions and aggregated income levels mediate the association. In contrast, Ross (2006) finds that although democracies spend more money on health care and education systems, these investments are not associated with improved health at the population-level. However, all three studies rely solely on aggregate data and cannot adjust for individual-level confounders. Nevertheless, the search for mediators is important for identifying plausible mechanisms that link political functioning of countries to the health of their populations, and could identify additional points of intervention that may allow the promotion of population health.

We advance prior research by examining the association between political variables and individual health by using multi-level data on 67 countries from all regions of the world and that vary in their political orientation and level of economic development. We will test multiple indicators of political functioning, adjust for both individual and country-level confounders, and test for three mechanisms that might plausibly link political functioning to health outcomes. Thus, we will provide a more rigorous test of the association between political functioning and population health than has been allowed previously.

POLITICAL FUNCTIONING AND HEALTH

Countries that have more democratic, transparent, and less corrupt political systems, and that support civil rights, may promote population health for several reasons. First, governments that are have regular elections and are routinely and openly scrutinized by the popular press may be responsive to public demands for laws or spending that support strong social programs, rigorous

safety-nets, and vibrant public health infrastructures. Second, democratic governments may support policies that improve the health of all individuals in an effort to protect civil liberties and ensure equal protection under the law for vulnerable groups including women, children, and race/ethnic or religious minorities. Third, governments that allow public participation may encourage autonomous decision-making in other contexts, so individuals may come to believe that they have control over their health and work opportunities, in addition to their political lives (13, 17-19). Finally, more democratic societies may be more stable, have low levels of state sponsored violence (5, 20-22), and promote the view that states protect and promote individual wellbeing—resulting in better health.

Mediators of Political Functioning and Health

We focus on three mediators that might account for the association between political variables and population health. First, democratic nations might invest more heavily in education, support literacy, and pass laws that require minimum levels of educational attainment. More democratic nations may invest in education because the ability to reason, consider different positions, form opinions, and vote accordingly is seen as an important part of being an active participant in a democratic society and having a strong labor force. Notably, educational attainment is associated with improved health and healthier behaviors across countries and over time (23-25).

Second, democratic nations may also invest resources directly into to public health by improving sanitation, increasing rates of vaccination, investing in hospitals and the education of doctors and nurses, and regulating the safety of food. Less corrupt nations may have greater support for increasing taxes to support investments in public health (26-27). In turn, access to

sanitation services, vaccinations, and healthcare professionals are shown to increase the overall well being of populations (28-31).

Third, democratic nations may impose tax rates, regulate monopolies, implement trade policies, or reduce corruption in such was as to decrease economic inequality (32-33). In turn, some evidence suggests that economic inequality is associated with worse health by weakening the middle class, increasing perceptions of relive deprivation, and reducing social capital and social cohesion within a society (34-39).

Confounders of Political Functioning and Health

By using multi-level data, we can consider both individual and country level confounders of the association between political functioning variables and population health (40). At the individual level, the distribution of age and sex may vary across countries—indeed, more democratic countries tend to have older age structures, as they are often further along in the demographic transition. Further, countries that are marked by more corruption, fewer civil liberties, and weaker democracies often have populations marked by low levels of education, personal wealth, and participation in a stable and well regulated labor force (41)—factors that are associated with worse health. In contrast, more democratic countries also tend to have later ages at first marriage, higher rates of divorce, and ultimately a lower prevalence of marriage, which might result in worse health.

At the nation level, indicators of economic development, such as gross domestic product (GDP) per capita, are positively associated with the development of democratic institutions (27, 42). Indeed, before nations achieve some basic level of economic development, life expectancies remain low and the drive to ensure transparent governments that promote civil liberties may be less important to many people than eking out their subsistence. However, as countries reach moderate

levels of economic development, concerns about the political organization of the society become more pressing.

DATA AND METHODS

The World Health Survey (WHS), conducted in 2002 and 2004, provides individual level data on respondents from all regions of the globe. The WHS was conducted in 70 countries. Three countries were dropped from analysis due to extremely high rates of missing data or implausible responses to multiple survey items (see Appendix A for a list of countries included in the analyses, by region of the globe). The WHS is conducted by the World Health Organization, and provides information on 313,554 respondents.

Individual Level Variables

Self-reported health is the main outcome, and is measured on a five point scale that ranges from excellent, very good, good, fair, and poor. Self-reported health has been shown to predict prospective mortality both in high-income and low-income countries (43-45).

Sex is coded dichotomously. Age is continuous. We include age-squared in our models to capture any nonlinear association between age and health. We code union status as 1 if respondents are either married or cohabiting, and 0 if respondents are neither married or cohabiting. In some countries, married and cohabiting statuses confer very different legal rights and social recognition, and in others they are largely interchangeable. Separate analyses found similar results when separating married and cohabiting statuses.

Educational attainment is assessed on a seven point scale that ranges from no formal schooling to post graduate degree. We standardize the educational variable to have a mean of 0 and a standard deviation of 1 within each country, because educational statuses may have different meanings across countries. We create a measure of household wealth by taking the first dimension

of a principal components analysis of a series of 15 items that households may own (46). Some of the items queried in low income countries (e.g., a clock, a bucket, number of tables) differ from those asked in high income countries (e.g., a DVD player, a video camera, number of televisions), and the meaning of ownership of different items varies across countries. Thus, we estimate the principal components analysis separately in each country, and then standardize the score within each country to have a mean of 0 and a standard deviation of 1. We code those who work in the paid labor force as 1, and those who don't work or who work in the informal economy as 0. The share of workers in the paid labor force varies across countries, but typically signals access to regular income and broader social networks across settings (41).

Country Level Variables

We append country level variables from various sources to the WHS data. Seven different indicators capture the political functioning of the nation—we sought measures that have been used in previous research and that capture different dimensions of political functioning (21).

The Corruption Perception Index (CPI) draws on multiple surveys and polls to indicate the frequency and severity with which residents are required (or perceive that they are required) to offer bribes or kickbacks to government officials in order to obtain permits, avoid taxes, or influence policies (47). The CPI ranges from 0 to 10, with high scores indicating higher levels of corruption. Data from 2003 had a large amount of missing data so we used data from 2005, which had data for all countries.

The Political Rights Index and the Civil Liberties Index focus on the rights and freedoms experienced by individuals, and are derived from survey data by Freedom House (48). The Political Rights Index indicates whether elections are free and fair, the rights of individuals to organize into different political parties, the freedom of elections, and government transparency.

The Civil Liberties Index measures the presence of a free and independent media, opportunities for public assembly, academic and religious freedom, protections from political terror, and the presence of an independent judiciary. Each scale ranges from 1 (most freedom) to 7 (virtually no freedom).

The Polity Version IV-Democracy Index rates countries on three central structural elements of democracy: the ability of citizens to effectively influence policies and government leaders, the existence of institutionalized constraints on executive power, and the guarantee of civil liberties to individuals (49). The Polity Version IV-Autocracy Index rates countries on their level of autocracy, as defined by the degree to which countries limit competitive political participation and have executives who can assert their authority with few institutionalized constraints. The democracy and autocracy indices are measured with different data elements, so it is empirically and logically possible for some states to have both democratic and autocratic characteristics. Both scales range from 0 (low levels of democracy or autocracy) to 10 (high levels of democracy or autocracy).

The Political Terror Scale indicates the level of state-sanctioned political violence, with an emphasis on violence that takes place within its own territorial borders. The index is comprised of two sub-scales—one draws on reports from the U.S. State Department and the other relies on reports from Amnesty International (50). Each sub-scale ranges from 1 to 5, with high scores indicating higher levels of civil and political rights violations to the entire population. The two sub-scales are highly correlated (r=0.80). Because each subscale relies on different sources to assess the same concept, we take the mean of the two items.

We assess the role of military officers in the government by using two items from the Database of Political Institutions (51): a first dichotomous variable indicates whether the defense

minister is a current military officer, and a second dichotomous variable indicates whether the chief minister is a current military officer. Ministers are documented as military officers if they were described as military officers without indication of formal retirement before assuming office. We sum the two dichotomous items (range: 0 to 2) with higher values indicating less independence between the military and the political administration.

Finally, we use factor analysis to create a factor for poor political functioning, based on the seven items described above. We reverse the Polity Version IV—Democracy Index in the factor analysis, so that higher levels on the factor indicate worse political functioning. We then standardize the factor to have a mean of 0 and a standard deviation of 1 in the country-level data.

Our measure of purchasing power parity adjusted gross domestic product per capita (GDP) comes from the Penn World Table (52). We log our measure of GDP to account for the diminishing returns to health as economic development increases.

We examine three country-level variables that may mediate the association between political functioning and health. First, the Gini index is a measure of economic that ranges from 0 (no inequality) to 100 (totally unequal) (53). Second, we use factor analyses to create a factor that captures investments in education across countries based on measures including the percentage of government expenditures spent on education, teacher-student ratio in primary schools, the percentage of the population that completed primary school, and literacy rates for men and women. Third, we use factor analysis to create a factor that captures public health investments and infrastructure, based on measures including the percentage of pregnant women receiving prenatal care, the percentage of births attended by a healthcare professional, the percentage of children receiving key vaccinations (diphtheria, pertussis, tetanus and measles), the number of physicians and nurses per 1,000 people, the percentage of government expenditures spent on health and the

percentage of the population with access to improved sanitation facilities. Measures for the public health and education factors were derived from the World Health Organization and the World Bank. We created factors because we have too little variation—given that we have only 67 countries—to include each item separately in our models.

Analysis

We use Mplus software to estimate multilevel ordered logistic regression models that predict respondents' self-rated health. Empty models that predict self-rated health but exclude all predictors find that about 17% of the variation in respondents' health occurs between countries (intra-class correlation = 0.17). Because final survey weights were missing for over one third of our data, we exclude them from our analyses. Separate analyses that used imputed survey weights for those with missing weights found virtually identical point estimates.

To account for missing data in the individual level and (very few of the) country level variables, we use multiple imputation to preserve our sample size. Multiple imputation assumes that data are missing at random, conditional on the other observed variables in the data set, and relies on a more plausible set of assumptions than listwise deletion. Given the relatively small number of country-level units, we use 20 imputed data sets to characterize the missing data.

RESULTS

Table 1 presents means and percentages of the study variables by self-rated health. The political functioning variables are generally associated with self-rated health as expected—with higher levels of corruption, political and civil rights, and autocracy associated with worse health. Notably, there are significant differences in all of the individual level variables across health statuses.

(Table 1 about here)

Table 2 presents coefficients from the hierarchical ordered logistic regression models that predict self-rated health. Each of the eight panels (Panel A through Panel H) focuses on a different indicator of political functioning. Model 1 adjusts for age, age-squared, and sex, and finds that the poor political functioning factor is the only political variable that is significantly associated with self-rated health. Model 1 Panel H shows that a one standard deviation increase in the poor political functioning factor is associated with a 0.23 decrease in the logged odds of having better health. Model 2 further adjusts for marital status, education, the wealth measure, and employment status, and again finds that only the poor political functioning factor is negatively associated with self-rated health.

Model 3 includes all of the individual level variables included previously, but also adjusts for the country-level measure of gross domestic product (GDP) per capita. Because GDP suppresses the negative association between political functioning and health, five of the political functioning variables are now significantly associated with self-rated health—and all in the expected direction. The Corruption Perception Index (Panel A), Freedom House Political Rights index (Panel B), Freedom House Civil Liberties index (Panel C), Political Terror Scale (Panel F), and the poor political functioning factor (Panel H) are all negatively and significantly associated with self-rated health.

Models 4 and 5 include the mediator variables into the model one at a time. Model 4 shows that the inverse association between the Corruption Perception Index and self-rated health remains significant after adjusting for the Gini index, but none of the other political variables are significantly associated with self-rated health. Further, the coefficients for the Gini index show that higher levels of income inequality are associated with worse self-rated health in two of the models.

In comparison with Model 3, Model 5 shows that the inverse associations between self-

rated health and the Corruption Perception Index (Panel A), Freedom House-Political Rights (Panel B), and Freedom House Civil Liberties (Panel C) persist. In contrast, the association between the poor political functioning factor and self-rated health falls from significance when adjusting for the public health factor. Notably, however, the public health factor is negatively associated with self-rated health across the panels, although it is only significant in the model that also includes the Corruption Perception Index.

Unfortunately, our models that include the educational factor are still in progress.

DISCUSSION

Our results suggest that the association between political functioning and health is in the expected direction, but emerges only when adjusting for the composition and economic development of countries. Our findings may explain the apparently discordant patterns observed in prior studies. Although may prior studies have found a significant relationship between political functioning and health (7-8, 15), others have found that political functioning has mixed effects on health depending on the larger global context, the time period being examined, and the GDP of the country (10, 16). For example, Ross (2006) found no relationship between political functioning and health among countries in extreme poverty, perhaps because extremely poor countries may have a different population compositions than mid and high-income countries.

Our study has several strengths that allow it to advance prior research, including the use of multilevel data that reflect all regions of the world and countries at all levels of economic development, the inclusion of both individual and country-level confounders, and tests for several potential mediators. Our study is not without limitations, however. First, because we have a limited number of countries in our data, we can include only a limited number of country-level models in our data simultaneously. Second, our data use self-rated health as an outcome, which may not be

directly comparable to measures including infant mortality rates or total life expectancy used in other studies.

Next steps include tests for whether educational investments mediate the association between the political variables and self rated health. Further, we plan to more fully exploit the multilevel structure of our data by testing whether the associations between certain individual level variables and self-rated health vary depending on the political organization of nations. For example, gender differences in health may be wider in less democratic societies if democratic development fosters greater recognition of women's rights. If so, democratic governments may be more responsive to the health of women and will have incentives to invest in maternal and child health. Alternately, greater liberty for women in the political sphere may also allow women and men to similarly embrace unhealthy lifestyles—such as smoking and drinking in excess—which might be associated with persistent or even widening gender disparities.

We will also test whether educational disparities in health widen or close as nations become more democratic. The inverse association between education and health may be greater in nations that are more democratic if democracy allows for greater meritocracy. Nations that permit freer labor markets, support workers' health and rights, and encourages the equal and fair treatment of all residents regardless of their background may result in more quickly increasing health among the more educated than among the less educated. In contrast, educational disparities in health may narrow with democratic development, if democratic nations invest more in safety nets including health care, food programs, and public schooling—thereby allowing even those with less education to achieve better health.

The persistent association between democratic functioning and population health is important given rapid changes in human and political rights occurring throughout the middle-east

and parts of Asia. Our results suggest that supporting the development of democracies may pay dividends for health in addition to civil and political rights. Nevertheless, the political turmoil in the middle east suggests that the development of strong and vibrant democracies can be perilous and result in the loss of lives due to refugee crises and state-sanctioned violence.

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Table 1: Means and Percentages of Study Variables, by Self Rated Health, World Health Survey 2002-2003

	Self Rated Health					
	Poor	Fair	Good	Very Good	Excellent	P-value
Country Level Characteristics						
Political Functioning Variables						
Corruption Perception Index	6.21	6.34	6.22	5.81	5.67	<0.001
Freedom House Political Rights	3.34	3.40	3.23	3.01	2.96	<0.001
Freedom House Civil Liberties	3.31	3.31	3.19	2.97	3.01	<0.001
Polity IV: Democracy	5.71	5.75	6.00	6.33	6.33	<0.001
Polity IV: Autocracy	1.97	1.76	1.57	1.49	1.48	<0.001
Political Terror Scale	2.78	2.89	2.90	2.80	2.76	<0.001
Ministry Involvement	0.13	0.20	0.22	0.22	0.20	<0.001
Democracy Factor[b]	0.14	0.17	0.09	-0.01	-0.03	<0.001
Economic Variables						
GDP Per Capita, $	8,432	7,890	8,716	10,660	10,941	<0.001
Gini Coefficient	40.9	41.3	41.7	41.0	40.5	<0.001
Health Factor[b]	-0.11	-0.22	-0.13	-0.08	-0.19	<0.001
Education Factor[b]	0.25	0.05	0.04	-0.01	-0.10	<0.001
Individual Level Characterеistics						
Age in decades	5.5	5.3	4.6	3.9	3.5	<0.001
Sex, %						<0.001
Female	64.4	63.5	60.3	55.0	49.5	
Male	35.6	36.5	39.7	45.0	50.5	
Married or Cohabiting, %						<0.001
No	41.0	37.0	31.3	31.0	36.1	
Yes	59.0	63.0	68.7	69.0	63.9	
Wealth[c]	-0.38	-0.30	-0.10	0.06	0.12	<0.001
Education[c]	-0.54	-0.43	-0.15	0.08	0.20	<0.001
Working for Pay, %						<0.001
No	72.2	58.8	44.4	35.2	33.5	
Yes	27.8	41.2	55.6	64.8	66.5	
Percent of Sample	1.2	7.1	27.4	41.6	22.7	

N=313,554

[a]The P-values indicate whether the values for a given covariate differ significantly across levels of self rated health.

[b]This variable is standardized to have a mean=0 and a standard deviation=0 in the full sample.

[c]This variable is standardized to have a mean=0 and a standard deviation=0 within each country.

Table 2: Multilevel Ordered Regression Coefficients for the Association between Political Functioning Variables and Self Rated Health, World Health Survey, 2002-2003

	Model 1	Model 2	Model 3	Model 4	Model 5
Panel A: Corruption Perception Index					
Corruption Perception Index	-0.045	-0.039	-0.099***	-0.122**	-0.176***
S.E.	0.042	0.052	0.023	0.039	0.031
Gini Index				0.007	
S.E.				0.008	
Health Factor					-0.32***
S.E.					0.090
Panel B: Freedom House Political Rights					
Freedom House Political Rights	-0.051	-0.049	-0.091**	-0.069	-0.129**
S.E.	0.053	0.268	0.033	0.071	0.048
Gini Index				-0.007	
S.E.				0.011	
Health Factor					-0.136
S.E.					0.109
Panel C: Freedom House Civil Liberties					
Freedom House Civil Liberties	-0.053	-0.048	-0.105**	-0.077	-0.149**
S.E.	0.056	0.232	0.039	0.052	0.057
Gini Index				-0.007	
S.E.				0.007	
Health Factor					-0.133
S.E.					0.109
Panel D: Polity IV: Democracy					
Polity IV: Democracy	0.021	0.018	0.047	0.033	0.046
S.E.	0.026	0.044	0.239	0.027	0.188
Gini Index				-0.012*	
S.E.				0.006	
Health Factor					0.010
S.E.					3.920
Panel E: Polity IV: Autocracy					
Polity IV: Autocracy	-0.031	-0.028	-0.044	-0.026	-0.039
S.E.	0.044	0.074	0.807	0.035	0.043
Gini Index				-0.013*	
S.E.				0.006	
Health Factor					0.029
S.E.					0.095
Panel F: Political Terror Scale					
Political Terror Scale	-0.016	-0.014	-0.129*	-0.055	-0.176
S.E.	0.059	2.003	0.057	0.093	0.100
Gini Index				-0.011	
S.E.				0.009	
Health Factor					-0.086
S.E.					0.125
Panel G: Ministry Involvement					
Ministry Involvement	-0.237	-0.242	-0.378	-0.189	-0.329
S.E.	0.270	0.268	0.265	0.263	0.295
Gini Index				-0.013	
S.E.				0.007	
Health Factor					0.033
S.E.					0.093
Panel H: Poor Democratic Functioning Factor					
Poor Demoractic Functioning	-0.224**	-0.215*	-0.212*	-0.156	-0.258*
S.E.	0.085	0.085	0.086	0.098	0.116
Gini Index				-0.009	
S.E.				0.006	
Health Factor					-0.077
S.E.					0.103

N=313,554; * p<0.05, ** p<0.01, *** p<0.001

Notes:

Model 1 adjusts for demographic variables (age, age-squred, and sex).

Model 2 adjusts for the demographic variables from Model 1, as well as social variables (marital status, wealth, education, and employment status).

Model 3 adjusts for the demographic and social variables from Model 2, as well as logged GDP per capita.

Model 4 adjusts for the social and demographic variables from Model 2, as well as logged GDP per capita, and also includes the Gini index as a mediator

Appendix: List of Countries used in the Analysis, By Region, World Health Survey, 2002-2003

Africa	Swaziland	Czech Republic	Russian Federation	**South East Asia**
Burkina Faso	Zambia	Denmark	Slovakia	Bangladesh
Chad	Zimbabwe	Estonia	Slovenia	India
Comoros		Finland	Spain	Myanmar
Congo	**Eastern**	France	Ukraine	Nepal
Côte d'Ivoire	**Mediterranean**	Georgia	United Kingdom	Sri Lanka
Ethiopia	Morocco	Germany		
Ghana	Pakistan	Greece		**Western Pacific**
Kenya	Tunisia	Hungary	**South & Central**	Australia
Malawi	United Arab	Ireland	**America**	China
Mali	Emirates	Israel	Brazil	Lao People's Democratic Republic
Mauritania		Italy	Dominican Republic	
Mauritius	**Europe**	Kazakhstan	Ecuador	Malaysia
Namibia	Austria	Latvia	Guatemala	Philippines
Senegal	Belgium	Luxembourg	Mexico	Viet Nam
South Africa	Bosnia and Herzegovina	Netherlands	Paraguay	
Swaziland		Norway	Uruguay	
Zambia	Croatia	Portugal		