Steven A. Peterson[1], *Evan Franzese-Peterson*[2]

DOI: https://doi.org/10.15804/rop2021207

HEALTH STATUS, NUTRITION AND DEMOCRATIZATION: A COMPARATIVE STUDY

Keywords: Health status, nutrition, democratization

ABSTRACT: Many factors have been adduced to explain why some states become democracies and others not. Accepted variables predicting democracy include education level, economic development, urbanization, communication networks and so on. This paper will explore two biological variables' role—nutrition level and health status. Comparative data are used to explore the effects of these variables on level of democracy. Implications are discussed.

INTRODUCTION

The number of democratic states has increased considerably over the past century. Huntington (1991) has referred to the "three waves" to depict the pattern of increase over time, with the "third wave" producing the largest percentage of democracies among all countries during the latter part of

[1] School of Public Affairs Penn State Harrisburg Middletown PA 17057, sap12@psu.edu

[2] School of Public Affairs Penn State Harrisburg Middletown PA 17057, Ebf5003@gmail.com

the 20th century. Freedom House notes that there was a large increase in the proportion of democracies throughout the world-up to the early 2000s, when a recent decline is noted (freedomhouse/report/freedom-world/2001/democracy-under-siege).

This paper explores two related biological elements that might affect the extent of democratization within and among countries-nutrition level and health status We explore their effect on democracy in the context of other factors often found to be associated with democracy.

And what variables are typically mentioned as these might affect the likelihood of democracy occurring? Over time, a list of variables has been created to explain the emergence and maintenance of democracy. Among these: education level, economic development, urbanization, and communication networks. A brief discussion about each: A long line of studies-dating back over fifty years-has suggested a number of key factors. One of those is *education level*. A number of classic studies have suggested that years of education and literacy are within a country are associated with greater probability of democratization (e.g., Deutsch, 1961; McCrone and Cnudde, 1967; Banks, 1972; Vanhanen, 1984).

Another well documented set of variables linked to democratization is *economic development* and some degree of economic equality. Wealth per capita is also associated with democracy (e.g., using energy as a surrogate, see Burkhart and Lewis-Beck, 1994). Income equality can work toward democracy, and inequality undermine that (e.g., Muller, 1988; Muller and Seligson, 1994; Vanhanen, 1984, 2003).

*Urbanizatio*n is another predictor found to be associated with democratization (e.g., see Lerner, 1958; Cutright, 1963; McCrone and Cnudde, 1967; Banks, 1972; Vanhanen, 1984). *Communication networks,* too, appear to be related to democratization (e.g., see Deutsch, 1961; Neubauer, 1967; Lipset, 1963; Dutton, 2009). Other variables could be discussed as well, but-for the sake of parsimony-these are the key ones that we consider.

This paper also examines a less discussed set of variables in the development and maintenance of democracy-nutrition and health status. On the face of it, this may not seem intuitively obvious. But there is a literature that suggests-directly or indirectly-that these variables may be additional

factors to take into account in the process of democratization. In the process, the issue of the relevance of biology for the study of politics is addressed (on this more general usage, see, e.g., Blank et al, 2014; Peterson and Somit, 2017).

Only a miniscule set of studies directly focus on the effect of health or nutrition on democracy itself. Perhaps the most direct example is the research reported by Barro (1996). He found that one measure of health (infant mortality rate) was associated with depressed odds of democracy (using Freedom House scores). According to Stauffer (1969), malnutrition, parasitic disease, and the like undermine a country's ability to achieve the mobilization regarded as a precondition for national development.

Other studies suggest indirect pathways by which health and nutrition might affect democracy. Nutrition and health may affect a citizenry's political attitudes and behaviors in ways that affect democracy. One well established principle in the study of democracy is that those who do **not** participate have less voice in the policy process (e.g., Schlozman, Verba, and Brady, 2012; Verba and Nie, 1972; Verba, Schlozman, and Brady, 1995). The research clearly indicates that there are class-based differences here, leading to those lower in socioeconomic status having less voice in political discussion-and, hence, less influence (e.g., see Schattschneider, 1960; Schlozman and Verba, 1979; Schlozman, Verba and Brady, 2012). Such factors influencing political participation rates by group of citizens can surely affect democracy when subtle (or not so subtle) biases leave certain groups less likely to mobilize and be heard.

More to the point for this paper? Evidence suggests that those with poorer nutrition and poorer health are apt to participate less, although there are some anomalies in the findings. On nutrition, data from India and the United States suggest that shortfalls in nutrition can reduce levels of political involvement, although the effects may not be dramatic (e.g., Bhaskaran, 1982; Peterson, 1987, 1989). Other research has discovered that health status can affect political involvement and participation. Data from the United States, Sweden, Ireland, and many other countries suggest a statistical linkage between better health status and more political activity. (Booth and Welch, 1976; Peterson, 1987, 1989; 1992; Schwartz, 1975, 1978; Denny and Doyle, 2007; Brody and Sniderman, 1977; Mattilla et al.,

2013; Pacheco and Fletcher, 2015; Soderlund and Repeli, 2014; Ksiazkiewicz and Friesen, 2017). Thus, research in the aggregate suggests (a) a direct association between health and nutrition and democracy, albeit based only on a very small number of studies and (b) an indirect association between health and nutrition and democracy via those variables' effects on participatory behavior and attitudes that are critical for a healthy democracy. Poorer nutrition and health status would reduce the voice of a segment of the population afflicted with such problems and, hence, render a society less democratic.

Based on the preceding survey of literature, we would hypothesize the following:

H1: Countries with lower levels of citizen nutrition will be less likely to be democratic.

H2: Countries with lower levels of citizen health will be less likely to be democratic.

This paper represents a preliminary effort to address these hypotheses.

RESEARCH METHODS

VARIABLES

There are several different sources for the data to measure key variables. Nutrition and Health as predictor variables come from the 2014 Social Progress Index (Porter and Stern, 2014). The index of democracy comes from the Freedom House annual report (Puddington, 2014A number of variables come from the *CIA Factbook* (Central Intelligence Agency, 2014). Only those states with a population of 1,000,000 or more are considered in statistical analysis below.

A brief discussion of each variable:

Dependent Variable: Democracy

Freedom House calculates a freedom index by developing two indices: Political rights and Civil liberties. Scores are based on judgments by a series of experts, such as in-house and external analysts.

Countries are rated from 1 (most free) to 7 (least free) on each of the two dimensions. The two scores are added together. The most democratic score is, therefore, a 2; the least democratic score is 14. States rated 2 include: The United States, the United Kingdom, Sweden, and France. The least free (democratic) countries, each receiving a score of 14, include: Central African Republic, North Korea, Saudi Arabia, and Sudan. If one add the two scores together and divide by two, the result: 1 to 2.5=free; 3 to 5=part free; 5.5–7=not free. These scores represent the variable in the data base used here. Thus, higher scores are less democratic.

Political rights indicators evaluated by the "judges" include such metrics as: electoral processes, political pluralism and participation, functioning of government. Civil liberties components include: freedom of expression, associational rights, rule of law, and personal rights and autonomy (see Puddington, 2014 for more detail).

Independent Variables

The *CIA World Handbook 2014* is the source for the following metrics:

(a) Population (needed to norm other variables, as per h);
(b) School life expectancy (educational attainment in terms of average of number of years of education attained);
(c) GDP per capita;
(d) Urbanization (percentage of population living in urban areas);
(e) Gini Index (a measure of income inequality; the greater the score, the greater the income inequality within a society);
(f) Number of cell phones in use;
(g) Number of internet users (For the relevance to democracy, see Dutton, 2009);
(h) An index of communications (the variable used in analysis: number of cell phones plus number of internet users divided by population).

Porter and Stern with Green, *Social Progress Index 2014*

a) Nutrition and Basic Health Care Index. This is composed of measures of the following: Undernourishment, depth of food deficit, maternal mortality rate, stillborn rate, child mortality rate, deaths from infectious diseases.

b) Health and Wellness Index. This index includes metrics made up of the following: life expectancy, non-communicable diseases deaths between 30 and 70 years of age; obesity rates; deaths because of outdoor air pollution; suicide rate.
c) One analysis below combines the two measures into one index.

FINDINGS

Table 1 provides descriptive statistics for each variable.

Table 1. Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Freedom House	145	12.00	2.00	14.00	6.9517	3.84117
GDP per capita	145	101.50	.60	102.10	15.0986	15.98274
Gini Index	135	40.00	23.00	63.00	39.6119	9.55839
Urban	142	91.00	9.00	100.00	58.6479	22.54364
School Years	138	17.00	4.00	21.00	12.6159	3.10714
Health	125	50.00	50.00	100.00	72.7600	7.37957
Nutrition	124	71.00	28.0	99.00	83.8790	16.03076
Nutrition/Health	124	50.50	48.50	99.00	78.3306	9.68863
Communications	142	2.72	.02	2.75	1.2724	.60031
Valid N (listwise)	123					

The range for the Freedom House score (the metric for democracy used in this essay) is 2 (most free) to 14 (least free). The mean score is almost 7, which Freedom House would interpret as Part Free. GDP per capita ranges from very small to very large. The mean score is about $15,000. The Gini Index runs from 23 (least unequal) to 63 (most unequal). The mean is 39.6. States run from 9% urban to 100% urban. Years of education go from 4 years at a minimum to 21 years at a maximum. The mean is 12.6 years of schooling. The nutrition index has a range from 28.00 to 99.00. The mean is 83.8790. The Health index has a range of from 50 to 100; the mean is 72.76. For the Nutrition/Health variable, the range is from 48.50 to 100.00.

The mean is 78.3306. Finally, the communication index runs from .02 to 2.75, with a mean score of 1.27.

Table 2 presents bivariate correlations among the different variables. Recall that lower Freedom House scores reflect more democratic states, whereas higher scores are less democratic states. To start, independent variables associated with more democratic scores from Freedom House include: greater GDP per capita, urbanization, education level, nutrition, health status, and communications. Related to lower democratic scores is a higher Gini index. Economic inequality would seem to reduce the likelihood of democracy.

Table 2. Pearson Correlation Matrix: N=123

	Freedom House score	**GDP per capita**	**Gini index**	**Urbanization**	**Education**	**Health**	**Nutrition**	**Nutrition/ Health**	**Communications**
Freedom House Score	---	-.578****	.182**	-.453****	-.591****	-.401****	-.483****	-552****	-543****
GDP		---	-.439****	.713****	.759****	.433****	.676****	.725****	.796****
Gini			---	-.195**	-.347****	-.059	-.413***	-.364****	-.353****
Urbanization				---	,728****	.289****	.742****	.724****	.742****
Education					---	.267****	.798****	.762****	.744****
Health						---	.269****	.605****	.245***
Nutrition							---	.930****	.814****
Nutrition/ Health								---	.767****
Communications									---

*P >.10; ** P >.05; *** P > .01; **** P > .001

One characteristic of the table, of course, is very high intercorrelations. Of 36 correlations in the matrix, 14 are above .70. However, the multicollinearity statistics used in multiple regression analysis (VIF and Tolerance), available through the SPSS statistical package, do not indicate problems with this set of variables. In addition, removing certain variables

from regression analysis that appear to be highly correlated with other items does not affect the coefficients or standard errors.

Table 3 represents results of a multiple regression analysis, with the Freedom House score as dependent variable. The biological variable is nutrition status.

Table 3. Predicting Democracy, Listwise regression (N=123)

Variable	1	2
Nutrition	-.118 (.018)****	-.007 (.036)
GDP per capita		-.085 (.038)**
Gini Index		.044 (.034)
Urban		-.023 (.022)
Education level		-.465 (.067)***
Communication		-1.066 (.973)
Multiple R		.637
Adjusted Multiple R square		.375
P		<.001
Standard error		2.98024

*P >.10; ** P >.05; *** P > .01; **** P > .001

Variables shaping greater democratization include years of education and GDP per capita. Communication networks are completely unrelated to the dependent variable. Urbanization and nutrition are also unrelated to variation in democratization. The Multiple R is robust--.637—as is the explained variation—37.5. There is no role played by the biological variable, nutrition, in this analysis.

Table 4. Predicting Democracy, Listwise regression (N=124)

Variable	1	2
Health	-.159 (.033)****	-.114 (.040)***
GDP per capita		-.042 (.039)
Gini index		.032 (.032)
Urban		.026 ((.020)*
Education		-.470 (.144)****
Communication		1.360 (.825)*

Variable	1	2
Multiple R		.666
Adjusted multiple R square		.416
P		.000
Standard error		2.87117

*P >.10; ** P >.05; *** P > .01; **** P > .001

Here, the health status variable becomes the biological independent variable. Results indicate that, indeed, it does have an effect on democracy among states; the higher the health status, the more likely a country is to be democratic (note that the Freedom House variable is coded such that lower scores represent greater democracy). Other variables associated with democratization include education (the single most powerful predictor), urbanization (against much literature, associated with less democracy), and communication (again, a negative relationship—going against expectations). The Multiple R is .666; the adjusted explained variation is 41.6%.

Table 5 uses the joint index representing the health index plus the nutrition index (a summed index).

Table 5. Predicting Democracy, Listwise regression (N=123)

Variable	1	2
Nutrition/Health	-.200 (2.081)****	-.076 (.050)*
GDP per capita		-.083 (.037) **
Gini index		-.053 (.033)*
Urban		.032 (.021)*
Education		-.379 (.155)***
Communication		.596 (.874)
Multiple R		.646
Adjusted multiple R square		.387
P		.000
Standard error		2.95120

*P >.10; ** P >.05; *** P > .01; **** P > .001

Nutrition/health is linked to democratization at a minimal .10 level. The most powerful predictor is education. GDP per capita has a statisti-

cally significant relationship with democracy (.05 level). The Gini index and urbanization exhibit only a very modest effect P is significant at .10).

Years of education is the only independent variable related to democratization. The Gini Index and urbanization are, simply, unrelated to the Freedom House metric. Of interest, given the hypotheses advanced earlier, is that nutrition/health is significant at a minimal .10 level (as is Communications). Multiple R is .626 and explained variation is 39.1%. Multiple R is .646. The Multiple R Squared is 38.7%.

Table 6, finally, uses both the nutrition index and the health index separately.

Table 6. Predicting Democracy, Listwise regression (N=122)

Variable	1	2
Nutrition	-.098 (.018)****	-.027 (.036)
Health	-.106 (.032)****	-.120 (.041)***
GDP per capita		-.032 (.041)
Gini index		-.024 (.034)
Urban		.021 ((.021)*
Education		-.527 (.163)****
Communication		1.726 (.969)**
Multiple R		.669
Adjusted multiple R square		.413
P		.000
Standard error		2.88811

*P >.10; ** P >.05; *** P > .01; **** P > .001

In equation 1, both nutrition and health have a substantial effect on democratization. When the full array of independent variables is in play, nutrition drops out as a predictor. However, health continues to have an impact (P <.01). Other variables associated with Freedom House scores are urbanization (negative, <.10), education (positive, P <.001), and communication (negative, P <.10). Multiple R is .669 and explained variation rests at 41.3%.

DISCUSSION

The results are straightforward enough. Standard predictors of the extent of democracy

across states are utilized as well as two biological metrics—health and nutrition status. Four regression tables were created, using a listwise approach. GDP per capita emerged as a statistically significant predictor ($P < .05$) twice; years of education on average for citizens was significant in all four tables. Health status was significant in the two regression analyses in which it was entered as a stand-alone variable; the summed index, nutrition + health, was significant in one of the four tables. Nutrition as a stand-alone variable did not display statistical significance. Communication was significant once. The Gini Index and urbanization did not associate with freedom scores significantly in any of the four tables.

The study of the linkage between biology and politics has suggested a number of areas where there may be a contribution. At the macro-level, Peter Corning has suggested that synergies emerging from biological factors can explain many complexities in society and politics (Corning, 1983). He has also contended that it is possible to derive policy implications, including a tendency toward policy fairness, from biological knowledge (Corning, 2011, 2017). At the micro-level, studies have suggested that a variety of biosocial factors affect political thinking and behavior (e.g., see Peterson and Somit, 2011; Blank et al., 2014; Murray, 2017).

A number of scholars within the field of biology and politics have explored linkages with democracy (Vanhanen, 2003; Somit and Peterson, 1997). This essay builds upon this body of work to try to explore the extent to which biological factors have an empirically verifiable relationship to political processes—in this case democratization. The role of nutrition and health was not nearly as significant as education. But the fact that health status did have a statistically significant effect on democratization suggests that future research in this area might well yield findings of value and interest.

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