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Polity and health care expenditures: The association among 159 nations

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Abstract This paper hypothesized that democratic nations, as characterized by Polity IV Project regime scores, spend more on health care than autocratic nations and that the association reported here is independent of other demographic, health system or economic characteristics of nations. WHO Global Observatory data on 159 nations with roughly 98% of the world's population were examined. Regime scores had significant, direct and independent associations with each of four measures of health care expenditure. For every unit increment in a nation's regime score toward a more democratic authority structure of governance, we estimated significant ($p < 0.05$) increments in the percent of GDP expended on health care (+0.14%), percent of general government expenditures targeted to health care (+0.25%), total per capita expenditures on health (+34.4 Int\$) and per capita general government expenditures (+22.4 Int\$), while controlling for a population's age distribution, life expectancy, health care workforce and system effectiveness and gross national income. Moreover, these relationships were found to persist across socio-economic development levels. The finding that practices of health care expenditure and authority structures of government co-vary is instructive about the politics of health and the challenges of advancing global health objectives.

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1. Introduction

For some time, scholars and health care advocates have been interested in the determinants, rationale and strategies for assuring adequate national health care spending. Regardless of how price-conscious, consumer-driven or technologically sophisticated a nation may be, health care expenditures will consume significant portions of its economy, often in place of other public obligations. How health care expenditures are accrued (i.e., what

Abbreviations: Int\$; International Dollar; US; United States; GDP; Gross Domestic Product; WHO; World Health Organization; SPSS; Statistical package for the social sciences.

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services are provided) and paid for (i.e., the balance of private and public sector appropriations) can spark lively discourse. Recent US debate about the appropriate role of government in defining and funding health services reflects not only diverging economic, but also socio-political and cultural perspectives that may inhibit a nation's capacity to forge effective health care policies [1,2]. Comparative health care studies can inform the understanding of how to address a nation's health care needs in ways that will maximize effectiveness (i.e., achieving measurable reductions in morbidity and mortality), efficiencies (i.e., doing so with minimal commitment of human, material and financial resources) and/or equity (i.e., distributing costs and benefits of care fairly and impartially). As Anderson and Poullier note, "looking at data from many countries allows policymakers to compare where individual countries are doing well, doing poorly, or simply making different choices [3]".

Cross-disciplinary research has documented sizable differences in expenditures within and across nations [4]. Overall, health care expenditures account for roughly 9% of the gross world product, although the proportion of nations that commit less than 4% of their Gross Domestic Product to health care approximates the proportion that spend 10% or more [5].

What accounts for such differences? Research on the associations among health care spending, supply, prices, utilization and health impact have been plentiful in the context of developed, industrialized democracies [6–9], but far less attention has been given to the interplay of such factors in the developing world. Access to economic resources and, to a considerably lesser extent, demographic factors has been recognized as predictors of a nation's health care expenditures. Wealthy nations have a disproportionately greater economic capacity to allocate to health care [10]. Newhouse, among the first to examine these relationships, found per capita income to account for a substantial portion of variation in per capita health expenditures among 13 developed nations [11]. Other research has highlighted the development of medical technologies, expansion in the number of insured lives, increased earnings expectations among health care professionals and general inflation of health care costs as being responsible for much of the observed increases [12]. Some have considered the impact of recent "demographic transitions" on health service demands and cost escalation [13,14], while others assert population aging has had a very modest impact on health care costs [15]. Fuchs and others have emphasized how

the availability of health care personnel and associated technology fuels health care expenditures [16–18]. Recent analyses found inflated personnel and service costs, readily accessible technologies and behavioral risks (i.e., obesity) as primary sources for elevated health care spending [8,9].

Negligible attention, by comparison, has focused on the nature of political institutions and their bearing on health care expenditures. Global increases in health care spending are understood to parallel economic development [3], but spending as related to the second and third waves of democratization has yet to garner attention [19].

The financing and delivery of health services, by their natures, are political. In principle, they reflect beliefs about rights to well-being of organized people, while in practice they readily reveal fundamental socio-political inequalities operating within a society [20]. Moreover, in as much as health services delivery to varying degrees is funded through public dollars, it is modifiable through public policy and its character reflects political exigencies as much as technological or logistical capacities. In essence, a nation's health care system is a consequence of economic, social and political power exerted through democratic or authoritarian national leadership, and, as such, the political dimensions of health care merit further study [21].

Understanding how, and to what extent, a nation expends resources on health care as a reflection of political ideology can provide insight about its capacities to address this and other public functions pertaining to education, public safety, physical infrastructure, communication, national security, etc. By doing so, one may better anticipate the health and social needs of at-risk populations and gain insight regarding the particular health burdens they may face. If, for example, spending on health care by democratic governments differs in either absolute or proportional terms from that of autocratic nations, it may be relevant to consider how worldwide movements toward democratization [22] may come to affect health care spending. This manuscript considers the relationship of a nation's regime type (i.e., norms by which governing authorities function) to health care expenditure levels. This study hypothesized that democratically governed nations spend more, both proportionately and per capita, on health care services than those governed autocratically and that the association of regime type with expenditures will persist when accounting for demographic, economic, and health system characteristics. The implication of this analysis in addressing global health objectives is briefly considered.

2. Methods and materials

Data regarding the populations, health systems and political characteristics of 159 nations, with roughly 98% of the world's population, were examined. The World Health Organization's (WHO) Global Health Observatory Database is a repository rich with information on health care expenditures, health services and health status indicators [5]. The WHO health expenditure database, whose procedures for securing and validating information are well described [23], provides cross-national comparisons over a 10+ year period, utilizing national health account reports, governmental and public expenditure information.

2.1. Outcome variables

Given a lack of consensus regarding the best indicator of national health care expenditures, four core measures were utilized. All four measures of health care expenditure used here pertain to 2008 data using the WHO's National Health accounts indicator framework [24]. Total Expenditures on Health as a percent of a nation's Gross Domestic Product (TEH%GDP) enumerated the sum of government and private expenditures on health (i.e., the value of all goods and services provided by a country without regard to the source or target of allocations). TEH%GDP measured the overall extent of economic resources committed by a nation to health care in relation to that nation's overall wealth. It included the value of expenditures for health care goods and services, public health activities, governmental and private health system administration, net cost of health insurance, research and other investments related to health care by a nation. By contrast, General Government Expenditures on Health (GGEH%GGE) measured total spending on health care goods and services specifically by governmental agencies and government-owned enterprises, whether through direct or contracted service provision, in proportion to a nation's total annual general governmental expenditures. As such, GGEH%GGE measured the proportion of all public sector (i.e., governmental) operations and expenditures that specifically pertain to health care.

Per capita total and general government expenditure on health (PcTEH and PcGGEH, respectively) were measured as the TEH%GDP and GGEH%GGE distributed across a nation's population count. Both PcTEH and PcGGEH were expressed in purchasing power parity (PPP) International dollars that standardized currency valuations in order to compare

relative differences in the magnitudes of health spending across nations.

2.2. Predictor variables

The principal independent variable of interest, a nation's authority structure of central government, was assessed using data from the Polity IV Project [25] to characterize REGIME type in 2008 according to a 21-point autocratic-democratic continuum. Nations with total populations in excess of 500,000 persons were assigned scores from -10 to characterize the most authoritarian governments (i.e., hereditary monarchies) to +10 reflecting the most democratic governments (i.e., consolidated democracies). These scores reflected consensus assessments of the degree to which governments provided mechanisms for the populace to express effective preferences about alternative political policies and leaders, the existence of institutionalized constraints on the exercise of executive power and the extent to which guarantees of civil liberties were extended to all citizens in their daily lives and in acts of political participation [22,26].

Covariates included in the analyses addressed population (% population 60 years of age and older and life expectancy), health system (doctors, nurses and midwifery per 10,000 persons and overall health system effectiveness), and socio-economic conditions (education attainment and gross national income) of nations. The percentage of a nation's population aged 60 years and older (Over60) reflected demographics estimated as of July 1, 2009 by the United Nations' "World Population Prospects" [27]. Life expectancy at birth (LifeExpect), estimated the duration of life newborns in 2008 could anticipate if exposed to prevailing age- and sex-specific death rates [28]. Together, these measures indirectly assessed the population growth and the health care demands of a nation. On the one hand, greater life expectancy is associated with overall growth in population size; a unit increase in life expectancy has been posited to yield a 0.3 to 0.8% increase in a nation's population size [29]. Notwithstanding evidence that today's aged are healthier than previous generations [30], their relatively high treated-case prevalence for degenerative conditions (i.e., chronic diseases) exert substantial social, economic and health care demands on a society [31].

Health system features were put into operation using two variables. A nation's health care workforce (DrRN/10K) was quantified using WHO esti-

mates for the average numbers of doctors, nurses and midwives actively participating in the delivery of health care per 10,000 persons in the population over a 10-year period (2000–2010) [28]. An adequate health care workforce is central to assuring a public's good health and is strongly predictive of the utilization of primary care and preventive health services [32]. Differences regarding the availability of health care workers help distinguish how responsive, capable, safe and equitable a nation is to its pressing health concerns. At the same time, the impact of a nation's health system (HSEffect) was measured utilizing an approach similar to that of Mathers et al. [33] of calculating the ratio of healthy life expectancy to overall life expectancy. Healthy life expectancy estimated the number of years individuals could live free from disabling ill-health based on current age-specific morbidity and mortality trends within a population. Places able to compress morbidity into later years of the lifespan, regardless of the expected duration of the lifespan generated ratios approaching 1.0; those less able to do so produced ratios of decreasing magnitude. As a summary measure, the expected proportion of a life lived healthy addresses both the general quality of life lived by populations and also offers indirect evidence of the relative effectiveness of a nation's health care system to minimize impairments and postpone mortality from illness or injury [34,35]. Data on health life expectancy for 2007 and overall life expectancy for 2008 were extracted from the UN's Human Development Report, 2001 [33].

Lastly, two aggregate measures of a nation's socio-economic standing were examined. The HDI Education Index (EDUIndex), a subscale of the U.N.'s Human Development Index [36] combined mean years of schooling among adults with the expected years of schooling of children. The index is considered a more useful measure than the literacy level to differentiate nations as well as being an indicator of human capital [37]. Education attainment is positively correlated with both economic development and better health status of populations [38,39]. The per capita Gross National Income (i.e., the total value of a nation's earnings roughly equaling the sum of all values generated by producers plus product taxes collected from abroad) divided by its population (PcGNI) was used to measure the relative economic strength across nations. PcGNI correlates directly with health care availability and inversely with morbidity and mortality rates. These data were reported by the World Bank for 2008 per 1000 International dollars, based on PPP [40].

2.3. Statistical methods

Least squares regression analyses using SPSS [41] examined the hypotheses that: (a) REGIME type was a significant, positive predictor of health care expenditures; and (b) the significant association of REGIME type and expenditures persisted independent of other selected factors. Table 1 presents information on the univariate distribution of variables along with first order regression results.

Multivariate regression analyses reported in Tables 2 and 3 estimated change in one of the four indicators of national health expenditures in relation to the selected predictor variables. Unstandardized regression coefficients described changes in health care expenditures per one unit increment in a predictor variable while controlling for the association of expenditures with other factors; standardized regression coefficients estimated those associations using standard deviation units of measurement. Adjusted R^2 values estimated the proportion of variance in health care expenditures attributable to its association with predictor variables. Table 2 includes data from all 159 nations; Table 3 examines a subset of nations ($N = 84$) classified by the Human Development Index as having achieved "Medium" or "Low" development [36].

3. Results

Sizable differences among the 159 nations regarding health care expenditures, demographic, health system and socio-economic conditions are evident in Table 1. One half of the 159 nations expended less than 6% of their GDPs on health. Predictably, the US expended more of its GDP than other nations on health during 2008 (15.2%), with the smallest percentage (1.7%) noted for Equatorial Guinea and Turkmenistan. With a range of 0.7–26.1%, the median expenditure on health by governments in 2008 was 10.9% of total government expenditures. Per capita total expenditures varied from 18 Int\$ for Eritrea to 7164 Int\$ for US, while per capita governmental expenditures ranged from 7 Int\$ for Sierra Leone to 4091 Int\$ for Norway. Univariate associations between these four indicators and REGIME, reflected by the standardized regression coefficient (Beta), were positive and moderately strong; at successively more democratic classifications, expenditures on health increased. Considered in isolation, a one-unit change in REGIME type was associated with 0.40 to 0.49 standardized unit changes in health expenditures; overall variation among nations in REGIME type ac-

Table 1 Distributions of selected socio-political indicators and simple correlation of REGIME and health care expenditures, 2008, N = 159.

Variable name	Description	Min	Median	Max	Skewness	Beta	p<
TEH%GDP	Total expenditures on health as% of a nation's GDP	1.9	6	15.2	0.6	0.49	0.01
GGEH%GGE	General government expenditures on health as % of a nation's general governmental expenditures	0.7	10.9	26.1	0.18	0.48	0.01
PcTEH	Per capita total expenditures on health at PPP	18	410	7164	2.1	0.41	0.01
PcGGEH	Per capita general government expenditures on health at PPP	7	217	4091	1.92	0.4	0.01
Over60	Percent of population 60 years of age and older	1	8	30	0.86		
LifeExpect	Life expectancy at birth in 2008	42	70	83	0.59		
DRN/10K	Doctors, nurses and midwives per 10,000 population	1.4	33.5	200.3	1.03		
HSEffect	Ratio of healthy life to overall life expectancy	0.71	0.88	0.98	-1.46		
EDUIndex	Mean years of education of adults plus expected years of education for children	0.16	0.65	1	-0.27		
PcGNI	Per capita gross national income per 1000 Int\$ at PPP	0.29	7.53	1.62	1.62		
REGIME	Authority characteristics of a nation's central government	-0.1	7	10	-0.82		

GDP – Gross Domestic Product.

PPP – Purchasing power parity [22].

Int\$ – International dollars.

counted for 24% to 16% of variation in expenditures across these 159 nations ($p < 0.01$).

Multivariate analyses (see Tables 2 and 3) markedly increased the proportions of explained variation in health expenditures, but did not eliminate the direct association observed between REGIME type and health care expenditures. Among 159 nations included in the analysis, health care expenditures as a proportion of a nation's GDP was estimated to increase with increased democratization evident in a nation's authority structure (e.g., an estimated 0.139% increment per a positive change in REGIME scores). As such, a 7-point difference in REGIME score between nations could be estimated to yield a 1% difference in the proportion of GDP expended on health care. This association was independent of those related to age composition, life expectancy, health care workforce and system effectiveness, as well as education and income variation across nations. Expenditures also were estimated to significantly increase with the percent of populations over 60 years of age (i.e., expenditures were estimated to increase 0.185% with every 1% increment in Over 60 values). Overall, the adjusted R^2 value revealed 38% of variation in the outcome variable that was associated with these seven predictors. Contrasting the difference in univariate and multivariate results for REGIME and TEH%GDP (Beta = 0.49 and 0.329 from Tables 1 and 2, respectively) suggested that one third of the initial association between measures could have been attributable to the association of REGIME with other predictor variables (0.161/0.49), while two thirds of the estimated association remained independent of those relationships.

Approximately one quarter of variability in the percent of general government expenditures attributable to health care was accounted for in the multivariate analysis. However, of the seven predictor variables, only REGIME yielded a significant association. The analysis estimated a 0.251% increment in the proportion of general government expenditures that were attributed to health expenditures for every unit increase in REGIME scores. For context, a difference in general government expenditures on health between REGIME scores for nations characterized as "fully institutionalized autocracies" (-10 to -5) and "fully institutionalized democracies" (+5 to +10) of 2.5% of general government expenditures could be anticipated. The standardized regression coefficient in this model for REGIME, Beta = 0.357, indicated that roughly three fourths of the association between outcome and predictor estimated by the univariate model (Beta = 0.48) was unique to REGIME and independent of other factors.

Table 2 Metric and standard regression coefficients (in parentheses) for national health care expenditures by selected socio-political indicators, 159 Nations, 2008.

Predictors ^a	TEH%GDP	GGEH%GGE	PcTEH	PcGGEH
Over60	.185** (.493)	0.136 (.216)	52.4** (.292)	42.2** (.335)
LifeExpect	-0.043 (-.164)	0.043 -0.098	-13 (-.105)	-10.5** (-.121)
DrRN/10 K	0.012 (-0.21)	-0.001 (-.015)	3.36* -0.127	2.94** (-0.16)
HSEffect	-27.5 (-.313)	-13.2 (-.090)	-478.5 (-.011)	-313.1 (-.011)
EDUIndex	-1.33 (-.088)	-1.43 (-.066)	-67.8 (-.011)	-224 (-.052)
PcGNI	0.008 (-.042)	0.036 (.119)	54.4** (.628)	37.6** (.619)
REGIME	.139** (.329)	.251** (.357)	34.4** (.171)	22.4** (.159)
Constant	30.8**	17.7	688.6	555.2
Adjusted R ²	.393**	.256**	.813**	.824**

^a See text for definitions and data sources.

* $p \leq 0.05$.

** $p \leq 0.01$.

The multivariate model accounted for better than 80% of variation in total per capita spending on health. Three of the seven predictor variables were significantly associated with expenditures. A 34.3 Int\$ per capita increment was estimated for every unit increment in REGIME score. The standardized coefficient (Beta = 0.171), though significant, was decreased approximately 60% from the

univariate statistic (Beta = 0.41), suggesting the majority of REGIME's initial effect was associated with its relationship to other factors included in the multivariate model. The model also estimated an increase in per capita expenditures which increased 52.4 Int\$ for every 1% increment in a nation's population over age 60, along with per capita increments of 3.36 Int\$ with every addi-

Table 3 Metric and standard regression coefficients (in parentheses) for national health care expenditures by selected socio-political indicators for nations with Human Development Index designations of "medium" or "low development"³⁴, 84 Nations, 2008.

Predictors ^a	TEH%GDP	GGEH%GGE	PcTEH	PcGGEH
Over60	.174** (.149)	0.067 (.034)	7.15 (.299)	-0.903 (-.016)
LifeExpect	-0.073 (-.241)	0.019 (.037)	-1.54 (-.018)	-0.47 (-.032)
DrRN/10 K	0.017 .161	-0.007 (-.042)	0.096 (.027)	-0.366 (-.071)
HSEffect	-29.9** (-.416)	-18.2 (-.151)	-709.3* (-.060)	-534.6* (-.151)
EDUIndex	-0.742 (-.045)	0.544 (.020)	177.5 (.208)	155.4 (.193)
PcGNI	-0.106 (-.142)	-0.063 (-.050)	41.5** (.624)	29.5** (.803)
REGIME	.112** (.254)	.205* (.278)	4.42** (.168)	3.57** (.165)
Constant	35.0**	23.6	597.7	418.7
R ²	.246**	0.038	.732**	.686**

^a See text for definitions and data sources.

* $p \leq 0.05$.

** $p \leq 0.01$.

tional doctor, nurse and/or midwife per 10,000 persons in the population.

According to the final equation of Table 2, REGIME, along with Over60, LifeExpect, DrRN/10K and PcGNI exhibited significant associations with per capita general government expenditures on health. Per capita expenditure increased 42.2 Int\$ for every percent increase in population over age 60, 2.94 Int\$ for every additional doctor, nurse or midwife per 10,000 persons, 37.6 Int\$ for every additional 1000 Int\$ in a nation's gross national income and 22.4 Int\$ for every increment in REGIME score. Together, the model accounts for 82.4% of variation in PcGGEH.

Data re-analyzed for a subset of nations ($N = 84$) classified in the Human Development Index [34] as having achieved "medium" to "low" development are reported in Table 3. In general, the associations, albeit weaker, were consistent with those based on the full data set. REGIME continued to be positively associated with expenditures. Among these nations not yet considered to have achieved high development, every unit increment in REGIME score increased the percentage of GDP developed to total health by 0.11%, while the increase in the percentage of general government expenditures spent on health was 0.20%. Per capita total expenditures were estimated to increase by 4.42 Int\$, with per capita government expenditures estimated to increase by 3.57 Int\$.

4. Discussion

The tenet of the WHO Constitution that "governments have a responsibility for the health of their people [42]" like Rudolf Virchow's observation that "politics is nothing but medicine at a larger scale [43]" underscores the relevance of central government authority in allocating rights, privileges and responsibilities as a root determinant of public's health. Whether and how governance affects the way health care is organized, delivered and/or financed is an important, but largely unexamined, subject of study. As global initiatives toward democratization proceed, important questions arise about health thresholds that governments must achieve in securing legitimacy from the populous. Equally consequential is the re-thinking of governance as "risk" given its enduring effects on economic productivity, educational achievement, socio-cultural practices, environmental stewardship, and the like.

The association of a nation's relative wealth with health care expenditures has been studied, and it is reasonable to attribute significant differ-

ences in health care expenditures to economic differences across nations [10,11]. This study diverged from previous studies by considering demographics, political, economic and health system features of nations concurrently with characteristics of their systems of governance. It was found that the authority structure of central governments has had a significant association with levels of health care expenditures. More democratic nations spent more, both proportionately and per capita, on health care than less democratic nations and that relationship persisted while controlling relevant economic, demographic and health system characteristics. For every unit increment in a nation's REGIME score toward a more democratic approach to governance, this study estimated significant ($p < 0.05$) increments in the percent of GDP expended on health care (+0.14%), the percent of general government expenditures targeted to health care (+0.25%), the total per capita expenditures on health (+34.4 Int\$) and the per capita general government expenditures (+22.4 Int\$).

Despite the consistency of findings with the expectations of this study, there are many reasons to withhold judgments about causation. For one thing, analyses of secondary data may be challenged for incomplete, inaccurate and/or inappropriate information. As such, the applicability of findings may be questioned. Differences in health care expenditures across geographic locations, for example, may account for many of the findings presented here. Such an "explanation" is largely useless, however, as it offers neither opportunity to modify nor to understand the mechanisms of the observed associations. In order to meaningfully advance socio-political initiatives to drive health services and health status improvements for populations at-risk, ongoing examinations of the costs and benefits associated with various approaches to governance are needed. This research attempted to quantify expenditure differences among "peer nations" that exhibited comparable levels of development. Relationships reported for the full dataset of 159 nations persisted when data were limited to 84 nations designated to be "medium" and "low" on the Human Development Index [36]. These findings are consistent at the least, with a plausible association between a nation's type of governance and its commitment to human health, even if they do not establish the view.

Some critics may consider "arbitrary" selection of specific indicators (e.g., Polity IV project scores rather than Freedom House scores, Global Democracy Rankings, etc.), while others may suspect the quality of information collected from poor nations. The use of U.N., WHO and similar public data

sources consistent with expectations about how and why such information was gathered (i.e., to advance understanding of factors contributing to human development) offers some reassurance about data validity and the analytic framework, but cannot completely resolve such concerns.

Another related concern pertains to whether these results reflect a genuine causal relation or a mere co-variation between indicators. In a separate analysis, it was found that the regression model that included any of the four indicators of health care expenditures as predictors was significant in accounting for variation in REGIME scores among nations. Only further study using different sources, tools and time frames for what the researchers believe is a relevant, fruitful line of inquiry can resolve such questions.

How health care spending affected health outcomes was beyond this paper's scope, but the findings of greater expenditures as characteristic of democratic nations portends better health outcomes for those populations. Complementary studies of authority structures and health outcomes have been reported [44–47], but additional research is needed.

What implications do these findings suggest? Health care expenditures frequently occur at the expense of other investments in a society's infrastructure and institutions. Understanding health care expenditures to be a consequence of underlying democratic structures, in contrast or complementary, to the impacts of larger economies and/or demographic transitions, would suggest the direction and intensity of future expenditures. Decisions by nations and governments about whether and to what degree to fund health care for citizens are important to the physical and socio-political health of the public-at-large. Good health is essential to personal well-being and civic participation. Democratically elected leaders may place greater emphasis on health care than leaders of autocratic institutions in order to appeal to an electorate. A more compelling and plausible argument is that health and well-being may more likely be viewed as a basic human right in democracies and as a privilege in autocracies.

Nations transitioning from an autocracy to a democracy may be particularly stressed to commit greater public resources in support of population health and well-being, the failure of which may limit or destabilize societal institutions during political transition. Cross-national analyses also may inform policy makers about whether a nation's expenditures are in line with peers or may be effectively modified without substantial detriment to population health status. Such inquiry reflects

WHO goals of improving health, addressing legitimate expectations of populations and the fair distribution of government financial burdens.

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