On The Health and Wealth of Nations

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Abstract

From the Human Development Report of 2014, we calculated the product of infant mortality rate, under-five mortality rate, female adult mortality rate, and male adult mortality rate as a new measure of national health, the total mortality rate or TMR, and the ratio of per capita health spending in purchasing power parity to inequality in life expectancy as a new measure of national health, the health spending per health inequality or Health/c/IneqLE. Of the 172 nations reporting sufficient data to evaluate these parameters, 52 were healthy (TMR < 1 billion). All healthy nations were rich (Health/c/IneqLE> 101). Of the 120 sick nations (TMR > 1 billion), 108 were poor (Health/c/IneqLE< 102). We conclude that Health/c/IneqLE> 101 is a necessary condition for national health. Twelve nations were rich but sick. None of these twelve had Health/c/IneqLE> 186. All nations with Health/c/IneqLE> 194 were healthy. We conclude that Health/c/IneqLE> 194 is a sufficient condition for national health. We recommend that efforts to improve human development be directed at increasing Health/c or decreasing IneqLE. Efforts to increase Health/c should increase per capita health spending and/or diminish population growth. Efforts to decrease IneqLE should enhance primary health care for the poor.

Key words: Health, Wealth, Nations, Inequality

Introduction

Human development is the process of improving wellbeing. The Human Development Index (HDI) was created to summarize human development within a nation. It combines equally measures of health, education, and wealth (1). The HDI has some utility, but also some flaws. First among these is the fact that wellbeing is essentially synonymous with health. Education and wealth are of secondary importance, valuable only as means to health. By combining the three parameters equally, the HDI dilutes and distorts the role of health in human development. Second, the HDI underestimates the difference in human development between nations.

In the 2014 Human Development Report, for instance, HDI varied from a low of 0.337 for Niger to a high of 0.944 for Norway (2). This implies that human development in Niger is 35.7% of what it is in Norway. We suggest this vastly understates the difference in wellness between these two countries. Finally, the division of all nations into four approximately equal groups designated "very high human development" for those with HDI >0.807, and "high human development" for those with HDI between0.699 and 0.807, and "medium human development" for those with HDI between 0.556 and 0.699, and low human development for those with HDI <0.541 is artificial and deceptive.

The most developed nations exhibit infant and child mortality rates and maternal mortality ratios that are less than 2%, and adult mortality rates that are less than 12%, of those in the least developed nations. These mortality statistics portray a larger difference in human development than does the HDI. And the mortality statistics give an undiluted, undistorted, and undeniable view of a nation's health.

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Mortality rate is the most fundamental measure of national health, and nations typically report four different mortality rates: Infant (probability of dying between birth and first birthday/1000 births = IMR), under-five (probability of dying between birth and fifth birthday/1000 births = U5MR), adult female (probability of a female dying between 15th and 60th birthdays/1000 females = AMR-F), and adult male (probability of a male dying between 15th and 60th birthdays/1000 males = AMR-M). For each reporting nation, we calculated the product of the four rates to form an approximation to total mortality rate (TMR). The TMR is an estimate of the probability of dying between birth and the 60th birthday/trillion people.

It is the purpose of this paper to list the nations according to this new measure of health, to dichotomize the listed nations as healthy or sick, and to compare the healthy and sick nations according to measures of wealth (gross domestic product per capita in purchasing power parity = GDP/c), health spending per capita in purchasing power parity (Health/c), and inequality in life expectancy as a percentage of expected (IneqLE) (2). For reference, we compare the above rankings with rankings by maternal mortality ratio (Maternal MR = deaths from pregnancy/100,000 live births), adolescent birth rate (Adol Births = number of births between ages 15 and 19/1000 females between ages 15 and 19) and HDI. We also created a new measure of national wealth, thehealth spending per capita relative to health inequality by calculating the ratio Health/c/IneqLE. We demonstrate the brilliant utility of this new measure.

Methods

In the 2014 Human Development Report (2), 187 nations reported HDI and other data. Fifteen of these nations, Lichtenstein, Andora, Hong Kong, Palestine, Zimbabwe, Cuba, Libya, Oman, Myanmar, Syria, Djibouti, Argentina, Dominica, Saint Kitts & Nevis, and Palau reported insufficient data to calculate TMR and/or Health/c/IneqLE, and were not consider further. For the remaining 172 nations, TMR and Health/c/IneqLE were calculated and analyzed as described above. Antigua & Barbuda, Seychelles, and Kiribati were included in this analysis, although these nations did not report maternal mortality ratios. All other data utilized in this analysis are from the 2014 Human Development Report (2).

Results

Table 1 lists the 172 nations studied with values for TMR and Health/c/IneqLE. Iceland has the lowest TMR at 9,728, and Sierra Leone the highest at 4,280,988,348.We defined healthy nations as those with TMR < 1 billion deaths/trillion people. Of the 172 nations studied, 52 are healthy by this definition. Of these 52 healthy nations, all are defined as rich because they have Health/c/IneqLEequal to or greater than 102. The remaining 120 nations are sick.Of these sick nations, 108 are defined as poor because they have Health/c/IneqLE< 102. Twelve sick nations are rich because they have Health/c/IneqLE> 102. But none of these rich & sick nations have Health/c/IneqLE> 186. Figure 1 describes the relationship between TMR and Health/c/IneqLE.
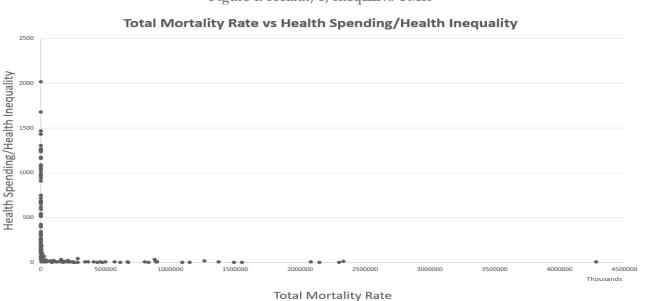
Figure 1: Health/c/IneqLEvs TMR

Table 1: Nations Ranked by TMR and Health/c/IneqLE

Nations	TMR	Health/c/IneqLE
Rich & Healthy		
Iceland	9728	1253
Luxembourg	17472	2020
Singapore	17712	1174
Sweden	18744	1269
Norway	22638	1682
Japan	23184	1018
Cyprus	27018	594
Finland	34496	969
Italy	35040	941
Israel	39600	620
Switzerland	45264	1434
Netherlands	47520	1306
Rep Korea	51408	545
Ireland	52020	1090
Slovenia	54162	656
Austria	55272	1236
Germany	58752	1259
France	71868	1046
Portugal	70200	669
Belgium	72216	1074
Australia	73600	906
Spain	74620	752
Denmark	76632	1163
Greece	87720	686
Czech Rep	95040	535
UK	103740	717
Canada	111300	988
Malta	135828	515
New Zeal	140250	681
Qatar	161616	424
Croatia	168000	299
Estonia	171396	259
Saudi Arab	232596	216
Poland	275040	260
Bahrain	281520	245
Kuwait	295240	316
Unite Arab E	304640	342
Bosnia & H	390852	140
Brunei Dar	417480	404
USA	423654	1468
Montenegro	449064	172
Chile	471888	268
Lithuania	491280	236
Macedonia	496752	102
Uruguay	510720	156
Maldives	549549	118
Slovakia	571200	397
Hungary	580320	316
Serbia	632100	142
Belarus	632420	131

Costa Rica	677160	195
Malaysia	986580	161
Poor & Sick		
Sri Lanka	1176560	36
China	1524096	57
Tunisia	2161152	62
Albania	2728755	59
Peru	2788884	40
Thailand	3019302	57
Columbia	3160080	53
Venezuela	3474900	75
Iran	3534300	74
Brazil	3676400	88
Grenada	3682448	87
Ukraine	3682800	58
Mexico	3766560	92
Algeria	4182000	30
Tonga	4256538	20
St. Lucia	4276800	74
Jordan	4394016	80
Egypt	4530330	39
Jamaica	4608632	24
Viet Nam	4610304	28
Samoa	5017950	26
Armenia	5143680	25
Vanuatu	5243940	7.8
Ecuador	6632280	54
Paraguay	7136096	36
Georgia	7191360	51
Moldova	7916670	43
Honduras	8120334	22
Belize	8406720	42
Surinam	8592066	59
Trinidad & T	8727264	101
El Salvador	9088128	35
St. Vin & G	9775920	39
Morocco	10503513	25
Cape Verde	11581526	25
Nicaragua	12235104	33
Dom Rep	15164820	35
Fiji	15604776	23
Azerbaijan	16239375	38
Kazakhstan	16545352	50
Iraq	22859424	69
Kyrgyzstan	24406920	9.3
Philippines	25251840	16
Solomon	25758954	7.8
Indonesia	26759200	15
Mongolia	29252412	26
Bangladesh	29993304	4.4
Micronesia	32526936	23
Guatemala	37765440	27
Uzbekistan	38237760	11
Nepal	41027868	3.8

Bolivia	49560390	11
Bhutan	53411400	14
Namibia	74522448	14
Cambodia	77792000	6.3
Tajikistan	79803360	4.6
Madagascar	84587838	2.3
Sao To & P	89071164	8.1
India	96768672	7.9
Guyana	99248730	19
Yemen	119480400	7.3
Lao	130076928	5.9
Kiribati	153897600	8.7
Botswana	155669374	34
Timor-Leste	158731776	4.1
Pakistan	167766048	3.6
Eritrea	172915652	1.3
Turkmen	179769375	13
Senegal	189072900	4.4
Ghana	192925152	5.7
Gabon	207799200	21
Rwanda	214723080	4.9
Sudan	215564328	8.6
Papua	221719680	3.8
Tanzania	239850072	4
Haiti	249237288	4.4
Gambia	250085955	2
Ethiopia	259163640	1.9
Comoros	284898900	2.3
South Afri	286483230	40
Mauritania	341610360	4.3
Kenya	363866748	3
Liberia	405938400	4.6
Malawi	435187968	1.6
Uganda	462117150	3.8
Benin	467386200	2.1
Burkina Fas	473448096	2.4
Afghanistan	497688345	5.2
Congo	567130368	3.9
Niger	609493248	1.2
Togo	668808384	2.8
Guinea	671678280	1.8
Zambia	800440368	4.9
Burundi	827589360	1.5
Eq Guinea	879400800	34
Cot d'Ivoire	885479040	4.7
Cameroon	894632100	3.4
Mozambique	1090890990	1.6
Mali	1148682240	2.4
Swaziland	1259919360	14
Nigeria	1368394560	7.1
Guinea-Bis	1489609440	1.6
Chad	1548640050	1.9
Angola	2079077200	5.6
DR Congo	2148214800	0.76
Cent Af Rep	2297557080	0.81

Lesotho	2333982200	9
Sierra Leone	4280988348	5.8
Rich & Sick		
Lebanon	1054944	155
Turkey	1405152	111
Latvia	1518696	173
Russia	1780290	147
Bulgaria	2202288	145
Romania	2317392	114
Barbados	2613240	145
Antigua & B	2996280	145
Seychelles	3177460	111
Panama	3689344	113
Mauritius	3812640	104
Bahamas	5245520	186

Tables 2 – 4 describe some characteristics of these groups of nations. Notice the clean break between the rich & healthy group and the poor & sick group in both TMR and Health/c/IneqLE. Notice also the overlap in the ranges of values for the other parameters between the three groups of nations.

Although GDP/c varies enormously over the 172 nations studied, from $451 for Democratic Republic of Congo to $133,713 for Qatar, a 294-fold difference, health spending as a percentage of GDP/c is remarkably constant, varying from 1.9% for Qatar to 19.5% for Liberia with a median of 6.3%.

Table 2: Rich and Healthy Nations (n = 52)

Parameters	Values		
	Minimum	Median	Maximum
TMR	9,728	107,520	986,580
Health/c/IneqLE	102	607	2020
Health/c	773	2,482	9,103
IneqLE	2.8	4.5	9.2
GDP/c	9,184	33,014	133,713
Maternal MR	2	8	60
Adol Births	0.6	11.2	60.8
HDI	.698	.857	.944

Table 3: Poor and Sick Nations (n = 108)

Parameters	Values		
	Minimum	Median	Maximum
TMR	1,176,560	76,157,224	4,280,988,348
Health/c/IneqLE	0.76	12	101
Health/c	31	285	1,658
IneqLE	8.3	22.0	51.2
GDP/c	451	4,923	37,479
Maternal MR	24	180	1100
Adol Births	4.6	65.1	204.8
HDI	.337	.617	.766

Table 4:   **Rich and Sick Nations (n = 12)**

Parameters	Values		
	Minimum	Median	Maximum
TMR	1,054,944	2,465,316	7,931,385
Health/c/IneqLE	104	145	186
Health/c	880	1,171	1,748
IneqLE	4.9	8.1	12.1
GDP/c	14,411	17,701	23,184
Maternal MR	11	34	92
Adol Births	12.0	31.0	78.5
HDI	.756	.775	.810

Discussion

Bloom and Canning described the loose, approximately linear relationship between a nation's life expectancy at birth and the log of that nation's per capita income (3). They discussed how causality might flow in both directions. Health fosters wealth, and vice versa.

We created a new measure of national health, the TMR, and a new measure of national wealth, the health spending per capita relative to the health inequality, or Health/c/IneqLE. The relationship between these two parameters is rectangular (Figure 1). Because none of the 108 nations with Health/c/IneqLE less than 102 are healthy, i.e., have a TMR less than 1 billion, we suspectHealth/c/IneqLE = 102 to be a necessary condition for national health.

Because all 52 nations with Health/c/IneqLE equal to, or greater than, 195 are healthy, i.e., have TMR less than 1 billion, we suspect Health/c/IneqLE = 195 to be a sufficient condition for national health. Nations with Health/c/IneqLE between 102 and 186 may be healthy or sick. Of the 20 nations with Health/c/IneqLEwithin this range, eight are healthy and 12 are sick.

The other parameters of health (maternal mortality ratio, adolescent birth rate, and health inequality) and wealth (Health/c, and GDP/c) show a correlation between median values of health and wealth. The wealthy nations have lower maternal mortality ratio, adolescent birth rate, and health inequality than the poor nations. But there is substantial overlap between the ranges of values between the rich & healthy, poor & sick, and rich & sick groups of nations. The wealthy nations have higher median HDI than the poor nations, but, again, with substantial overlap between ranges (Tables 2 – 4).

In conclusion, we offer TMR and Health/c/IneqLE as accurate measures of national health and wealth, respectively. We recommend that efforts to improve human development be directed at increasing Health/c and/or decreasing IneqLE. Because all nations spend approximately the same percentage of GDP/c on health, increasing GDP/c by increasing GDP and/or reducing population growth should increase Health/c. Improving primary health care for the poor, as recommended by the Alma Atta Declaration (4), should decrease IneqLE.

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