Country GDP Vs. Country Mortality Rates

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Background

- What is Gross Domestic Product (GDP)?
  - Used to gauge the health of the economy in countries
  - Represents the total dollar value of all of the goods and services produced in a certain time period.
- What is the Mortality Rate?
  - $$\frac{\textit{Deaths occurring during a given time period}}{\textit{Size of the population among which the deaths occurred}} \times 10^n$$

Variables Used

- The variables that were used throughout our regression analysis:
  - Mortality/Death Rate
  - Country’s GDP, per capita
  - Population
  - Literacy Rates
  - Climate

Purpose & Hypothesis

- Main goals:
  - See whether or not there is a correlation between a country's GDP and the country’s mortality rate.
- Hypothesis:
  - H0: $B1 = 0$
  - H1: $B1 \neq 0$

Raw Data (from kaggle.com)

Region	Population	Area (sq. mi.)	Pop. Density (per sq. mi.)	Coastline (coast/area ratio)	Net migration	Infant mortality (per 1000 births)	GDP ($ per capita)	Literacy (%)	Phones (per 1000)	Arable (%)	Crops (%)	Other (%)	Climate	Birthrate	Deathrate	Agriculture	Industry	Service
ASIA (EX. NEAR EAST)	31056997	647500	48	0	23.06	163.07	700	36	3.2	12.13	0.22	87.65	1	46.6	20.34	0.38	0.24	0.38
EASTERN EUROPE	3581655	28748	124.6	1.26	-4.93	21.52	4500	86.5	71.2	21.09	4.42	74.49	3	15.11	5.22	0.232	0.188	0.579
NORTHERN AFRICA	32930091	2381740	13.8	0.04	-0.39	31	6000	70	78.1	3.22	0.25	96.53	1	17.14	4.61	0.101	0.6	0.298
OCEANIA	57794	199	290.4	58.29	-20.71	9.27	8000	97	259.5	10	15	75	2	22.46	3.27	0	0	0
WESTERN EUROPE	71201	468	152.1	0	6.6	4.05	19000	100	497.2	2.22	0	97.78	3	8.71	6.25	0	0	0
SUB-SAHARAN AFRICA	12127071	1246700	9.7	0.13	0	191.19	1900	42	7.8	2.41	0.24	97.35	0	45.11	24.2	0.096	0.658	0.246
LATIN AMER. & CARIB	13477	102	132.1	59.8	10.76	21.03	8600	95	460	0	0	100	2	14.17	5.34	0.04	0.18	0.78
LATIN AMER. & CARIB	69108	443	156	34.54	-6.15	19.46	11000	89	549.9	18.18	4.55	77.27	2	16.93	5.37	0.038	0.22	0.743
LATIN AMER. & CARIB	39921833	2766890	14.4	0.18	0.61	15.18	11200	97.1	220.4	12.31	0.48	87.21	3	16.73	7.55	0.095	0.358	0.547
C.W. OF IND. STATES	2976372	29800	99.9	0	-6.47	23.28	3500	98.6	195.7	17.55	2.3	80.15	4	12.07	8.23	0.239	0.343	0.418
LATIN AMER. & CARIB	71891	193	372.5	35.49	0	5.89	28000	97	516.1	10.53	0	89.47	2	11.03	6.68	0.004	0.333	0.663
OCEANIA	20264082	7686850	2.6	0.34	3.98	4.69	29000	100	565.5	6.55	0.04	93.41	1	12.14	7.51	0.038	0.262	0.7
WESTERN EUROPE	8192880	83870	97.7	0	2	4.66	30000	98	452.2	16.91	0.86	82.23	3	8.74	9.76	0.018	0.304	0.678
C.W. OF IND. STATES	7961619	86600	91.9	0	-4.9	81.74	3400	97	137.1	19.63	2.71	77.66	1	20.74	9.75	0.141	0.457	0.402
LATIN AMER. & CARIB	303770	13940	21.8	25.41	-2.2	25.21	16700	95.6	460.6	0.8	0.4	98.8	2	17.57	9.05	0.03	0.07	0.9
NEAR EAST	698585	665	1050.5	24.21	1.05	17.27	16900	89.1	281.3	2.82	5.63	91.55	1	17.8	4.14	0.005	0.387	0.608
ASIA (EX. NEAR EAST)	147365352	144000	1023.4	0.4	-0.71	62.6	1900	43.1	7.3	62.11	3.07	34.82	2	29.8	8.27	0.199	0.198	0.603
LATIN AMER. & CARIB	279912	431	649.5	22.51	-0.31	12.5	15700	97.4	481.9	37.21	2.33	60.46	2	12.71	8.67	0.06	0.16	0.78
C.W. OF IND. STATES	10293011	207600	49.6	0	2.54	13.37	6100	99.6	319.1	29.55	0.6	69.85	4	11.16	14.02	0.093	0.316	0.591
WESTERN EUROPE	10379067	30528	340	0.22	1.23	4.68	29100	98	462.6	23.28	0.4	76.32	3	10.38	10.27	0.01	0.24	0.749
LATIN AMER. & CARIB	287730	22966	12.5	1.68	0	25.69	4900	94.1	115.7	2.85	1.71	95.44	2	28.84	5.72	0.142	0.152	0.612
SUB-SAHARAN AFRICA	7862944	112620	69.8	0.11	0	85	1100	40.9	9.7	18.08	2.4	79.52	2	38.85	12.22	0.316	0.138	0.546
NORTHERN AMERICA	65773	53	1241	194.34	2.49	8.53	36000	98	851.4	20	0	80	2	11.4	7.74	0.01	0.1	0.89
ASIA (EX. NEAR EAST)	2279723	47000	48.5	0	0	100.44	1300	42.2	14.3	3.09	0.43	96.48	2	33.65	12.7	0.258	0.379	0.363
LATIN AMER. & CARIB	8989046	1098580	8.2	0	-1.32	53.11	2400	87.2	71.9	2.67	0.19	97.14	1.5	23.3	7.53	0.128	0.352	0.52
EASTERN EUROPE	4498976	51129	88	0.04	0.31	21.05	6100	0	215.4	13.6	2.96	83.44	4	8.77	8.27	0.142	0.308	0.55
SUB-SAHARAN AFRICA	1639833	600370	2.7	0	0	54.58	9000	79.8	80.5	0.65	0.01	99.34	1	23.08	29.5	0.024	0.469	0.507
LATIN AMER. & CARIB	188078227	8511965	22.1	0.09	-0.03	29.61	7600	86.4	225.3	6.96	0.9	92.15	2	16.56	6.17	0.084	0.4	0.516
LATIN AMER. & CARIB	23098	153	151	52.29	10.01	18.05	16000	97.8	506.5	20	6.67	73.33	2	14.89	4.42	0.018	0.062	0.92
ASIA (EX. NEAR EAST)	379444	5770	65.8	2.79	3.59	12.61	18600	93.9	237.2	0.57	0.76	98.67	2	18.79	3.45	0.036	0.561	0.403
EASTERN EUROPE	7385367	110910	66.6	0.32	-4.58	20.55	7600	98.6	336.3	40.02	1.92	58.06	3	9.65	14.27	0.093	0.304	0.603
SUB-SAHARAN AFRICA	13902972	274200	50.7	0	0	97.57	1100	26.6	7	14.43	0.19	85.38	2	45.62	15.6	0.322	0.196	0.482
ASIA (EX. NEAR EAST)	47382633	678500	69.8	0.28	-1.8	67.24	1800	85.3	10.1	15.19	0.97	83.84	2	17.91	9.83	0.564	0.082	0.353

Regresssion | GDP v Deathrate

Multiple Regression Analysis

Look at p-value, if positive and < alpha, then it is significant. Alpha = 0.05

Rsquare suggests that a linear relationship is present.

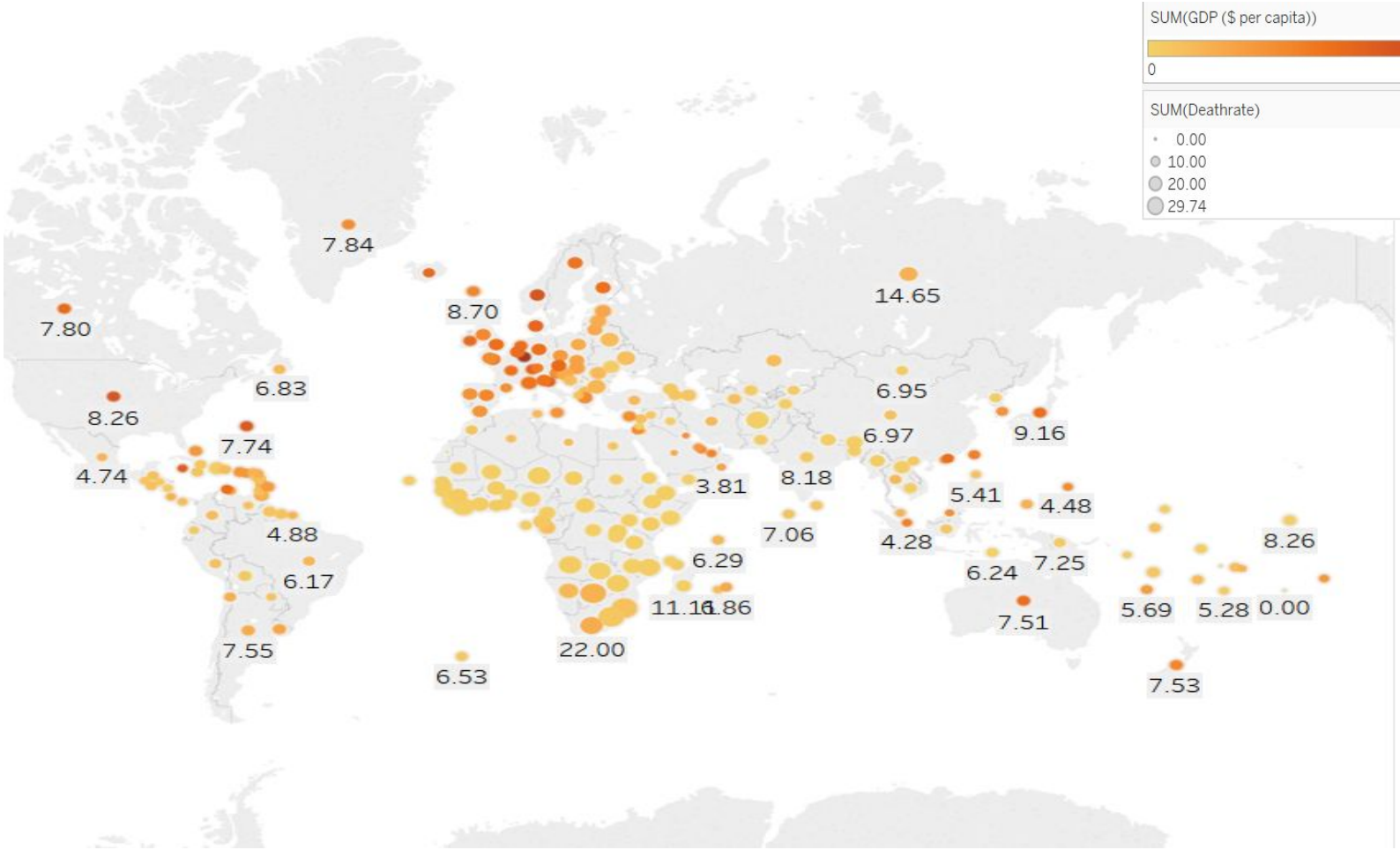
	A	B	C	D	E	F	G	H	I
1	SUMMARY OUTPUT								
2									
3	*Regression Statistics*								
4	Multiple R	0.765762							
5	R Square	0.586391							
6	Adjusted R Square	0.559077							
7	Standard Error	3.38224							
8	Observations	227							
9									
10	ANOVA								
11		*df*	*SS*	*MS*	*F*	*Significance F*			
12	Regression	14	3438.286927	245.5919234	21.46867913	2.31E-33			
13	Residual	212	2425.183564	11.43954511					
14	Total	226	5863.470491						
15									
16		*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
17	Intercept	3.122069	2.792388594	1.118063889	0.264805066	-2.382335051	8.626472752	-2.382335051	8.626472752
18	Population	-5.2E-09	2.26169E-09	-2.298603335	0.022502042	-9.65703E-09	-7.40448E-10	-9.65703E-09	-7.40448E-10
19	Area (sq. mi.)	2.63E-07	1.50948E-07	1.741623282	0.083024858	-3.46568E-08	5.60447E-07	-3.46568E-08	5.60447E-07
20	Pop. Density (per sq. mi.)	7.4E-05	0.000148931	0.496989287	0.619711603	-0.000219558	0.000367592	-0.000219558	0.000367592
21	Coastline (coast/area ratio)	-0.001345	0.003567319	-0.37697124	0.70657204	-0.008376736	0.005687183	-0.008376736	0.005687183
22	Net migration	-0.085409	0.055514125	-1.538517402	0.125413354	-0.194839835	0.02402094	-0.194839835	0.02402094
23	Infant mortality (per 1000 births)	0.157845	0.01287187	12.26277795	1.76674E-26	0.132471638	0.183218137	0.132471638	0.183218137
24	GDP ($ per capita)	0.000107	4.52317E-05	2.372925106	0.018541694	1.81699E-05	0.000196493	1.81699E-05	0.000196493
25	Literacy (%)	0.000604	0.008906612	0.067857638	0.945962917	-0.016952483	0.018161246	-0.016952483	0.018161246
26	Phones (per 1000)	0.00216	0.002052478	1.052299954	0.293859889	-0.001886057	0.006205703	-0.001886057	0.006205703
27	Arable (%)	0.043777	0.030819781	1.420428954	0.156951857	-0.016975167	0.104529785	-0.016975167	0.104529785
28	Crops (%)	-0.055015	0.040608812	-1.354748076	0.176939783	-0.135063492	0.025034071	-0.135063492	0.025034071
29	Other (%)	-0.002928	0.025448367	-0.115069243	0.908499152	-0.053092579	0.04723593	-0.053092579	0.04723593
30	Climate	0.642853	0.262207901	2.45169041	0.015027664	0.125983921	1.159721272	0.125983921	1.159721272
31	Birthrate	-0.115265	0.041860583	-2.753555669	0.006406928	-0.19778174	-0.032749152	-0.19778174	-0.032749152

Multiple Regression Analysis

Test to see if there is a significant relationship between the dependent variable (Mortality Rate) to any of the independent variables (more specifically GDP).

Condition:

P-value<alpha, reject null hypothesis.


SUM(GDP ($ per capita))
0
55,100
SUM(Deathrate)
0.00
10.00
20.00
29.74
7.84
7.80
8.70
14.65
6.83
8.26
6.95
7.74
6.97
9.16
4.74
3.81
8.18
5.41
4.48
4.88
7.06
4.28
8.26
6.29
6.24
7.25
6.17
11.16
6.86
5.69
5.28
0.00
7.51
7.55
22.00
6.53
7.53

Correlations

United States currently has an average GDP of $37,800 and a mortality rate of 8.26 (per 1,000 people) as of 2017.

The highest mortality rate is 29.74 (per 1,000 people) with a GDP of $4,900 in the african country of Swaziland

The lowest mortality rate is 2.41 (per 1,000 people) with a GDP of $2,200 in Kuwait

22 countries have a GDP under $1,000 and of those 22 countries 11 have mortality rates 15.00 (per 1,000 people) or more

Luxembourg has the highest GDP at 55,100 and a mortality rate of 8.41 (per 1,000 people)

Results

Based on a linear regression model by conducting a significance test, there is sufficient evidence to suggest to reject the null hypothesis.

By rejecting the null hypothesis, we accept the alternative hypothesis that suggest that a linear relationship exists.

GDP, Population, Climate, and Birth Rate are all significant variables that most influence the Mortality Rates for countries.

Recommendations

In order to decrease mortality rates, we recommend a country should boost their economy by producing more goods and services domestically.

Questions?