Modeling of COVID-19 Infection per 1 Million Population in Indonesia

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INTRODUCTION TO DATA SET

Aim: We aim to predict the number of COVID-19 infections per 1 million population in Indonesia. This is to help the Indonesia Government to decisively take exact measure in preventing and fighting the COVID-19 in Indonesia, as well as to predict the number of logistics and human resources required in fighting this dangerous disease.

Method: The models include (A) Population Density per Km, (B) Contagion per 1M population, (C) Income per Capita, (D) Health Care Index, (E) Energy Index, (F) A*D (in thousands), (G) Elderly Population, (H) G/D, (I) Years of Schooling, (J) Public Trust in Politicians. Eleven countries were selected to calculate the best correlation of all parameters, therefore can be applied to estimate contagion per 1M population in Indonesia. These countries include Iran, France, Italy, Netherland, Germany, China, UK, USA, Spain, Malaysia, and Singapore.

Key findings: As of 23rd March 2020, Indonesian daily trajectory follows 3rd order polynomial with [daily number of COVID-19 positive] = $0,0891 (\text{days})^3 - 0,8385 (\text{days})^2 + 2,5223 (\text{days}) + 0,458$ with $R^2 = 0,9966$. The best model is produced from Public Trust to Politicians vs Contagion per 1M population with correlation of 0.898. From the linear graph, COVID-19 per 1M population = $(\text{trust} - 5.2558)/0.1227$, we estimate the current peak of positive COVID-19 per 1 M population in Indonesia to be 299 persons.

Recommendations: Models from eleven countries produce a typical spread of COVID-19 have a strong correlation with (1) level of trust in government or community leaders, Moderately correlated with (3) elderly population and (4) health service index and weakly correlated with (5) income per capita, population density, and (6) education level. To avoid 299 positive COVID-19 per 1 M population in Indonesia the best strategy is to work together with community leaders and strong influencers so that the people can follow government recommendation i.e. to stay at home, to work from home, and to avoid the crowd.

Keywords: COVID-19, Indonesia, Public Trust to Politicians, Contagion per 1M population

Graph 1. Daily number of confirmed COVID-19 cases in Indonesia

Table 1. Possible predictors in the determination of contagion per 1M population in Indonesia

Country	A Population Density per Km	B Contagion per 1M pop.	C Income per Capita	D Health Care Index	E Energy Index	F A*D (000)	G Elderly Population	H G/D	I Years of Schooling	J Public Trust in Politicians
Indonesia*	1121 (Java)	299*	2520.9	60	64.1	67.8	6.44	0.11	8	42
Iran	134	258	5503.1	52	63.6	67.8	8.7	0.17	15	49
France	122	245	41,080	80	81	9.76	17.95	0.22	11	44
Italy	205	978	33,730	67	77	13.65	21.25	0.32	10	122
Netherland	511	245	51,260	75	78	38.15	17.09	0.23	12	7
Germany	237	297	47,090	73	79	17.38	21.45	0.29	14	13
China	145	56	9,389	64	64	9.35	9	0.14	8	27
UK	274	84	43,160	74	82	20.40	18	0.24	13	17
USA	94	105	60,200	69	78	6.51	16	0.14	12	16
Spain	92	640	30,370	79	77	7.26	17	0.22	12	104
Malaysia	96	40	10,590	68	69	6.54	18	0.26	10	29
Singapore	7953	78	58,770	71	71	563.39	10	0.14	12	1
CORRELATION (except Indonesia)	- 0.225		- 0.029	0.068	0.271	- 0.230	- 0.421	0.573	- 0.034	0.898

* optimized case predicted based on Graph 2.

Graph 2. Four models to predict the number of Indonesia's COVID-19 contagion per 1M population