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| Title: | Using every countries COVID-19 and government response data to create a composite index ranking that describe their relative handling of the COVID-19 Pandemic. |

The COVID-19 pandemic is the largest global pandemic since the 1918 Spanish Flu. As of today, it has killed over 2.5 million people and infected nearly 115 million others. The debate about which countries have best handled the COVID-19 pandemic has been frequently and continuously debated and focuses on both the outbreak severity in a country and a country’s government response. However, the data most used (in mainstream discussions) when describing outbreak severity has tended to only be surface level (e.g. total case, deaths, and tests) and the data used when describing a country’s government response has rarely been quantitative. This is dangerous as it has allowed for nationalism and prejudice to factor into such discussions instead of hard evidence. Thus, we think it is imperative to perform and in depth analysis on every country’s COVID-19 and government response data so future discussions and potential policy decision can be grounded, quantitative, unbiased, and fair.

From every country’s COVID-19 data, we created an algorithm that fits a continuous and derivable interpolated function to every country’s COVID-19 case and death data. This allowed the calculation of advanced pandemic description metrics (e.g. the rate of growth of a pandemic) was performed to describe a country’s outbreak severity. By using government response data collected by the University of Oxford, metrics about every country’s response severity could calculated. Then, the interaction between the COVID-19 data and government response data was used to calculate further risk tolerance metrics which described how bad the pandemic was in a country before they enacted strict lockdown measures. The results of these metrics were used construct a composite index (composed of a outbreak severity, response severity, and risk tolerance index) to quantitatively describe the relative outbreak severity and government response metrics taken during the COVID-19 Pandemic. Additionally, statistical correlation was performed between possible confounding variables (e.g. economic, healthcare quality, population, and press freedom data) to see if any significance trends existed. Additionally, we performed statistical correlation analyses between our calculated metrics and the 2019 Global Health Security Rankings (which were supposed to describe how well every country was equipped to handle a pandemic outbreak) to judge their efficacy.

We found that, although the 2019 GHS Rankings did not accurately predict the severity of a pandemic outbreak within a country (and sometimes the results there the opposite of expectation), they showed that the country’s that were most prepared to combat a pandemic outbreak had high risk tolerance (possibly because they had high trust in their healthcare systems) which lead to more severe pandemic outbreaks. We also found that Median Age, Press Freedom Ranking, and Categorical Income were all significant predictors of outbreak severity or government response. Furthermore, the results of our composite index appear to make intuitive sense and demonstrate enough parity for their practical application. The rankings of all G20 countries in our composite index are on the next page.

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| ISO | Composite | | Outbreak Severity | | Response Severity | | Risk Tolerance | |
| Index | Rank | Index | Rank | Index | Rank | Index | Rank |
| **ARG** | 0.6238 | 95 | 0.4122 | 173 | 0.7037 | 11 | 0.7555 | 80 |
| **AUS** | 0.6262 | 93 | 0.6808 | 76 | 0.5124 | 91 | 0.6855 | 99 |
| **BRA** | 0.4742 | 156 | 0.4329 | 170 | 0.6362 | 35 | 0.3536 | 160 |
| **CAN** | 0.4974 | 147 | 0.5796 | 131 | 0.4677 | 110 | 0.445 | 152 |
| **CHN** | 0.7107 | 40 | 0.6587 | 94 | 0.7295 | 5 | 0.7439 | 86 |
| **DEU** | 0.467 | 158 | 0.5988 | 128 | 0.5409 | 80 | 0.2613 | 166 |
| **FRA** | 0.4067 | 166 | 0.5132 | 154 | 0.4463 | 118 | 0.2606 | 167 |
| **GBR** | 0.407 | 165 | 0.4825 | 161 | 0.3482 | 154 | 0.3904 | 158 |
| **IDN** | 0.6962 | 49 | 0.6356 | 110 | 0.5933 | 62 | 0.8598 | 41 |
| **IND** | 0.6982 | 48 | 0.5568 | 144 | 0.6688 | 19 | 0.8691 | 25 |
| **ITA** | 0.5407 | 133 | 0.4564 | 167 | 0.5655 | 71 | 0.6002 | 117 |
| **JPN** | 0.508 | 142 | 0.6828 | 73 | 0.1999 | 171 | 0.6412 | 112 |
| **KOR** | 0.5778 | 115 | 0.675 | 80 | 0.4658 | 111 | 0.5926 | 120 |
| **MEX** | 0.6539 | 77 | 0.4973 | 158 | 0.6154 | 46 | 0.849 | 48 |
| **RUS** | 0.6638 | 72 | 0.5325 | 149 | 0.5937 | 61 | 0.8652 | 32 |
| **SAU** | 0.6183 | 98 | 0.5408 | 148 | 0.5899 | 63 | 0.7242 | 91 |
| **TUR** | 0.5753 | 116 | 0.6061 | 124 | 0.4305 | 123 | 0.6894 | 98 |
| **USA** | 0.4838 | 153 | 0.4235 | 172 | 0.5192 | 88 | 0.5087 | 146 |
| **ZAF** | 0.62 | 97 | 0.4793 | 162 | 0.5369 | 81 | 0.8436 | 50 |