Title: Obesity as a driver of international differences in COVID-19 death rates

Running title: Obesity and COVID-19 death rates

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Abstract

Aims
There is considerable variation in death rates from coronavirus disease 2019 (COVID-19) between countries, and these variations are not fully understood. The aim was to determine what proportion of the variation in death rates between countries can be explained in terms of obesity rates and other known risk factors for COVID-19.

Materials and methods
COVID-19 death rates from 30 industrialized countries were analyzed using linear regression models. Covariates modelled population density, the age structure of the population, obesity, population health, per capita GDP, ethnic diversity, national temperature and government delay in imposing virus control measures.

Results
The multivariable regression model explained 63% of the inter-country variation in COVID-19 death rates. The initial model was optimized using stepwise selection. In descending order of absolute size of model coefficient, the covariates in the optimized model were: obesity rate, hypertension rate, population density, life expectancy, percentage of population over 65, percentage of population under 15, diabetes rate, the delay in imposing national COVID-19 control measures, per capita GDP and mean

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temperature (a negative coefficient indicating an association between higher national temperatures and lower death rates).

Conclusions
A large proportion of the variation in COVID-19 death rates between countries can be explained by differences in obesity rates, population health, population density, age demographics, the delay in imposing national virus control measures, per capita GDP and climate. Some of the unexplained variation is probably attributable to inter-country differences in the definition of COVID-19 deaths and in the completeness of the recording of COVID-19 deaths.

Introduction
The global pandemic arising from the rapid spread of coronavirus disease 2019 (COVID-19) has instigated unparalleled public health emergency measures from countries around the world. The number of deaths per million population varies widely internationally, and the reasons for these variations are not fully understood. In this paper COVID-19 death statistics from 30 industrialized countries are analyzed in terms of demographic and health related covariates with a view to identifying explanatory factors underlying the inter-country variation in mortality rates.

Government responses to the pandemic have varied greatly. Some countries, such as Norway and Denmark, imposed restrictions on the movement and association of citizens soon after the first case was identified in each country.\(^1\) Sweden, on the other hand, has largely relied on voluntary public health measures to control the spread of infection.\(^2\)

Higher mortality rates have been reported amongst older adults\(^3\) and those with certain pre-existing health conditions including obesity\(^4-6\) diabetes\(^7,8\) and hypertension.\(^9\) Studies have also highlighted smoking as a risk factor for COVID-19 mortality.\(^3\) There is conflicting evidence around the significance of ethnicity as a risk factor for mortality, which may be confounded by socio-economic and medical disadvantage experienced by ethnic minorities.\(^10,11\) There is also evidence of an interaction between the effects of obesity and ethnic group.\(^12\)

It is widely acknowledged that greater population density facilitates the spread of COVID-19.\(^13\) Due to the prolonged incubation period demonstrated amongst children some have suggested that they facilitate viral spread, although this is contentious.\(^14,15\) Another factor implicated in the spread of respiratory viruses, such as COVID-19, is the climate: there is growing evidence that COVID-19 spreads more readily in temperate latitudes compared to hotter climates.\(^16\)

Informed by this evidence, model covariates were drawn from the domains of age distribution, obesity and health, population density, socio-economic factors and climate.
In addition to these demographic and environmental factors, a covariate was included which measured how quickly governments responded to the coronavirus pandemic via severe restrictions on person to person contacts.

**Materials and methods**

To be included in the study countries had to have a population of at least 2 million and a per capita gross domestic product (GDP) of at least $27,000 (US) per year. Countries for which data were considered to be unreliable for data transparency reasons were excluded, for example China and Russia. The selection of countries was made prior to data collection and data analysis. The following 30 countries were included in the analysis: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Lithuania, Malaysia, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. These countries make up 15% of the world’s population.

The date of the first COVID-19 case in each country was retrieved from the World Health Organization website.\(^{17}\) The number of COVID-19 deaths in each country up the 26\(^{th}\) of July 2020 was found from the John Hopkins University coronavirus resource centre.\(^{18}\) National populations and life expectancy data were sourced from the United Nations.\(^{19,20}\) Data were retrieved from the World Bank on the percentage of the population living in urban settlements,\(^{21}\) on the percentages of the population under 15 and over 65\(^{22,23}\) and the percentage of the population aged 20 to 79 with diabetes.\(^{24}\) Per capita GDP and adult obesity rates were sourced from the CIA World Factbook.\(^{25,26}\) The percentage of the adult population (aged 18 and over) with hypertension, defined as systolic blood pressure $\geq 140$ or diastolic blood pressure $\geq 90$, was found from World Health Organization data.\(^{27}\) Smoking rates were retrieved from the World Population Review,\(^{28}\) and mean national temperatures 1961-1990 were sourced from the Climactic Research Unit.\(^{29}\) Population densities from official national estimates were retrieved from Wikipedia,\(^ {30}\) as were the ethnic diversity index figures,\(^ {31}\) which were derived from Fearon.\(^ {32}\)

A country was considered to have introduced national COVID-19 control measures once compulsory restrictions were adopted which applied to the whole country and included at least two of the following: (i) a limit on public gatherings to 30 people or fewer, (ii) the closure of public buildings including non-essential shops, restaurants, bars, theatres and cinemas, (iii) the closure of schools, (iv) a requirement on the public to stay at home except for medical reasons, exercise, essential shopping and work that can’t be done remotely, (v) a requirement on the public to observe social distancing. Determining when countries met these criteria for national COVID-19 control measures required the consultation of a large number of sources. Most of these are accessible from the Wikipedia pages on the COVID-19 pandemic in specific countries.\(^ {33}\) Full details of the sources consulted are given in the online Supporting Information. The delay in introducing national COVID-19 control measures was taken to be the time from the first
case to when these conditions were first met. For two countries, Sweden and South Korea, these criteria for national COVID-19 control measures were never met. The delay in introducing national control measures was therefore considered to extend to 26th of July 2020, the date up to which COVID-19 deaths were counted.

The ethnic diversity index is defined as the probability that two randomly chosen individuals in a population come from different ethnic groups. For an ethnically homogenous population the index is zero, whilst for a population with many ethnic groups it increases towards a value of one.

The recording period was calculated from the date of the first case to the 26th of July 2020. The number of COVID-19 deaths was divided by the population and the recording period to give a death rate in units of deaths per million population per year. COVID-19 death rates were positively skewed. In order to produce a more Normally distributed outcome variable and improve model fit, the outcome variable used was the log death rate.

An initial multivariable linear regression model was fitted of the log COVID-19 death rate in terms of the covariates: population, population density, life expectancy, percentage of population living in urban settlements, percentage of population under 15, percentage of population over 65, percentage of adult population which is obese, percentage of adult population with diabetes, percentage of adult population with hypertension, percentage of population who smoke, per capita GDP, ethnic diversity index, mean temperature and the delay in introducing national COVID-19 control measures.

An optimized model (Model 1) was derived using stepwise covariate selection. This was done by minimizing the AIC criterion, a log-likelihood penalized by the number of model parameters. Minimizing this criterion produces a model which seeks to explain the variation in the outcome whilst omitting superfluous covariates. This was carried out using the stepAIC procedure in the MASS library for R.

The covariate “delay in introducing national COVID-19 control measures” differs from the others in that it was the result of government decisions. A further model (Model 2) was fitted which omitted this covariate from Model 1.

Countries were ranked by the model residuals from Models 1 and 2. These show the variation in death rates which is not explained by the covariates in a given model. These rankings were compared with a ranking of countries by raw death rates.

Analyses were carried out in R 3.6.3.

Results

The date of the first case, the date national COVID-19 control measures were introduced, the delay in introducing national control measures and COVID-19 death rate
per million population per year are shown in Table 1. Summary statistics for all variables are given in Table 2.

The correlation between obesity rate and COVID-19 death rate (deaths per million population per year) was 0.153 for the raw death rate and 0.297 for the logged death rate.

The initial multivariable model including all covariates had a coefficient of determination (multiple R$^2$) of 0.629, which indicates that 63% of the variation between countries in COVID-19 death rates can be explained by the 14 covariates included in the model. Standardized model coefficients with 95% confidence intervals and associated p-values are given in Table 3.

The model optimized using stepwise selection (Model 1) included 10 of the 14 covariates. In descending order of absolute size of the standardized model coefficients these were: the percentage of the adult population which is obese, the percentage of the adult population with hypertension, population density, life expectancy, percentage of population over 65, percentage of population under 15, the percentage of the adult population with diabetes, national COVID-19 control measures delay, per capita GDP and mean temperature. The model coefficient for mean temperature was negative, indicating an association between higher mean temperatures and lower COVID-19 death rates. The multiple R$^2$ value for this model was 0.583, showing that these 10 covariates explain 58% of the international variation in COVID-19 death rates. Further results for Model 1 are given in Table 4.

Model 2, which omitted the covariate “national COVID-19 control measures delay”, had a multiple R$^2$ value of 0.547. Model 2 explains 3.6% less of the variation in death rates than does Model 1. Further results for Model 2 are given in Table 4.

The rankings of countries by (a) raw COVID-19 death rates, (b) residuals from Model 1 and (c) residuals from Model 2 are given in Table 5. Rankings (b) and (c) indicate the relative COVID-19 death rates between countries once the variables in the relevant model have been controlled for.

Where a country is lower in ranking (b) than ranking (a), this indicated that the country’s death rate has been elevated by relatively unfavorable values for the covariates included in Model 1. For example, the UK is 7 places lower in ranking (b) than in ranking (a). This can be attributed to characteristics of the UK, including a high obesity rate, a high population density, a high proportion of older people and a low mean temperature.

Where a country is higher in ranking (b) than ranking (a), this indicated that the country’s death rate has been depressed by relatively favorable values for the Model 1 covariates. For example, Malaysia is 23 places higher in ranking (b) than ranking (a). This can be attributed to characteristics of Malaysia, including a low obesity rate, a relative low percentage of the population over 65 and a high temperature.
Where a country is lower in ranking (c) than in ranking (b), this indicates that a relatively short delay in introducing national COVID-19 control measures has helped to reduce the death rate. For example, Denmark had a delay in introducing control measures of 15 days and is 5 places lower in ranking (c) than ranking (b).

Where a country is higher in ranking (c) than ranking (b), this indicates that a relatively long delay in introducing national COVID-19 control measures has contributed to raising the death rate. For example, Sweden, which never introduced national COVID-19 control measures as defined in this analysis, is ranked 9 places higher in ranking (c) than ranking (b), and the US, which had a relatively long delay of 78 days in introducing COVID-19 control measures, is ranked 7 places higher in ranking (c) than ranking (b).

**Discussion**

In the final multivariable model, the factor most strongly associated with COVID-19 death rate is obesity rate, followed by hypertension rate and population density. Factors related to the age structure of the population show somewhat weaker associations, with higher life expectancy and a higher percentage of the population over 65 being associated with higher death rates, as would be expected given the greater vulnerability of older people to COVID-19. A higher proportion of children under 15 in the population is also associated with a higher death rate. The role of children in spreading COVID-19 remains unclear, with recent evidence suggesting that children play a lesser role than adults in transmitting the virus. However, it is possible that children have an important role in spreading the virus as asymptomatic carriers. Another possible explanation for this finding is that children’s role in virus spread is mainly an indirect one through their promoting of population mixing, with children promoting adult to adult contact via school drop-offs and pick-ups, and adult to elder contact where grandparent care is used.

Factors more weakly associated with COVID-19 death rates are diabetes rates, the delay in the imposition of national control measures, per capita GDP and temperature, with higher national temperatures being associated with lower death rates. Of these factors, only the role of per capita GDP is unexpected. A possible explanation for the association between higher levels of GDP and higher COVID-19 death rates may be that there is more intra- and international travel in wealthier populations.

The covariates analyzed here explain around 63% of the international variation in COVID-19 death rates, leaving around 37% to be explained by other factors.

Some of this remaining variation is likely to be explained by the effect on death statistics of heterogeneity in the ways in which a death from COVID-19 has been defined in different countries. For example, some countries have considered any death where the patient tested positive for COVID-19 during their final illness to be a death from COVID-19, while other countries have only counted deaths where COVID-19 was the principal cause of death. Where there is a requirement for a positive test result, COVID-19 deaths which occur outside hospital may not be recorded as such. Analysis of excess deaths in 2020, as compared to the mean death rates for previous years, suggests that
the number of COVID-19 deaths may be considerably higher than has been reported, and the degree of under-reporting is likely to vary by country.39

Sweden and South Korea differ from all other countries studied in that they never imposed national COVID-19 control measures, according to the definition adopted in this study. The analysis suggests that the decision not to “lock down” led to a higher death rate in these countries than would have otherwise occurred. The death rate in the US also appears to have been higher due to a slow imposition of national virus control measures, the delay between the first case of COVID-19 and the imposition of national measures being 78 days.

Concern has been expressed in the UK that the national COVID-19 death rate is high compared to that of most other countries. The “lock down” delay in the UK was close to the international average, and this does not in itself explain the UK’s relatively high death rate. This analysis suggests that the UK’s high death rate is partly explained by demographic and health factors, including a high obesity rate, high population density and high rates of hypertension.

A strength of this analysis is the inclusion of a wide range of covariates resulting in a model that accounts for 63% of the variation in COVID-19 death rates between countries. The countries studied comprise 15% of the world’s population: this represents a large proportion of the wealthier nations.

However, the sample size of 30 countries is small for linear regression analysis. This makes the results of the regression models less robust than where a larger sample size is available. Another limitation is that data were analyzed at country level whilst there is considerable regional heterogeneity in the pandemic within countries. Some of the unexplained variation in death rates between countries is likely to be due to modelling the outcome and covariates at this relatively high level.

In conclusion, a considerable proportion of the international variation in COVID-19 death rates in wealthier countries can be explained by obesity rates, population density, age distribution, hypertension and diabetes rates and national temperature, all factors which are outside government control, at least in the short term.

However, how quickly governments imposed virus control measures was also an influential factor on death rates, and this should inform policy in the case of future viral epidemics. There is also a case for strengthening policies aimed at tackling obesity, diabetes and hypertension, since an additional benefit of such public health measures may be that populations have greater resistance to future respiratory virus epidemics. The relationship between obesity, diabetes and COVID-19 is not yet fully understood.40 Further studies will be needed to clarify how obesity, diabetes and hypertension influence death rates from respiratory epidemics such as COVID-19.

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Conflict of interest
The authors have no conflicts of interest to declare.

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# Tables

Table 1: Date of first case, date national measures were introduced, national measures delay and death rate per million population per year (raw and logged).

| Country            | Date of first case | Date national measures were introduced | National measures delay (days) | Death rate per million population per year | Log death rate per million population per year |
|--------------------|--------------------|----------------------------------------|------------------------------|---------------------------------------------|-----------------------------------------------|
| Australia          | 25 January 2020    | 30 March 2020                          | 65                           | 11.1                                        | 2.41                                          |
| Austria            | 26 February 2020   | 16 March 2020                          | 19                           | 192.0                                       | 5.26                                          |
| Belgium            | 04 February 2020   | 17 March 2020                          | 42                           | 1795.2                                      | 7.49                                          |
| Canada             | 26 January 2020    | 22 March 2020                          | 56                           | 478.4                                       | 6.17                                          |
| Czech Republic     | 01 March 2020      | 16 March 2020                          | 15                           | 84.8                                        | 4.44                                          |
| Denmark            | 27 February 2020   | 13 March 2020                          | 15                           | 258.6                                       | 5.56                                          |
| Finland            | 29 January 2020    | 16 March 2020                          | 47                           | 121.3                                       | 4.80                                          |
| France             | 24 January 2020    | 17 March 2020                          | 53                           | 920.0                                       | 6.82                                          |
| Germany            | 28 January 2020    | 22 March 2020                          | 54                           | 221.5                                       | 5.40                                          |
| Greece             | 27 February 2020   | 13 March 2020                          | 15                           | 46.7                                        | 3.84                                          |
| Hungary            | 05 March 2020      | 16 March 2020                          | 11                           | 157.2                                       | 5.06                                          |
| Ireland            | 01 March 2020      | 27 March 2020                          | 26                           | 897.2                                       | 6.80                                          |
| Italy              | 29 January 2020    | 09 March 2020                          | 40                           | 1182.5                                      | 7.08                                          |
| Japan              | 14 January 2020    | 16 April 2020                          | 93                           | 14.8                                        | 2.69                                          |
| Lithuania          | 28 February 2020   | 16 March 2020                          | 17                           | 71.1                                        | 4.26                                          |
| Malaysia           | 25 January 2020    | 18 March 2020                          | 53                           | 7.7                                         | 2.04                                          |
| Netherlands        | 28 February 2020   | 15 March 2020                          | 16                           | 882.9                                       | 6.78                                          |
| New Zealand        | 28 February 2020   | 25 March 2020                          | 26                           | 11.3                                        | 2.42                                          |
| Norway             | 26 February 2020   | 12 March 2020                          | 15                           | 114.7                                       | 4.74                                          |
| Poland             | 04 March 2020      | 12 March 2020                          | 8                            | 110.8                                       | 4.71                                          |
| Portugal           | 02 March 2020      | 20 March 2020                          | 18                           | 417.1                                       | 6.03                                          |
| Slovakia           | 06 March 2020      | 16 March 2020                          | 10                           | 13.2                                        | 2.58                                          |
| Slovenia           | 04 March 2020      | 16 March 2020                          | 12                           | 140.3                                       | 4.94                                          |
| South Korea        | 19 January 2020    | 26 July 2020                           | 189                          | 11.2                                        | 2.42                                          |
| Spain              | 02 February 2020   | 28 March 2020                          | 55                           | 1269.5                                      | 7.15                                          |
| Sweden             | 31 January 2020    | 26 July 2020                           | 177                          | 1171.3                                      | 7.07                                          |
| Switzerland        | 24 February 2020   | 16 March 2020                          | 21                           | 549.3                                       | 6.31                                          |
| Turkey             | 11 March 2020      | 16 March 2020                          | 5                            | 177.8                                       | 5.18                                          |
| United Kingdom     | 01 February 2020   | 23 March 2020                          | 51                           | 1402.5                                      | 7.25                                          |
| United States      | 20 January 2020    | 07 April 2020                          | 78                           | 852.9                                       | 6.75                                          |
Table 2: Summary statistics for variables.

| Variable                                | Minimum   | Median    | Maximum   | Mean      | Standard Deviation |
|-----------------------------------------|-----------|-----------|-----------|-----------|--------------------|
| Population                              | 2,078,654 | 11,114,268| 329,064,917 | 39,347,743| 62,949,691         |
| Life Expectancy (years)                 | 75.7      | 81.8      | 84.5      | 81.0      | 2.3                |
| Mean Temperature (℃)                    | -5.3      | 9.1       | 25.4      | 9.3       | 5.8                |
| % urban population                      | 54.0      | 80.0      | 98.0      | 77.1      | 11.2               |
| % under age 15 years of age             | 12.9      | 15.7      | 25.0      | 16.5      | 3.1                |
| % over age 65 years of age              | 6.3       | 18.7      | 27.0      | 17.9      | 4.0                |
| % obese                                 | 4.3       | 22.2      | 36.2      | 22.6      | 6.6                |
| % with diabetes                         | 3.2       | 6.0       | 16.7      | 6.7       | 2.8                |
| % with hypertension                     | 11.0      | 19.7      | 30.5      | 20.6      | 5.2                |
| % who smoke                             | 13.2      | 23.3      | 42.6      | 24.4      | 6.4                |
| Per capita GDP (US $)                   | 27,000    | 43,500    | 73,200    | 43,620    | 12,387             |
| Population density (per km²)            | 3.0       | 106.1     | 516.7     | 140.9     | 129.5              |
| Diversity index                         | 0.004     | 0.210     | 0.857     | 0.269     | 0.218              |
| National measures delay (days)          | 5         | 26        | 189       | 43        | 44                 |
| Number of COVID-19 deaths               | 22        | 1,324     | 144,469   | 11,368    | 27,794             |
| Recording period (days)                 | 137       | 152       | 194       | 163       | 18                 |
| Deaths per million population           | 3.8       | 73.0      | 850.3     | 209.5     | 245.5              |
| Deaths per million population per year  | 7.7       | 184.9     | 1795.2    | 452.8     | 510.8              |
| Log deaths per million population per year | 2.04     | 5.22      | 7.49      | 5.15      | 1.70               |
Table 3: Results of multivariable model of COVID-19 death rate in terms of all model covariates.

| Covariate                               | Standardized Beta | 95% Confidence Interval                | p-value |
|-----------------------------------------|-------------------|----------------------------------------|---------|
| % obese                                 | 0.935             | (0.257 - 1.612)                        | 0.010   |
| % over age 65 years of age              | 0.928             | (-0.224 - 2.080)                       | 0.107   |
| Population density (per km²)            | 0.806             | (0.231 - 1.381)                        | 0.009   |
| % under age 15 years of age             | 0.750             | (-0.166 - 1.665)                       | 0.101   |
| % with hypertension                     | 0.402             | (-0.541 - 1.345)                       | 0.378   |
| Life Expectancy (years)                 | 0.392             | (-0.415 - 1.199)                       | 0.317   |
| % with diabetes                         | 0.383             | (-0.157 - 0.924)                       | 0.152   |
| National measures delay (days)          | 0.375             | (-0.174 - 0.925)                       | 0.166   |
| % urban population                      | -0.350            | (-1.049 - 0.349)                       | 0.303   |
| Mean Temperature (°C)                   | -0.305            | (-0.776 - 0.167)                       | 0.189   |
| Per capita GDP (US $)                   | 0.276             | (-0.211 - 0.764)                       | 0.246   |
| % smoking                               | 0.175             | (-0.269 - 0.619)                       | 0.415   |
| Population                              | -0.133            | (-0.698 - 0.431)                       | 0.622   |
| Diversity index                         | 0.112             | (-0.356 - 0.580)                       | 0.617   |

Beta is a standardized regression model coefficient. Rows are sorted by the absolute value of Beta, in descending order.

The multiple $R^2$ value was 0.629.
Table 4: Results of a model of COVID-19 death rate in terms of an optimized set of covariates selected using the AIC criterion (Model 1), and the same model without the national measures delay covariate (Model 2).

| Covariate                          | Model 1                  |          | Model 2                  |          |
|------------------------------------|--------------------------|----------|--------------------------|----------|
|                                    | Standardized Beta | 95% Confidence Interval | p-value | Standardized Beta | 95% Confidence Interval | p-value |
| % obese                            | 0.901                    | (0.347 - 1.455) | 0.003          | 0.719                    | (0.246 - 1.191) | 0.005          |
| % with hypertension                | 0.689                    | (0.017 - 1.361) | 0.045          | 0.448                    | (-0.103 - 0.999) | 0.105          |
| Population density (per km²)       | 0.688                    | (0.218 - 1.158) | 0.006          | 0.613                    | (0.153 - 1.072) | 0.011          |
| Life Expectancy (years)            | 0.519                    | (-0.126 - 1.163) | 0.109          | 0.437                    | (-0.201 - 1.075) | 0.169          |
| % over age 65 years of age         | 0.438                    | (-0.200 - 1.076) | 0.167          | 0.440                    | (-0.206 - 1.086) | 0.171          |
| % under age 15 years of age        | 0.353                    | (-0.249 - 0.955) | 0.234          | 0.344                    | (-0.265 - 0.953) | 0.253          |
| % with diabetes                    | 0.283                    | (-0.151 - 0.716) | 0.188          | 0.243                    | (-0.190 - 0.677) | 0.256          |
| National measures delay            | 0.280                    | (-0.179 - 0.739) | 0.216          |                          |              |                |
| Per capita GDP (US $)              | 0.279                    | (-0.153 - 0.712) | 0.193          | 0.235                    | (-0.197 - 0.667) | 0.269          |
| Mean Temperature (°C)              | -0.265                   | (-0.667 - 0.138) | 0.185          | -0.281                   | (-0.688 - 0.125) | 0.165          |

Beta is a standardized regression model coefficient. Rows are sorted by the absolute value of Beta, in descending order (Model 1).

The multiple R² values were 0.583 (Model 1) and 0.547 (Model 2).
Table 5: Countries ranked by (a) observed time-adjusted death rate, (b) residuals from Mode 1, (c) residuals from Model 2.

| Rank | (a) Ranked by raw data | (b) Rank controlling for model covariates from optimised model (Model 1) | (c) Rank controlling for covariates, excluding national measures delay (Model 2) |
|------|------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| 1    | Belgium                | Spain                                                                   | Spain                                                                         |
| 2    | United Kingdom        | Italy                                                                   | Sweden                                                                         |
| 3    | Spain                  | Portugal                                                                | Italy                                                                          |
| 4    | Italy                  | Belgium                                                                 | France                                                                         |
| 5    | Sweden                 | Ireland                                                                | Portugal                                                                       |
| 6    | France                 | France                                                                  | Ireland                                                                        |
| 7    | Ireland                | Malaysia                                                                | Belgium                                                                        |
| 8    | Netherlands            | Austria                                                                 | United Kingdom                                                                 |
| 9    | United States          | United Kingdom                                                          | Malaysia                                                                       |
| 10   | Switzerland            | Switzerland                                                             | United States                                                                  |
| 11   | Canada                 | Sweden                                                                  | Austria                                                                        |
| 12   | Portugal               | Denmark                                                                 | Canada                                                                         |
| 13   | Denmark                | Canada                                                                  | Lithuania                                                                      |
| 14   | Germany                | Greece                                                                  | Switzerland                                                                    |
| 15   | Austria                | Lithuania                                                               | Hungary                                                                        |
| 16   | Turkey                 | Poland                                                                  | Poland                                                                         |
| 17   | Hungary                | United States                                                          | Denmark                                                                        |
| 18   | Slovenia               | Hungary                                                                 | South Korea                                                                    |
| 19   | Finland                | Finland                                                                 | Greece                                                                         |
| 20   | Norway                 | Turkey                                                                  | Turkey                                                                         |
| 21   | Poland                 | Netherlands                                                             | Finland                                                                        |
| 22   | Czech Republic         | South Korea                                                             | Slovenia                                                                       |
| 23   | Lithuania              | Slovenia                                                                | Netherlands                                                                    |
| 24   | Greece                 | Norway                                                                  | Slovakia                                                                       |
| 25   | Japan                  | Slovakia                                                                | Norway                                                                         |
| 26   | Slovakia               | Germany                                                                 | Germany                                                                        |
| 27   | New Zealand            | Japan                                                                   | Czech Republic                                                                 |
| 28   | South Korea            | Czech Republic                                                          | Australia                                                                       |
| 29   | Australia              | Australia                                                               | Japan                                                                          |
| 30   | Malaysia               | New Zealand                                                             | New Zealand                                                                    |

The number following the Model 1 rankings (b) gives the change in rank compared to the raw data rankings (a).

The number following the Model 2 rankings (c) gives the change in rank compared to the Model 1 rankings (b).
Supporting Information

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Tables of complete analysis data

The raw data used in the analysis are shown in Tables 6 to 10.

- Population, population density, life expectancy, per capita GDP and Diversity index. (Table 6)
- Health variables. (Table 7)
- Temperature, % urban population, % under age 15 and % over age 65. (Table 8)
- COVID-19 deaths and related variables. (Table 9)
- Date of first case and date national measures were introduced. (Table 10).
Table 6: Raw data: population, population density, life expectancy, per capita GDP and Diversity index.

| Country          | Population (per km²) | Life Expectancy (years) | Per capita GDP (US $) | Diversity index |
|------------------|----------------------|-------------------------|-----------------------|-----------------|
| Australia        | 3.00                 | 83.3                    | 50,400                | 0.857           |
| Austria          | 106.14               | 81.4                    | 50,000                | 0.126           |
| Belgium          | 375.52               | 81.5                    | 46,600                | 0.567           |
| Canada           | 4.00                 | 82.3                    | 48,400                | 0.596           |
| Czech Republic   | 135.43               | 79.2                    | 35,500                | 0.322           |
| Denmark          | 134.91               | 80.8                    | 50,100                | 0.128           |
| Finland          | 16.33                | 81.7                    | 44,500                | 0.132           |
| France           | 123.28               | 82.5                    | 44,100                | 0.272           |
| Germany          | 232.80               | 81.2                    | 50,800                | 0.095           |
| Greece           | 81.27                | 82.1                    | 27,800                | 0.059           |
| Hungary          | 104.96               | 76.7                    | 29,600                | 0.186           |
| Ireland          | 70.03                | 82.1                    | 73,200                | 0.171           |
| Italy            | 199.97               | 83.6                    | 38,200                | 0.040           |
| Japan            | 333.38               | 84.5                    | 42,900                | 0.012           |
| Lithuania        | 42.78                | 75.7                    | 32,400                | 0.338           |
| Malaysia         | 99.00                | 76.1                    | 29,100                | 0.596           |
| Netherlands      | 421.00               | 82.1                    | 53,900                | 0.077           |
| New Zealand      | 19.00                | 82.1                    | 39,000                | 0.363           |
| Norway           | 16.58                | 82.3                    | 72,100                | 0.098           |
| Poland           | 122.76               | 78.5                    | 29,600                | 0.047           |
| Portugal         | 111.59               | 81.9                    | 30,500                | 0.040           |
| Slovakia         | 111.15               | 77.4                    | 33,100                | 0.332           |
| Slovenia         | 102.81               | 81.2                    | 34,500                | 0.231           |
| South Korea      | 516.72               | 82.8                    | 39,500                | 0.004           |
| Spain            | 92.76                | 83.4                    | 38,400                | 0.502           |
| Sweden           | 22.97                | 82.7                    | 51,200                | 0.189           |
| Switzerland      | 207.98               | 83.4                    | 62,100                | 0.575           |
| Turkey           | 106.12               | 78.3                    | 27,000                | 0.299           |
| United Kingdom   | 279.95               | 81.2                    | 44,300                | 0.324           |
| United States    | 34.00                | 78.9                    | 59,800                | 0.491           |
Table 7: Raw data: health variables.

| Country          | % obese | % with diabetes | % with hypertension | % smoking |
|------------------|---------|-----------------|---------------------|----------|
| Australia        | 29.0    | 5.6             | 15.2                | 14.90    |
| Austria          | 20.1    | 6.6             | 21.0                | 35.15    |
| Belgium          | 22.1    | 4.6             | 17.5                | 23.25    |
| Canada           | 29.4    | 7.6             | 13.2                | 14.95    |
| Czech Republic   | 26.0    | 7.0             | 27.9                | 33.20    |
| Denmark          | 19.7    | 8.3             | 20.6                | 17.00    |
| Finland          | 22.2    | 5.6             | 19.4                | 20.85    |
| France           | 21.6    | 4.8             | 22.0                | 27.70    |
| Germany          | 22.3    | 10.4            | 19.9                | 30.35    |
| Greece           | 24.9    | 4.7             | 19.1                | 42.65    |
| Hungary          | 26.4    | 6.9             | 30.0                | 28.40    |
| Ireland          | 25.3    | 3.2             | 19.7                | 22.15    |
| Italy            | 19.9    | 5.0             | 21.2                | 24.00    |
| Japan            | 4.3     | 5.6             | 17.6                | 22.15    |
| Lithuania        | 26.3    | 3.8             | 29.3                | 30.15    |
| Malaysia         | 15.6    | 16.7            | 22.9                | 22.20    |
| Netherlands      | 20.4    | 5.4             | 18.7                | 25.05    |
| New Zealand      | 30.8    | 6.2             | 16.2                | 13.20    |
| Norway           | 23.1    | 5.3             | 19.7                | 22.25    |
| Poland           | 23.1    | 6.1             | 28.7                | 28.05    |
| Portugal         | 20.8    | 9.8             | 24.4                | 22.60    |
| Slovakia         | 20.5    | 6.5             | 28.5                | 28.65    |
| Slovenia         | 20.2    | 5.9             | 30.5                | 20.20    |
| South Korea      | 4.7     | 6.9             | 11.0                | 27.00    |
| Spain            | 23.8    | 6.9             | 19.2                | 29.20    |
| Sweden           | 20.6    | 4.8             | 19.3                | 20.60    |
| Switzerland      | 19.5    | 5.7             | 18.0                | 23.30    |
| Turkey           | 32.1    | 11.1            | 20.3                | 25.95    |
| United Kingdom   | 27.8    | 3.9             | 15.2                | 19.15    |
| United States    | 36.2    | 10.8            | 12.9                | 17.25    |
Table 8: Raw data: temperature, % urban population, % under age 15 and % over age 65.

| Country          | Mean Temperature (°C) | % urban population | % under age 15 | % over age 65 |
|------------------|-----------------------|--------------------|----------------|---------------|
| Australia        | 21.65                 | 86                 | 19.0           | 15.5          |
| Austria          | 6.35                  | 59                 | 14.1           | 19.2          |
| Belgium          | 9.55                  | 98                 | 17.1           | 18.6          |
| Canada           | -5.35                 | 81                 | 16.0           | 17.0          |
| Czech Republic   | 7.55                  | 74                 | 15.4           | 19.0          |
| Denmark          | 7.50                  | 88                 | 16.5           | 19.7          |
| Finland          | 1.70                  | 85                 | 16.4           | 21.2          |
| France           | 10.70                 | 81                 | 18.1           | 19.7          |
| Germany          | 8.50                  | 77                 | 13.1           | 21.5          |
| Greece           | 15.40                 | 79                 | 14.2           | 20.4          |
| Hungary          | 9.75                  | 72                 | 14.3           | 18.6          |
| Ireland          | 9.30                  | 63                 | 21.6           | 13.9          |
| Italy            | 13.45                 | 71                 | 13.5           | 23.0          |
| Japan            | 11.15                 | 92                 | 12.9           | 27.0          |
| Lithuania        | 6.20                  | 68                 | 14.8           | 19.0          |
| Malaysia         | 25.40                 | 77                 | 24.3           | 6.3           |
| Netherlands      | 9.25                  | 92                 | 16.4           | 18.8          |
| New Zealand      | 10.55                 | 87                 | 19.8           | 15.3          |
| Norway           | 1.50                  | 83                 | 17.8           | 16.8          |
| Poland           | 7.85                  | 60                 | 14.8           | 16.8          |
| Portugal         | 15.15                 | 66                 | 13.6           | 21.5          |
| Slovakia         | 6.80                  | 54                 | 15.4           | 15.1          |
| Slovenia         | 8.90                  | 55                 | 15.0           | 19.1          |
| South Korea      | 11.50                 | 81                 | 13.5           | 13.9          |
| Spain            | 13.30                 | 81                 | 14.7           | 19.4          |
| Sweden           | 2.10                  | 88                 | 17.5           | 19.9          |
| Switzerland      | 5.50                  | 74                 | 14.9           | 18.4          |
| Turkey           | 11.10                 | 76                 | 25.0           | 8.2           |
| United Kingdom   | 8.45                  | 84                 | 17.7           | 18.5          |
| United States    | 8.55                  | 82                 | 18.9           | 15.4          |
Table 9: Raw data: COVID-19 deaths and related variables.

| Country            | No. of COVID deaths | Recording period (days) | Deaths per million population | Deaths per million population per year | Log deaths per million population per year |
|--------------------|---------------------|-------------------------|-------------------------------|----------------------------------------|-------------------------------------------|
| Australia          | 140                 | 183                     | 5.6                           | 11.1                                   | 2.41                                      |
| Austria            | 711                 | 151                     | 79.4                          | 192.0                                  | 5.26                                      |
| Belgium            | 9812                | 173                     | 850.3                         | 1795.2                                 | 7.49                                      |
| Canada             | 8919                | 182                     | 238.4                         | 478.4                                  | 6.17                                      |
| Czech Republic     | 365                 | 147                     | 34.1                          | 84.8                                   | 4.44                                      |
| Denmark            | 613                 | 150                     | 106.2                         | 258.6                                  | 5.56                                      |
| Finland            | 329                 | 179                     | 59.5                          | 121.3                                  | 4.80                                      |
| France             | 30185               | 184                     | 463.5                         | 920.0                                  | 6.82                                      |
| Germany            | 9117                | 180                     | 109.2                         | 221.5                                  | 5.40                                      |
| Greece             | 201                 | 150                     | 19.2                          | 46.7                                   | 3.84                                      |
| Hungary            | 596                 | 143                     | 61.5                          | 157.2                                  | 5.06                                      |
| Ireland            | 1763                | 147                     | 361.1                         | 897.2                                  | 6.80                                      |
| Italy              | 35092               | 179                     | 579.6                         | 1182.5                                 | 7.08                                      |
| Japan              | 994                 | 194                     | 7.8                           | 14.8                                   | 2.69                                      |
| Lithuania          | 80                  | 149                     | 29.0                          | 71.1                                   | 4.26                                      |
| Malaysia           | 123                 | 183                     | 3.8                           | 7.7                                    | 2.04                                      |
| Netherlands        | 6158                | 149                     | 360.2                         | 882.9                                  | 6.78                                      |
| New Zealand        | 22                  | 149                     | 4.6                           | 11.3                                   | 2.42                                      |
| Norway             | 255                 | 151                     | 47.4                          | 114.7                                  | 4.74                                      |
| Poland             | 1655                | 144                     | 43.7                          | 110.8                                  | 4.71                                      |
| Portugal           | 1705                | 146                     | 166.7                         | 417.1                                  | 6.03                                      |
| Slovakia           | 28                  | 142                     | 5.1                           | 13.2                                   | 2.58                                      |
| Slovenia           | 115                 | 144                     | 55.3                          | 140.3                                  | 4.94                                      |
| South Korea        | 298                 | 189                     | 5.8                           | 11.2                                   | 2.42                                      |
| Spain              | 28429               | 175                     | 608.3                         | 1269.5                                 | 7.15                                      |
| Sweden             | 5697                | 177                     | 567.6                         | 1171.3                                 | 7.07                                      |
| Switzerland        | 1977                | 153                     | 230.1                         | 549.3                                  | 6.31                                      |
| Turkey             | 5563                | 137                     | 66.7                          | 177.8                                  | 5.18                                      |
| United Kingdom     | 45639               | 176                     | 675.8                         | 1402.5                                 | 7.25                                      |
| United States      | 144469              | 188                     | 439.0                         | 852.9                                  | 6.75                                      |
Table 10: Raw data: Date of first case and date national measures were introduced.

| Country         | Date of First Case   | National measures date | National measures delay (days) |
|-----------------|----------------------|------------------------|--------------------------------|
| Australia       | 25 January 2020      | 30 March 2020          | 65                             |
| Austria         | 26 February 2020     | 16 March 2020          | 19                             |
| Belgium         | 04 February 2020     | 17 March 2020          | 42                             |
| Canada          | 26 January 2020      | 22 March 2020          | 56                             |
| Czech Republic  | 01 March 2020        | 16 March 2020          | 15                             |
| Denmark         | 27 February 2020     | 13 March 2020          | 15                             |
| Finland         | 29 January 2020      | 16 March 2020          | 47                             |
| France          | 24 January 2020      | 17 March 2020          | 53                             |
| Germany         | 28 January 2020      | 22 March 2020          | 54                             |
| Greece          | 27 February 2020     | 13 March 2020          | 15                             |
| Hungary         | 05 March 2020        | 16 March 2020          | 11                             |
| Ireland         | 01 March 2020        | 27 March 2020          | 26                             |
| Italy           | 29 January 2020      | 09 March 2020          | 40                             |
| Japan           | 14 January 2020      | 16 April 2020          | 93                             |
| Lithuania       | 28 February 2020     | 16 March 2020          | 17                             |
| Malaysia        | 25 January 2020      | 18 March 2020          | 53                             |
| Netherlands     | 28 February 2020     | 15 March 2020          | 16                             |
| New Zealand     | 28 February 2020     | 25 March 2020          | 26                             |
| Norway          | 26 February 2020     | 12 March 2020          | 15                             |
| Poland          | 04 March 2020        | 12 March 2020          | 8                              |
| Portugal        | 02 March 2020        | 20 March 2020          | 18                             |
| Slovakia        | 06 March 2020        | 16 March 2020          | 10                             |
| Slovenia        | 04 March 2020        | 16 March 2020          | 12                             |
| South Korea     | 19 January 2020      | 26 July 2020           | 189                            |
| Spain           | 02 February 2020     | 28 March 2020          | 55                             |
| Sweden          | 31 January 2020      | 26 July 2020           | 177                            |
| Switzerland     | 24 February 2020     | 16 March 2020          | 21                             |
| Turkey          | 11 March 2020        | 16 March 2020          | 5                              |
| United Kingdom  | 01 February 2020     | 23 March 2020          | 51                             |
| United States   | 20 January 2020      | 07 April 2020          | 78                             |
Tables of countries ranked by each variable

Countries are shown ranked by each variable in Tables 11 to 21.

- Countries ranked by population and per capita GDP. (Table 11)
- Countries ranked by population density and % urban population. (Table 12)
- Countries ranked by % under age 15 and % over age 65. (Table 13)
- Countries ranked by life expectancy and Diversity index. (Table 14)
- Countries ranked by mean temperature. (Table 15)
- Countries ranked by % of adult population which is obese and % of adult population with diabetes. (Table 16)
- Countries ranked by % of adult population with hypertension and % of adult population which smokes. (Table 17)
- Countries ranked by numbers of COVID-19 deaths and period from first case to date when death totals were retrieved. (Table 18)
- Countries ranked by death rate (deaths per million population) and time-adjusted death rate (deaths per million population per year) / log time-adjusted death rate. (Table 19)
- Countries ranked by date of first COVID-19 case. (Table 20)
- Countries ranked by date national measures were introduced and delay between first case and the introduction of national measures. (Table 21)
| Country            | Population | Country   | Per capita GDP (US $) |
|-------------------|------------|-----------|-----------------------|
| United States     | 329,064,917| Ireland   | 73,200                |
| Japan             | 126,860,301| Norway    | 72,100                |
| Germany           | 83,517,045 | Switzerland| 62,100                |
| Turkey            | 83,429,615 | United States | 59,800                |
| United Kingdom    | 67,530,172 | Netherlands| 53,900                |
| France            | 65,129,728 | Sweden    | 51,200                |
| Italy             | 60,550,075 | Germany   | 50,800                |
| South Korea       | 51,225,308 | Australia | 50,400                |
| Spain             | 46,736,776 | Denmark   | 50,100                |
| Poland            | 37,887,768 | Austria   | 50,000                |
| Canada            | 37,411,047 | Canada    | 48,400                |
| Malaysia          | 31,949,777 | Belgium   | 46,600                |
| Australia         | 25,203,198 | Finland   | 44,500                |
| Netherlands       | 17,097,130 | United Kingdom | 44,300                |
| Belgium           | 11,539,328 | France    | 44,100                |
| Czech Republic    | 10,689,209 | Japan     | 42,900                |
| Greece            | 10,473,455 | South Korea| 39,500                |
| Portugal          | 10,226,187 | New Zealand| 39,000                |
| Sweden            | 10,036,379 | Spain     | 38,400                |
| Hungary           | 9,684,679  | Italy     | 38,200                |
| Austria           | 8,955,102  | Czech Republic | 35,500                |
| Switzerland       | 8,591,365  | Slovenia  | 34,500                |
| Denmark           | 5,771,876  | Slovakia  | 33,100                |
| Finland           | 5,532,156  | Lithuania | 32,400                |
| Slovakia          | 5,457,013  | Portugal  | 30,500                |
| Norway            | 5,378,857  | Hungary   | 29,600                |
| Ireland           | 4,882,495  | Poland    | 29,600                |
| New Zealand       | 4,783,063  | Malaysia  | 29,100                |
| Lithuania         | 2,759,627  | Greece    | 27,800                |
| Slovenia          | 2,078,654  | Turkey    | 27,000                |
Table 12: Countries ranked by population density and % urban population.

| Country          | Population density (per km²) | Country         | % urban population |
|------------------|------------------------------|-----------------|-------------------|
| South Korea      | 516.72                       | Belgium         | 98                |
| Netherlands      | 421.00                       | Japan           | 92                |
| Belgium          | 375.52                       | Netherlands     | 92                |
| Japan            | 333.38                       | Denmark         | 88                |
| United Kingdom   | 279.95                       | Sweden          | 88                |
| Germany          | 232.80                       | New Zealand     | 87                |
| Switzerland      | 207.98                       | Australia       | 86                |
| Italy            | 199.97                       | Finland         | 85                |
| Czech Republic   | 135.43                       | United Kingdom  | 84                |
| Denmark          | 134.91                       | Norway          | 83                |
| France           | 123.28                       | United States   | 82                |
| Poland           | 122.76                       | Canada          | 81                |
| Portugal         | 111.59                       | France          | 81                |
| Slovakia         | 111.15                       | South Korea     | 81                |
| Austria          | 106.14                       | Spain           | 81                |
| Turkey           | 106.12                       | Greece          | 79                |
| Hungary          | 104.96                       | Germany         | 77                |
| Slovenia         | 102.81                       | Malaysia        | 77                |
| Malaysia         | 99.00                        | Turkey          | 76                |
| Spain            | 92.76                        | Czech Republic  | 74                |
| Greece           | 81.27                        | Switzerland     | 74                |
| Ireland          | 70.03                        | Hungary         | 72                |
| Lithuania        | 42.78                        | Italy           | 71                |
| United States    | 34.00                        | Lithuania       | 68                |
| Sweden           | 22.97                        | Portugal        | 66                |
| New Zealand      | 19.00                        | Ireland         | 63                |
| Norway           | 16.58                        | Poland          | 60                |
| Finland          | 16.33                        | Austria         | 59                |
| Canada           | 4.00                         | Slovenia        | 55                |
| Australia        | 3.00                         | Slovakia        | 54                |
| Country       | % under age 15 | Country       | % over age 65 |
|--------------|---------------|--------------|--------------|
| Turkey       | 25.0          | Japan        | 27.0         |
| Malaysia     | 24.3          | Italy        | 23.0         |
| Ireland      | 21.6          | Germany      | 21.5         |
| New Zealand  | 19.8          | Portugal     | 21.5         |
| Australia    | 19.0          | Finland      | 21.2         |
| United States| 18.9          | Greece       | 20.4         |
| France       | 18.1          | Sweden       | 19.9         |
| Norway       | 17.8          | Denmark      | 19.7         |
| United Kingdom| 17.7       | France       | 19.7         |
| Sweden       | 17.5          | Spain        | 19.4         |
| Belgium      | 17.1          | Austria      | 19.2         |
| Denmark      | 16.5          | Slovenia     | 19.1         |
| Finland      | 16.4          | Czech Republic| 19.0     |
| Netherlands  | 16.4          | Lithuania    | 19.0         |
| Canada       | 16.0          | Netherlands  | 18.8         |
| Czech Republic| 15.4       | Belgium      | 18.6         |
| Slovakia     | 15.4          | Hungary      | 18.6         |
| Slovenia     | 15.0          | United Kingdom| 18.5    |
| Switzerland  | 14.9          | Switzerland  | 18.4         |
| Lithuania    | 14.8          | Canada       | 17.0         |
| Poland       | 14.8          | Norway       | 16.8         |
| Spain        | 14.7          | Poland       | 16.8         |
| Hungary      | 14.3          | Australia    | 15.5         |
| Greece       | 14.2          | United States| 15.4         |
| Austria      | 14.1          | New Zealand  | 15.3         |
| Portugal     | 13.6          | Slovakia     | 15.1         |
| Italy        | 13.5          | Ireland      | 13.9         |
| South Korea  | 13.5          | South Korea  | 13.9         |
| Germany      | 13.1          | Turkey       | 8.2          |
| Japan        | 12.9          | Malaysia     | 6.3          |
Table 14: Countries ranked by life expectancy and Diversity index.

| Country   | Life Expectancy (years) | Country   | Diversity index |
|-----------|-------------------------|-----------|-----------------|
| Japan     | 84.5                    | Australia | 0.857           |
| Italy     | 83.6                    | Canada    | 0.596           |
| Spain     | 83.4                    | Malaysia  | 0.596           |
| Switzerland | 83.4                | Switzerland | 0.575       |
| Australia | 83.3                    | Belgium   | 0.567           |
| South Korea | 82.8               | Spain     | 0.502           |
| Sweden    | 82.7                    | United States | 0.491     |
| France    | 82.5                    | New Zealand | 0.363        |
| Canada    | 82.3                    | Lithuania | 0.338           |
| Norway    | 82.3                    | Slovakia  | 0.332           |
| Greece    | 82.1                    | United Kingdom | 0.324    |
| Ireland   | 82.1                    | Czech Republic | 0.322    |
| Netherlands | 82.1               | Turkey    | 0.299           |
| New Zealand | 82.1               | France    | 0.272           |
| Portugal  | 81.9                    | Slovenia  | 0.231           |
| Finland   | 81.7                    | Sweden    | 0.189           |
| Belgium   | 81.5                    | Hungary   | 0.186           |
| Austria   | 81.4                    | Ireland   | 0.171           |
| Germany   | 81.2                    | Finland   | 0.132           |
| Slovenia  | 81.2                    | Denmark   | 0.128           |
| United Kingdom | 81.2         | Austria   | 0.126           |
| Denmark   | 80.8                    | Norway    | 0.098           |
| Czech Republic | 79.2          | Germany   | 0.095           |
| United States | 78.9            | Netherlands | 0.077       |
| Poland    | 78.5                    | Greece    | 0.059           |
| Turkey    | 78.3                    | Poland    | 0.047           |
| Slovakia  | 77.4                    | Italy     | 0.040           |
| Hungary   | 76.7                    | Portugal  | 0.040           |
| Malaysia  | 76.1                    | Japan     | 0.012           |
| Lithuania | 75.7                    | South Korea | 0.004        |
Table 15: Countries ranked by mean temperature.

| Country         | Mean Temperature (°C) |
|-----------------|-----------------------|
| Malaysia        | 25.40                 |
| Australia       | 21.65                 |
| Greece          | 15.40                 |
| Portugal        | 15.15                 |
| Italy           | 13.45                 |
| Spain           | 13.30                 |
| South Korea     | 11.50                 |
| Japan           | 11.15                 |
| Turkey          | 11.10                 |
| France          | 10.70                 |
| New Zealand     | 10.55                 |
| Hungary         | 9.75                  |
| Belgium         | 9.55                  |
| Ireland         | 9.30                  |
| Netherlands     | 9.25                  |
| Slovenia        | 8.90                  |
| United States   | 8.55                  |
| Germany         | 8.50                  |
| United Kingdom  | 8.45                  |
| Poland          | 7.85                  |
| Czech Republic  | 7.55                  |
| Denmark         | 7.50                  |
| Slovakia        | 6.80                  |
| Austria         | 6.35                  |
| Lithuania       | 6.20                  |
| Switzerland     | 5.50                  |
| Sweden          | 2.10                  |
| Finland         | 1.70                  |
| Norway          | 1.50                  |
| Canada          | -5.35                 |
Table 16: Countries ranked by % of adult population which is obese and % of adult population with diabetes.

| Country        | % obese | Country       | % with diabetes |
|----------------|---------|---------------|-----------------|
| United States  | 36.2    | Malaysia      | 16.7            |
| Turkey         | 32.1    | Turkey        | 11.1            |
| New Zealand    | 30.8    | United States | 10.8            |
| Canada         | 29.4    | Germany       | 10.4            |
| Australia      | 29.0    | Portugal      | 9.8             |
| United Kingdom | 27.8    | Denmark       | 8.3             |
| Hungary        | 26.4    | Canada        | 7.6             |
| Lithuania      | 26.3    | Czech Republic| 7.0             |
| Czech Republic | 26.0    | Hungary       | 6.9             |
| Ireland        | 25.3    | South Korea   | 6.9             |
| Greece         | 24.9    | Spain         | 6.9             |
| Spain          | 23.8    | Austria       | 6.6             |
| Norway         | 23.1    | Slovakia      | 6.5             |
| Poland         | 23.1    | New Zealand   | 6.2             |
| Germany        | 22.3    | Poland        | 6.1             |
| Finland        | 22.2    | Slovenia      | 5.9             |
| Belgium        | 22.1    | Switzerland   | 5.7             |
| France         | 21.6    | Australia     | 5.6             |
| Portugal       | 20.8    | Finland       | 5.6             |
| Sweden         | 20.6    | Japan         | 5.6             |
| Slovakia       | 20.5    | Netherlands   | 5.4             |
| Netherlands    | 20.4    | Norway        | 5.3             |
| Slovenia       | 20.2    | Italy         | 5.0             |
| Austria        | 20.1    | France        | 4.8             |
| Italy          | 19.9    | Sweden        | 4.8             |
| Denmark        | 19.7    | Greece        | 4.7             |
| Switzerland    | 19.5    | Belgium       | 4.6             |
| Malaysia       | 15.6    | United Kingdom| 3.9             |
| South Korea    | 4.7     | Lithuania     | 3.8             |
| Japan          | 4.3     | Ireland       | 3.2             |
Table 17: Countries ranked by % of adult population with hypertension and % of adult population which smokes.

| Country           | % with hypertension | Country          | % smoking |
|-------------------|---------------------|------------------|-----------|
| Slovenia          | 30.5                | Greece           | 42.65     |
| Hungary           | 30.0                | Austria          | 35.15     |
| Lithuania         | 29.3                | Czech Republic   | 33.20     |
| Poland            | 28.7                | Germany          | 30.35     |
| Slovakia          | 28.5                | Lithuania        | 30.15     |
| Czech Republic    | 27.9                | Spain            | 29.20     |
| Portugal          | 24.4                | Slovakia         | 28.65     |
| Malaysia          | 22.9                | Hungary          | 28.40     |
| France            | 22.0                | Poland           | 28.05     |
| Italy             | 21.2                | France           | 27.70     |
| Austria           | 21.0                | South Korea      | 27.00     |
| Denmark           | 20.6                | Turkey           | 25.95     |
| Turkey            | 20.3                | Netherlands      | 25.05     |
| Germany           | 19.9                | Italy            | 24.00     |
| Ireland           | 19.7                | Switzerland      | 23.30     |
| Norway            | 19.7                | Belgium          | 23.25     |
| Finland           | 19.4                | Portugal         | 22.60     |
| Sweden            | 19.3                | Norway           | 22.25     |
| Spain             | 19.2                | Malaysia         | 22.20     |
| Greece            | 19.1                | Ireland          | 22.15     |
| Netherlands       | 18.7                | Japan            | 22.15     |
| Switzerland       | 18.0                | Finland          | 20.85     |
| Japan             | 17.6                | Sweden           | 20.60     |
| Belgium           | 17.5                | Slovenia         | 20.20     |
| New Zealand       | 16.2                | United Kingdom   | 19.15     |
| Australia         | 15.2                | United States    | 17.25     |
| United Kingdom    | 15.2                | Denmark          | 17.00     |
| Canada            | 13.2                | Canada           | 14.95     |
| United States     | 12.9                | Australia        | 14.90     |
| South Korea       | 11.0                | New Zealand      | 13.20     |
Table 18: Countries ranked by numbers of COVID-19 deaths and period from first case to date when death totals were retrieved.

| Country            | No. of COVID deaths | Country       | Recording period (days) |
|--------------------|---------------------|---------------|-------------------------|
| United States      | 144,469             | Japan         | 194                     |
| United Kingdom     | 45,639              | South Korea   | 189                     |
| Italy              | 35,092              | United States | 188                     |
| France             | 30,185              | France        | 184                     |
| Spain              | 28,429              | Australia     | 183                     |
| Belgium            | 9,812               | Malaysia      | 183                     |
| Germany            | 9,117               | Canada        | 182                     |
| Canada             | 8,919               | Germany       | 180                     |
| Netherlands        | 6,158               | Finland       | 179                     |
| Sweden             | 5,697               | Italy         | 179                     |
| Turkey             | 5,563               | Sweden        | 177                     |
| Switzerland        | 1,977               | United Kingdom| 176                     |
| Ireland            | 1,763               | Spain         | 175                     |
| Portugal           | 1,705               | Belgium       | 173                     |
| Poland             | 1,655               | Switzerland   | 153                     |
| Japan              | 994                 | Austria       | 151                     |
| Austria            | 711                 | Norway        | 151                     |
| Denmark            | 613                 | Denmark       | 150                     |
| Hungary            | 596                 | Greece        | 150                     |
| Czech Republic     | 365                 | Lithuania     | 149                     |
| Finland            | 329                 | Netherlands   | 149                     |
| South Korea        | 298                 | New Zealand   | 149                     |
| Norway             | 255                 | Czech Republic| 147                     |
| Greece             | 201                 | Ireland       | 147                     |
| Australia          | 140                 | Portugal      | 146                     |
| Malaysia           | 123                 | Poland        | 144                     |
| Slovenia           | 115                 | Slovenia      | 144                     |
| Lithuania          | 80                  | Hungary       | 143                     |
| Slovakia           | 28                  | Slovakia      | 142                     |
| New Zealand        | 22                  | Turkey        | 137                     |
Table 19: Countries ranked by death rate (deaths per million population) and time-adjusted death rate (deaths per million population per year) / log time-adjusted death rate.

| Country         | Deaths per million population | Country         | Deaths per million population | Log deaths per million population per year |
|-----------------|-------------------------------|-----------------|-------------------------------|--------------------------------------------|
| Belgium         | 850.3                         | Belgium         | 1795.2                       | 7.49                                       |
| United Kingdom  | 675.8                         | United Kingdom  | 1402.5                       | 7.25                                       |
| Spain           | 608.3                         | Spain           | 1269.5                       | 7.15                                       |
| Italy           | 579.6                         | Italy           | 1182.5                       | 7.08                                       |
| Sweden          | 567.6                         | Sweden          | 1171.3                       | 7.07                                       |
| France          | 463.5                         | France          | 920.0                        | 6.82                                       |
| United States   | 439.0                         | Ireland         | 897.2                        | 6.80                                       |
| Ireland         | 361.1                         | Netherlands     | 882.9                        | 6.78                                       |
| Netherlands     | 360.2                         | United States   | 852.9                        | 6.75                                       |
| Canada          | 238.4                         | Switzerland     | 549.3                        | 6.31                                       |
| Switzerland     | 230.1                         | Canada          | 478.4                        | 6.17                                       |
| Portugal        | 166.7                         | Portugal        | 417.1                        | 6.03                                       |
| Germany         | 109.2                         | Denmark         | 258.6                        | 5.56                                       |
| Denmark         | 106.2                         | Germany         | 221.5                        | 5.40                                       |
| Austria         | 79.4                          | Austria         | 192.0                        | 5.26                                       |
| Turkey          | 66.7                          | Turkey          | 177.8                        | 5.18                                       |
| Hungary         | 61.5                          | Hungary         | 157.2                        | 5.06                                       |
| Finland         | 59.5                          | Slovenia        | 140.3                        | 4.94                                       |
| Slovenia        | 55.3                          | Finland         | 121.3                        | 4.80                                       |
| Norway          | 47.4                          | Norway          | 114.7                        | 4.74                                       |
| Poland          | 43.7                          | Poland          | 110.8                        | 4.71                                       |
| Czech Republic  | 34.1                          | Czech Republic  | 84.8                         | 4.44                                       |
| Lithuania       | 29.0                          | Lithuania       | 71.1                         | 4.26                                       |
| Greece          | 19.2                          | Greece          | 46.7                         | 3.84                                       |
| Japan           | 7.8                           | Japan           | 14.8                         | 2.69                                       |
| South Korea     | 5.8                           | Slovakia        | 13.2                         | 2.58                                       |
| Australia       | 5.6                           | New Zealand     | 11.3                         | 2.42                                       |
| Slovakia        | 5.1                           | South Korea     | 11.2                         | 2.42                                       |
| New Zealand     | 4.6                           | Australia       | 11.1                         | 2.41                                       |
| Malaysia        | 3.8                           | Malaysia        | 7.7                          | 2.04                                       |
| Country         | Date of First Case |
|-----------------|--------------------|
| Japan           | 14 January 2020    |
| South Korea     | 19 January 2020    |
| United States   | 20 January 2020    |
| France          | 24 January 2020    |
| Australia       | 25 January 2020    |
| Malaysia        | 25 January 2020    |
| Canada          | 26 January 2020    |
| Germany         | 28 January 2020    |
| Finland         | 29 January 2020    |
| Italy           | 29 January 2020    |
| Sweden          | 31 January 2020    |
| United Kingdom  | 01 February 2020   |
| Spain           | 02 February 2020   |
| Belgium         | 04 February 2020   |
| Switzerland     | 24 February 2020   |
| Austria         | 26 February 2020   |
| Norway          | 26 February 2020   |
| Denmark         | 27 February 2020   |
| Greece          | 27 February 2020   |
| Lithuania       | 28 February 2020   |
| Netherlands     | 28 February 2020   |
| New Zealand     | 28 February 2020   |
| Czech Republic  | 01 March 2020      |
| Ireland         | 01 March 2020      |
| Portugal        | 02 March 2020      |
| Poland          | 04 March 2020      |
| Slovenia        | 04 March 2020      |
| Hungary         | 05 March 2020      |
| Slovakia        | 06 March 2020      |
| Turkey          | 11 March 2020      |
Table 21: Countries ranked by date national measures were introduced and delay between first case and the introduction of national measures.

| Country          | National measures date | Country       | National measures delay (days) |
|------------------|------------------------|---------------|-------------------------------|
| Italy            | 09 March 2020          | South Korea   | 189                           |
| Norway           | 12 March 2020          | Sweden        | 177                           |
| Poland           | 12 March 2020          | Japan         | 93                            |
| Denmark          | 13 March 2020          | United States | 78                            |
| Greece           | 13 March 2020          | Australia     | 65                            |
| Netherlands      | 15 March 2020          | Canada        | 56                            |
| Austria          | 16 March 2020          | Spain         | 55                            |
| Czech Republic   | 16 March 2020          | Germany       | 54                            |
| Finland          | 16 March 2020          | France        | 53                            |
| Hungary          | 16 March 2020          | Malaysia      | 53                            |
| Lithuania        | 16 March 2020          | United Kingdom| 51                            |
| Slovakia         | 16 March 2020          | Finland       | 47                            |
| Slovenia         | 16 March 2020          | Belgium       | 42                            |
| Switzerland      | 16 March 2020          | Italy         | 40                            |
| Turkey           | 16 March 2020          | Ireland       | 26                            |
| Belgium          | 17 March 2020          | New Zealand   | 26                            |
| France           | 17 March 2020          | Switzerland   | 21                            |
| Malaysia         | 18 March 2020          | Austria       | 19                            |
| Portugal         | 20 March 2020          | Portugal      | 18                            |
| Canada           | 22 March 2020          | Lithuania     | 17                            |
| Germany          | 22 March 2020          | Netherlands   | 16                            |
| United Kingdom   | 23 March 2020          | Czech Republic| 15                            |
| New Zealand      | 25 March 2020          | Denmark       | 15                            |
| Ireland          | 27 March 2020          | Greece        | 15                            |
| Spain            | 28 March 2020          | Norway        | 15                            |
| Australia        | 30 March 2020          | Slovenia      | 12                            |
| United States    | 07 April 2020          | Hungary       | 11                            |
| Japan            | 16 April 2020          | Slovakia      | 10                            |
| South Korea      | 26 July 2020           | Poland        | 8                             |
| Sweden           | 26 July 2020           | Turkey        | 5                             |
Comparing the outcome variable with the model residuals

The outcome variable used in the models was log death rate, standardized to have mean 0 and standard deviation 1. In Table 22, countries are shown ranked by (a) the outcome variable, (b) residuals from Model 1 and (c) residuals from Model 2. The values of the outcome variable and the model residuals are also shown.
Table 22: Countries ranked by (a) the outcome variable, (b) residuals from Model 1 and (c) residuals from Model 2. The value of the outcome variable and the model residuals are shown.

| Rank | (a) Outcome variable | (b) Residuals from Model 1 | (c) Residuals from Model 2 |
|------|----------------------|---------------------------|---------------------------|
| 1    | Belgium 1.38         | Spain 1.19                | Spain 1.28                |
| 2    | United Kingdom 1.23  | Italy 0.85                | Sweden 1.06               |
| 3    | Spain 1.18           | Portugal 0.59             | Italy 0.86                |
| 4    | Italy 1.13           | Belgium 0.55              | France 0.64               |
| 5    | Sweden 1.13          | Ireland 0.53              | Portugal 0.57             |
| 6    | France 0.99          | France 0.53               | Ireland 0.52              |
| 7    | Ireland 0.97         | Malaysia 0.50             | Belgium 0.51              |
| 8    | Netherlands 0.96     | Austria 0.49              | United Kingdom 0.45       |
| 9    | United States 0.94   | United Kingdom 0.46       | Malaysia 0.44             |
| 10   | Switzerland 0.68     | Switzerland 0.37          | United States 0.34        |
| 11   | Canada 0.60          | Sweden 0.36               | Austria 0.28              |
| 12   | Portugal 0.52        | Denmark 0.32              | Canada 0.19               |
| 13   | Denmark 0.24         | Canada 0.32               | Lithuania 0.19            |
| 14   | Germany 0.15         | Greece 0.22               | Switzerland 0.17          |
| 15   | Austria 0.06         | Lithuania 0.19            | Hungary 0.16              |
| 16   | Turkey 0.02          | Poland 0.12               | Poland 0.12               |
| 17   | Hungary -0.05        | United States 0.12        | Denmark 0.09              |
| 18   | Slovenia -0.12       | Hungary 0.05              | South Korea 0.01          |
| 19   | Finland -0.21        | Finland -0.09             | Greece -0.04              |
| 20   | Norway -0.24         | Turkey -0.10              | Turkey -0.17              |
| 21   | Poland -0.26         | Netherlands -0.21         | Finland -0.23             |
| 22   | Czech Republic -0.42 | South Korea -0.24         | Slovenia -0.29            |
| 23   | Lithuania -0.52      | Slovenia -0.41            | Netherlands -0.32         |
| 24   | Greece -0.77         | Norway -0.50              | Slovakia -0.61            |
| 25   | Japan -1.45          | Slovakia -0.51            | Norway -0.68              |
| 26   | Slovakia -1.51       | Germany -0.88             | Germany -0.73             |
| 27   | New Zealand -1.60    | Japan -1.02               | Czech Republic -0.99      |
| 28   | South Korea -1.61    | Czech Republic -1.14      | Australia -1.05           |
| 29   | Australia -1.61      | Australia -1.16           | Japan -1.15               |
| 30   | Malaysia -1.83       | New Zealand -1.49         | New Zealand -1.62         |

The outcome variable is standardized log death rate (deaths per million population per year).
Data sources from which national measures dates were derived

A country was considered to have introduced national COVID-19 control measures once compulsory restrictions were adopted which applied to the whole country and included at least two of the following:

(i) A limit on public gatherings to 30 people or fewer.
(ii) The closure of public buildings including non-essential shops, restaurants, bars, theatres and cinemas.
(iii) The closure of schools.
(iv) A requirement on the public to stay at home except for medical reasons, exercise, essential shopping and work that can't be done remotely.
(v) A requirement on the public to observe social distancing.

Details are given below of the sources used to determine the dates that national COVID-19 control measures were introduced in each country. Sources were accessed on 11th of August 2020.

Australia
National measures date: 30 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Australia
https://www.pm.gov.au/media/national-cabinet-statement

“On 29 March, the Cabinet agreed to stricter limits to apply from midnight on the 30th: a limit on both indoor and outdoor gatherings of two people except weddings (5) funerals (10) and people of the same household or family; strong guidance to all Australians is to stay home unless for necessary shopping, health care, exercise, and work and study that can't be done remotely; public playgrounds, skate parks and outside gyms to be closed. It was left to individual states to enforce these guidelines. They also agreed to a moratorium on evictions for six months for both commercial and residential tenancies suffering financial distress.”

Austria
National measures date: 16 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Austria
https://orf.at/stories/3158055/

“On 16 March, a nationwide curfew went into force. Homes may only be left for a handful of specified reasons, see above. Non-essential work that cannot be done from home was stopped.”
Belgium
National measures date: 17 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Belgium
https://www.belgium.be/en/news/2020/coronavirus_reinforced_measures

“On 17 March, the National Security Council decided to take additional measures, based on the spread of COVID-19 in Belgium and on recommendations of experts. Stricter social distancing measures were imposed from noon the following day until 5 April, with non-essential travel prohibited, non-essential shops to close, gatherings banned, with penalties for corporate and individual persons who failed to comply with the restrictions.”

Canada
National measures date: 22 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Canada#Provincial_and_territorial

From a study of the COVID-19 control measures imposed by individual states, the conclusion was drawn that the conditions for “COVID-19 control measures”, as defined above, were met nationally from March the 22nd 2020, this being the date that a state of emergency was declared in Nova Scotia.

Czech Republic
National measures date: 16 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_the_Czech_Republic

“16 March – Starting at midnight, an hour after the nationwide quarantine declaration was approved the previous day, nearly 11 million Czech residents were placed under quarantine (see policies section below).[2] The Czech Republic became one of the first[39] countries in the EU to completely close its borders (with exemptions including international freight transport, see policies section below).[2] First three people were reported recovered.”

Denmark
National measures date: 13 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Denmark
https://nyheder.tv2.dk/samfund/2020-03-11-danmark-lukker-ned-her-er-regeringens-nye-tiltag
“Starting on 13 March 2020, all people working in non-essential functions in the public sector were ordered to stay home for two weeks.”

**Finland**  
National measures date: 16 March 2020

Sources:  
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Finland

“On 16 March, the Finnish Government, in cooperation with the President of Finland, declared a state of emergency in the country. A list of measures intended to slow down the spreading of the virus and to protect at-risk groups were implemented in accordance with the Emergency Powers Act (1552/2011), the Communicable Diseases Act (1227/2016), and other legislation.”

**France**  
National measures date: 17 March 2020

Sources:  
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_France  
https://www.marianne.net/politique/emmanuel-macron-annonce-l-interdiction-des-deplacements-non-essentiels-des-mardi-midi

“On 16 March (one day after the first round of the municipal elections), Emmanuel Macron announced the beginning of a lockdown period from the 17 March at noon.”

**Germany**  
National measures date: 22 March 2020

Sources:  
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Germany  
https://www.welt.de/politik/deutschland/article206725829/Coronavirus-Deutschland-Kontaktverbote-zu-mehr-als-zwei-Personen-Friseure-zu.html

“On 22 March, the government and the federal states agreed for at least two weeks to forbid gatherings of more than two people and require a minimum distance of 1.5 metres (4 ft 11 in) between people in public except for families, partners or people living in the same household. Restaurants and services like hairdressers were to be closed.”

**Greece**  
National measures date: 13 March 2020

Sources:
“On 13 March, the nationwide closure of all shopping centres, cafes, restaurants, bars, museums and archaeological sites and food outlets, excluding supermarkets, pharmacies and food outlets that offer take-away and delivery only, was announced.[398] On 14 March, all organised beaches and ski resorts were closed.”

Hungary
National measures date: 16 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Hungary

“Elementary and high schools were initially excluded from closure, due to an initial assessment that COVID-19 did not have as serious of an impact to children.[71][72][73] The Ministry of Human Capacities recommended that schools suspend field trips, open-air classes, and exchange programs.[74] On 13 March during a radio interview, Prime Minister Viktor Orbán said kindergarten was also excluded since parents would have to guarantee children’s supervision, and teachers would be required to take unpaid leave.[75] That evening, Orbán announced that elementary and high schools would be closed to in-person classes effective 16 March.[76]

On 16 March, Prime Minister Orbán announced further restrictions, including ordering the cancellation of all events, and banning restaurants and cafes from operating beyond 3 p.m. Only grocery stores and pharmacies would be allowed to remain open past this time. In addition, it was announced that the country would allow entry to Hungarian citizens only.[77][77] In spite of the notices issued by operational staff about responsible behaviour and moderation, a 30-year-old security guard shared fake news on YouTube regarding the pandemic. He was the subject of police action.[78]”

Ireland
National measures date: 27 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_the_Republic_of_Ireland
https://www.gov.ie/en/publication/cf9b0d-new-public-health-measures-effective-now-to-prevent-further-spread-o/?referrer=/en/publication/539d23-stay-at-home-the-latest-public-health-measures-to-prevent-the-spread/

“On 27 March, 302 new cases as well as 3 new deaths brought the total number of confirmed cases and deaths to 2,121 and 22, respectively.[52] Among the deaths was the country's first healthcare fatality, who was based in the east.[53] Taoiseach Leo Varadkar announced a series of measures which he summed up as: "Stay at Home" (subject to certain exemptions).”
Italy
National measures date: 09 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Italy
https://edition.cnn.com/2020/03/09/europe/coronavirus-italy-lockdown-intl/index.html

“On 9 March, the government announced that all sporting events in Italy would be cancelled until at least 3 April, but the ban does not include Italian clubs or national teams participating in international competitions.[242] In the evening, Conte announced in a press conference that all measures previously applied only in the so-called "red zones" had been extended to the whole country, putting approximately 60 million people in lockdown. Conte later proceeded to officially sign the new executive decree.[117][243]”

Japan
National measures date: 16 April 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Japan

“On 16 April, Abe expanded the state of emergency declaration to include every prefecture within the country.[11] Later on 4 May, Abe said that Japanese Cabinet would expand the state of emergency declaration until end of May.[73] Then on 14 May, Abe and his cabinet declared that Japanese Government decided to relieve the state of emergency declaration, excluding 8 prefectures like Tokyo, Kyoto Prefecture.[74] Some media expressed doubts about why only some of the easing standards were released under the name of comprehensive judgment.”

Lithuania
National measures date: 16 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Lithuania

“16 March: Two new cases were confirmed. Both patients were in Vilnius, and they had returned from Spain (Barcelona via Paris) and Germany.[30] Later in the day, three more cases were confirmed: one person in Telšiai who returned from the Dominican Republic on 8 March, and two people in Vilnius who returned from Austria.[31] Also on the same day, Lithuania was put under quarantine.”

Malaysia
National measures date: 18 March 2020

Sources:
Prime Minister Muhyiddin Yassin announced that Malaysia would enter into lockdown on 18 March 2020.

Netherlands
National measures date: 15 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_the_Netherlands
https://nos.nl/artikel/2327194-alle-scholen-cafes-en-restaurants-tot-en-met-6-april-dicht-om-coronavirus.html

“15 March: the total number of cases was 1,135. The Public Health Service (GGD) estimated that as of this day, 6,000 people in the Netherlands had been infected. This is because since 12 March people with mild complaints had not been tested any more.[38] Public measures were also tightened up. Schools and childcare centres will remain closed until 6 April, as well as cafés, restaurants, sports clubs, saunas, sex clubs and coffeeshops.”

New Zealand
National measures date: 25 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_New_Zealand

“Beginning on 25 March, the Alert Level was moved to Level 4, putting the country into a nationwide lockdown.”

Norway
National measures date: 12 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Norway
https://www.nrk.no/korona/status/

“The Norwegian Directorate of Health introduced a number of measures from Thursday 12 March 2020.

- All educational institutions were closed and organized sports activities were to be discontinued.
- A number of events and businesses were closed, including cultural events, sports events, gyms and swimming pools. All establishments in the hospitality industry such as bars, pubs and clubs other than those serving food were to close, and any establishment serving food would have to ensure that visitors could stay at least 1 meter apart.
• Healthcare professionals working with patient care were prohibited from traveling abroad until 20 April 2020. The ban applied to both business travel and private travel.
• Everyone who had returned from trips outside Sweden and Finland since 27 February were to quarantine, regardless of whether they showed symptoms or not.
• Leisure travel was strongly discouraged. The Directorate discouraged travelling to work unless strictly necessary and encouraged avoiding public transport if possible, as well as avoiding crowded places.
• People were requested not to visit others in institutions with vulnerable groups (the elderly, psychiatry, prison etc.) and generally encouraged to limiting close contact with others.
• The public transport schedule was to run as normal, to ensure that people with critical social functions could get to and from work and be able to distance themselves from each other.”

Poland
National measures date: 12 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Poland

"Polish authorities' initial COVID-19 limitation strategy of laboratory testing, contact tracing, quarantining and monitoring intensified in mid-March with "lockdown" type measures. On 10 March, authorities cancelled all mass events, defined as those allowing 1000 or more participants in the case of stadiums or other events outside of buildings, and those allowing 500 or more participants in the case of events in buildings.[11] Cultural institutions, such as philharmonic orchestras, operas, theatres, museums, and cinemas, had their activities suspended beginning on 12 March 2020.[12]

All schools in Poland were closed starting on 12 March, with a reopening initially scheduled for 25 March 2020.[13] The closure was extended to 10 April, with schools being required to carry out online classes with their students. As of 20 March, the dates of final exams for eighth (final) year of primary school and matura, the exam during the final year of secondary school (liceum or technikum), remained unchanged.[56]"

Portugal
National measures date: 20 March 2020

Sources:
https://www.gov.uk/government/news/portugal-coronavirus-covid-19-state-of-emergency#:~:text=On%20March%20the,virus%20(COVID%2019).

"On 18 March 2020 the President of Portugal, Marcelo Rebelo de Sousa, announced a State of Emergency to be brought in by the Portuguese Government. The State of Emergency legislation published on 20 March brings into force a series of measures to
limit the spread of the virus (COVID-19). Cases of coronavirus (COVID-19) have been confirmed in Portugal.”

Slovakia
National measures date: 16 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Slovakia

“12 March 2020 - Emergency declared,[9] all event venues closed[10]
13 March 2020 - Compulsory 14-day quarantine upon returning from abroad,[11]
restarting border controls, international passenger transportation halted[citation needed]
15 March 2020 - Emergency declared in health care,[12] face masks compulsory in public transport and shops[13]
16 March 2020 - Non-essential stores closed”

Slovenia
National measures date: 16 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Slovenia

“16 March 2020: The government closed all restaurants and bars. Public parking places in Ljubljana, Maribor, Murska Sobota were made free for the time being; all educational institutions, including kindergartens, primary and secondary schools, closed down. 34 new cases, 253 total out of 6,712 tests (until 14:20).[26] Infection with COVID-19 has been confirmed with one employee from nursing home in Štore and suspected with an employee from nursing home in Šmarje pri Jelšah; 12 more employees were ordered to self-isolate. 6 infections were confirmed among Red Cross volunteers taking body temperature of the travellers on the border crossings with Italy.”

South Korea
National measures date: 26 July 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_South_Korea

No evidence was found that government measures ever met the conditions for “COVID-19 control measures”, as defined above.

Spain
National measures date: 28 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Spain
“On 28 March, the Spanish government banned all non-essential activity,[142][143] providing affected workers with paid recoverable leave unless they provide an essential service, work remotely, are on sick leave, or have their contracts suspended.”

**Sweden**
National measures date: 26 July 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Sweden

No evidence was found that government measures ever met the conditions for “COVID-19 control measures”, as defined above.

**Switzerland**
National measures date: 16 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Switzerland

“On 16 March, the Federal Council announced[40] further measures, and a revised ordinance.[41][42][43] Measures include the closure of bars, shops and other gathering places until 19 April, but leaves open certain essentials, such as grocery shops, pharmacies, (a reduced) public transport and the postal service.[44]”

**Turkey**
National measures date: 16 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Turkey

“On 15 March, the Ministry of Culture and Tourism announced that between 16 and 30 March all libraries in Turkey would be closed.[103] The Ministry of the Interior announced that pavilions, discotheques, bars and night clubs would be closed temporarily starting from 10:00 on 16 March.”

**United Kingdom**
National measures date: 23 March 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_the_United_Kingdom

“Having previously advised the public to avoid pubs and restaurants, on 23 March, Boris Johnson announced in a television broadcast that measures to mitigate the virus were to be tightened to protect the NHS, with wide-ranging restrictions on freedom of movement, enforceable in law,[9] under a stay-at-home order which would last for at least three weeks.”
United States
National measures date: 07 April 2020

Sources:
https://en.wikipedia.org/wiki/COVID-19_pandemic_in_the_United_States

From a study of the COVID-19 control measures imposed by individual states tabulated here:

https://en.wikipedia.org/wiki/U.S._state_and_local_government_responses_to_the_COVID-19_pandemic

the conclusion was drawn that the conditions for “COVID-19 control measures”, as defined above, were met nationally from April the 7th 2020, this being the date that a “stay at home” was ordered in South Carolina.