Regulation and trust: COVID-19 mortality in 25 European countries

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Abstract

Background
The outbreak of COVID-19 has dramatically changed societies in 2020. Since the end of February, Europe has been hit particularly hard by COVID-19, but there are major country differences in both the spread of the virus and measures taken to stop the virus. Social psychological factors such as institutional trust could be important in understanding the development of the epidemic. The aim of our study was to examine country-variation in COVID-19 mortality in Europe by analyzing 1) social risk factors explaining the spread of the disease, 2) restrictions and control measures and 3) institutional trust.

Methods
The present study was based on a background analysis of European Social Survey data on 25 European countries (N = 47,802). Multilevel mixed effects linear regression models focused on 75 days of the COVID-19 epidemic (January 23 – April 7, 2020) and modelled the daily COVID-19 mortality. Analysis focused on the impact of social relations, restrictions and institutional trust within each country.

Results
The spread of the COVID-19 epidemic has been fast everywhere, but our findings reveal significant differences between countries in COVID-19 mortality. Perceived sociability predicted higher COVID-19 mortality. Major differences between the 25 countries were found in reaction times to the crisis. Late reaction to the crisis predicted later mortality figures. Institutional trust was associated with lower COVID-19 mortality. Increase in mortality was more rapid in countries that reacted late during the 21-day follow-up.

Discussion
The analyses demonstrated the importance of societal and social psychological factors in the spread of the COVID-19 epidemic. By considering multiple perspectives, our study showed that country differences in Europe are major and this will have an impact on how countries will cope with the ongoing crisis in the following months. Our results indicate the importance of timely restrictions and cooperation with people. Digital technologies are likely to help in achieving these goals.

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Abstract

Background
The outbreak of COVID-19 has dramatically changed societies in 2020. Since the end of February, Europe has been hit particularly hard by COVID-19, but there are major country differences in both the spread of the virus and measures taken to stop the virus. Social psychological factors such as institutional trust could be important in understanding the development of the epidemic.

Objective
The aim of our study was to examine country-variation in COVID-19 mortality in Europe by analyzing 1) social risk factors explaining the spread of the disease, 2) restrictions and control measures and 3) institutional trust.

Methods
The present study was based on a background analysis of European Social Survey data on 25 European countries (*N* = 47,802). Multilevel mixed effects linear regression models focused on 82 days of the COVID-19 epidemic (January 23 – April 14, 2020) and modelled the daily COVID-19 mortality. Analysis focused on the impact of social relations, restrictions and institutional trust within each country.

Results
The spread of the COVID-19 epidemic has been fast everywhere, but our findings reveal significant differences between countries in COVID-19 mortality. Perceived sociability predicted higher COVID-19 mortality. Major differences between the 25 countries were found in reaction times to the crisis. Late reaction to the crisis predicted later mortality figures. Institutional trust was associated with lower COVID-19 mortality. Increase in mortality was more rapid in countries that reacted late during the 21-day follow-up.

Conclusions
The analyses demonstrated the importance of societal and social psychological factors in the spread of the COVID-19 epidemic. By considering multiple perspectives, our study showed that country differences in Europe are major and this will have an impact on how countries will cope with the ongoing crisis in the following months. Our results indicate the importance of timely restrictions and cooperation with people.

Funding
None.

Introduction

The global outbreak of a new type of coronavirus (SARS-CoV-2) causing coronavirus disease (COVID-19) has rapidly changed societies in the first three months of 2020. COVID-19 was first reported in December 2019 in Wuhan, the capital of Hubei province, China.[1] As a response to a broader disease threat, China placed restrictions on travel in and out of Wuhan on January 23, 2020, but the virus was detected in Europe already in January in countries such France (January 24, 2020) and Finland (January 26, 2020).[2] Currently, it is not well known for how long there were active COVID-19 cases circling in Europe before different countries started to react to the epidemic. The first death caused by COVID-19 outside Asia occurred in France on February 15, 2020. In Italy, the number of infections started to rise rapidly in the last week of February.[3] During March 2020, almost all European countries placed at least some restrictions in effort to prevent further uncontrolled spread of the virus.

Much of the focus of COVID-19 discussion and research has centralized on epidemiological factors. The reproductive number (R_0) of COVID-19 has been considered higher than that of SARS. In a recent review study, the average R_0 of COVID-19 was found to be 3.28 with a median of 2.79.[4] Viral shedding of the novel coronavirus is also long (median 20 days in survivors), while non-survivors have died, on average, after 18–19 days of illness onset.[5,6] Case fatality and infection fatality ratios have been recently reported for China, being 3.67% and 0.66%, respectively.[6] In Europe, similar estimations have not been made yet, but COVID-19 mortality has been particularly high in some regions, such as Lombardy, Italy. Data shows major country variation in the spread and mortality rates of COVID-19 within Europe, but reasons behind the spread of the disease and subsequent mortality remain partly unexplained. Different countries have also responded to the epidemic at different rates, which gives a starting point for our investigations on societal and psychological factors related to the spread of COVID-19. Social scientific perspective could help us understand COVID-19 mortality.

Social factors are important in epidemics which should be always understood in their ecological context.[7] This means, for example, that social activity has an impact on the spread of viruses. European countries vary greatly in terms of population density and there are also differences in the number of social contacts people have and interact with on a daily basis. In addition, there are major cultural differences in the physical distance people keep when interacting with their close friends and other people.[8] For instance, Southern European countries have been traditionally considered as contact cultures in comparison to noncontact cultures, such as North Europe and Asia.[8-10] During an epidemic both physical and social closeness of people are factors explaining the spread of the disease.

Another important social factor explaining the spread of viruses is trust. Trust in institutions and other people is considered an important factor in wellbeing and the overall functioning of societies.[11,12] Institutional trust can be a crucial part of epidemic management and prevention, because trust in public systems and authorities, such as health care systems, influences how people use services and follow instructions.[13] Trust in institutions becomes very important after disruptive events, such as terrorist attacks, natural disasters, or epidemics.[14,15] Research evidence from previous epidemics showed that those who had lower trust in government were less likely to take precautions against the Ebola virus disease in Liberia and Congo during the 2014–2016 outbreak.[16,17] Similar findings were also made during the 2002-2004 SARS outbreak in Hong Kong.[18] Great trust in authorities has been also associated with carrying out avoidant behaviors during the Swine Flu epidemic in the UK.[19]

Dozens of studies have previously demonstrated significant country differences in institutional trust, making it an essential societal element to consider.[20,21] Trust in state institutions is typically highest in Nordic countries (Finland, Denmark, Iceland, Norway, Sweden) which also rank high in different welfare statistics globally.[22] Elsewhere in Europe, institutional trust is found to be low; particularly in Eastern European countries, but also in Southern European countries, such as Italy.[23,24] Determinants of institutional trust vary across different sides of Europe, but the perceived lack of responsiveness of political and governmental entities often results in low received trust from the public. In East Central Europe older individuals and women have been found to show more trust toward institutions, while trust in political institutions is lower among more educated people.[25] In Southern European countries, such as Italy and Spain, socialization experiences are largely associated with low institutional trust and attitudes toward political institutions are deeply rooted in cultural legacy.[26] In other words, institutional trust is lowest in those countries characterized as contact cultures. The combination of social closeness and lack of trust in authorities might turn out to be very lethal within Europe, at least for the elderly.

The aim of our study was to examine country-variation in COVID-19 mortality in Europe by analyzing 1) social risk factors explaining the spread of the disease, 2) restrictions and control measures and 3) institutional trust. We expected to find societal differences especially in the capability to cope with this crisis situation.

Methods

Data sources

The study was based on analysis of European Social Survey data on 25 European countries (N=47,802). Data were from 2016 (ESS8), except for Bulgaria, Cyprus, and Slovakia whose data were from 2012 (ESS6) and Denmark with data from 2014 (ESS4). ESS data sets are openly available for research purposes at the ESS web site (http://www.europeansocialsurvey.org). Additional country information was received from Eurostat and the World Bank. COVID-19 mortality and incidence figures were drawn from the database built by the Corona Virus Resource Centre at Johns Hopkins University, U.S.[27] The data were updated April 15, 2020 for this article. Country restrictions were drawn from official websites of states and ministries, and other related webpages created for the purpose of providing COVID-19 updates.

Measures

COVID-19 mortality and incidence time series data were collected for 25 European countries and covered 75 days of the COVID-19 epidemic (January, 23 – April 14, 2020). Incidence rates were also collected, but they are treated only as controls, because countries differ a lot in their testing rates. Hence, mortality figures provide much more accurate information on the spread of the epidemic during February–April 2020.

Country restrictions information included national bans or restrictions. These included bans on public events, curfews, country border closures, restrictions on restaurant operations, and elementary school contact teaching. Public events, curfews or unauthorized outings were reviewed and applied from the date the first nationwide restriction became effective. Country border closures were determined starting from the date when all the borders of the country were closed. Restrictions on restaurant operations and elementary school contact teaching were calculated from the date at least some national restrictions became effective. Restrictions varied in exact content and accuracy across countries.

General country information includes the size of the population, population density (persons per square kilometer), old-age-dependency ratio (i.e. ratio of people aged 65 and over), gender ratio, life expectancy at birth, health care expenditure (euros per habitants), and number of tourist arrivals per year. Self-reported country information included perceived sociability, household size, the proportion of older people living with children, and perceived institutional trust.

Perceived sociability was measured with a question “How often do you take part in social activities compared to others of same age". The given responses were 1 "Much less than most", 2 "Less than most", 3 "About the same", 4 "More than most", 5 "Much more than most". *Household size* was based on respondents' information on how many people live regularly in their household. *The proportion of elderly people living with children* was calculated by grouping respondents aged 64 or over according to whether they currently live in the same household with children. *Institutional trust* was measured by respondents' trust in five institutions, namely parliament, politicians, political parties, the police, and the legal system. Respondents were asked how much they personally trust these institutions on a scale from 0 to 10 in which 0 meant no trust at all, and 10 meant complete trust. Reliability of the measure was good with Cronbach's alpha ranging from 0.82 to 0.92. In the analyses, institutional trust was categorized as very low (19 or less), low (20–22), high (23–29), and very high (30 or over) for an illustrative map, and as low (less than 23) and high (23 or over) based on median for random effects regression model.

Statistical techniques

All statistical analyses were conducted with Stata 16 software. Daily COVID-19 mortality during the COVID-19 epidemic in Europe was analyzed with multilevel mixed effects linear regression models. In the multilevel models, the dependent variable was square root transformed daily mortality count. The count was based on daily follow-ups on COVID-19 mortality cases for each country, starting from the first confirmed infection and ending April 14, 2020. This resulted in follow-up periods that varied between countries (from 82 days in France to 37 days in Cyprus).

To assess the relationship between the daily mortality count and our main theoretical variables, we conducted three separate models: Model 1 included perceived sociality, Model 2 included timing of national restrictions, and Model 3 included institutional trust as an independent variable. All models controlled for the following between-country factors: average household size, population, population density, old-age-dependency ratio, life expectancy at birth, health care expenditure per inhabitant, high tourist arrival (dummy variable based on median) and the length of the follow-up period for each country. In addition, our models included time as a within-country predictor of mortality. The end point of our follow-up period (April 14, 2020) was coded as zero point for our time variable. Preceding days had negative values in descending order till the first day of the country's follow-up period. Thus, time was used to estimate the within-country change in mortality during the epidemic, while the between-country variables estimated the country differences in mortality. Except time and high tourist arrival dummy, all independent variables were mean centered before adding them into the regression models.

All models were conducted with maximum likelihood estimation. We estimated Huber-White standard errors that were robust to within country clustering and modelled our residuals to account for the autocorrelated error structure of our longitudinal data. The models included random intercept and random slope for time with unstructured covariances. We report regression coefficients and corresponding 95% confidence intervals and p-values for the fixed part of our models and standard deviation with 95% confidence interval for the random effects.

The progression of COVID-19 mortality before and after the first COVID-19 death were analyzed with random effects models to account for clustering at the country level. We model first the amount of daily deaths in low and high institutional trust (cut-off point median value 23) after the first COVID-19 death (time=0), which is used as reference category. Then we analyzed countries reacting late (restrictions placed after the first COVID-19 death) and early (restrictions placed before the first COVID-19 death). In both analyses each time point (day) is allowed to have a separate coefficient for the COVID-19 mortality value (presented as deaths/million persons). Models are presented as figures, and they are adjusted for population density, gender, old-age ratio, and proportion of over 65-year-olds living with children, life-expectancy, and tourist arrivals. Models included country restrictions as daily varying dummies (0=no control, 1=control).

Results

The spread of the COVID-19 epidemic has been fast everywhere, but our findings reveal significant differences between countries. The most impacted countries in Europe by April 14 are Italy (21067 death, 349 deaths / million habitants), Spain (18056 deaths, 385 deaths / million habitants) and France (15729, 235 deaths / million habitants) (see Table 2). All of these countries were also significantly late to implement national restrictions. For example, Italy placed national restrictions almost two weeks after the first COVID-19 incident (see Figure 1). France already had one death case in February and was the slowest to react nationwide. It is highly likely that during these days the virus was able to spread fast in the population, which explains the later mortality figures.

Our multilevel linear regression models analyzed the daily mortality in 25 countries (Table 3). First of all, the fixed effect of time was a significant predictor of mortality in all of the models, indicating the increasing trend in deaths during the crisis period. According to the random part of our models, however, there was a between-country variation in this trend (SD = 0.10, 95% CI = [0.07, 0.15]). In addition to within-country change, we found that between-country factors significantly predicted mortality. Model 1 shows first that perceived sociability predicted higher daily mortality (b=7.04; 95% CI 0.25–13.83; p=0.042). Model 2 shows that late restrictions were associated with higher number of COVID-19 deaths (b=2.55; 95% CI 1.08, 4.02; p=0.001). Model 3 shows that institutional trust was negatively associated with daily COVID-19 mortality figures (b=-0.42, 95% CI -0.65, -0.19, p<0.001). Of our control variables, population density, life expectancy at birth, health care expenditure per inhabitant, high tourist arrival, and the length of the follow-up period were positively associated with daily mortality, yet the significance of these associations varied between models.

The final part of the analysis focused on the role of institutional trust and reaction time. Figure 2 shows the map of Europe and the average number of deaths per million habitants in the analyzed 25 countries categorized in four country groups based on their level of institutional trust. The map demonstrates that those countries with low institutional trust countries have more deaths per million habitants on average compared to high trust countries. We analyzed the difference between countries with low vs. high perceived institutional trust using a random effects regression model. Figure 3 shows development after the first COVID-death case in low and high trust countries. There are no statistically significant differences between the curves. Both curves indicate increase in mortality two weeks after the first COVID-19 death case, and there are no statistically significant differences between them. Figure 4 shows deaths per million habitants for countries reacting late and early. We can see how the number of deaths per day varies in 3 weeks following the first national restrictions and there is a statistically significant difference between the curves. Increase in mortality is more rapid in those countries reacting late than those reacting early. For example, 23 days after the first COVID-19 death there were 2.5 times more deaths in late reacting countries (4.56 deaths/M [95% CI 3.34, 5.78]) than in early reacting countries (1.83 deaths/M, 95% CI, 1.02, 2.65].

Discussion

The starting point for this study were the major country differences observed in COVID-19 mortality and the related societal and cultural differences, as well as how people act in different societies during the current crisis situation. We analyzed social risk factors explaining the spread of the COVID-19, restrictions and control measures and institutional trust in attempt to understand the prevailing country differences.

Our analysis showed that there was major variation in reaction to the global epidemic. We were able to show that mortality was significantly associated with the studied social factors. Perceived sociability was associated with higher COVID-19 mortality even after adjusting for a number of control factors. This might be important in understanding why the virus has been able to spread so fast in some countries, such as Italy, which also has a dense population. The results also reflect previous cross-cultural findings showing that Italians and Spanish people have smaller social, personal and intimate distance compared to many other European nations.[8] These countries also have strong inter-generational ties, which may explain why so many elderly people got sick.[28]

One of the key points of our analysis is, however, that the COVID-19 mortality is tied to societal processes. We found major differences in how fast countries were reacting to the COVID-19 outbreak. Compared to China, European countries had time to react. Yet, national restrictions were placed late. Those countries that are now hit heaviest by the disease were also the ones that were slowest to react nationwide, most notably Italy, Spain and France. Our models showed that late national restrictions predicted a higher number of deaths. Despite the unity provided by EU, European countries were not working together against the emerging disease threat and the regulations progressed slowly, taking one step at a time. There were also delays in putting the restrictions in action. Some countries have also taken different strategies to the COVID-19. In Scandinavia, for example, Sweden has adopted less restrictions than Denmark, Finland and Norway. Sweden also has a higher number of deaths per habitants, as of today. This example shows that even within similar neighboring countries national precautions to COVID-19 have been very different.

We were able to demonstrate in our analysis that institutional trust was a protective factor. This is in line with previous studies indicating that people with higher institutional trust are more likely to follow the advice and guidelines given by the health authorities.[16,17] In our analysis, COVID-19 mortality figures have progressed differently in low trust countries and high trust countries. Remarkably, some low trust countries such as Italy, Spain and France were not only late in placing restrictions, but later they had to place very hard measures, such as curfews, because people were simply not following the recommendations not to socialize with each other. Despite hard measures, these countries have also had to sanction disobedient citizens. For example, the Ministry of Interior in Italy reported intensive controls and over 100,000 people were caught by the police for breaking the curfew.[29]

Epidemiologists have not necessarily given enough attention to the societal and social psychological factors explaining epidemics. Although there have been virus epidemics before, the crisis caused by COVID-19 has created a unique global situation, demonstrating how poorly the previous epidemics (e.g., SARS and MERS) have prepared countries to deal with it.[30] What has made the COVID-19 situation unique when compared to other epidemics, has been the rapid spread of the virus and the unusually hard restrictions placed in order to prevent physical contact and closeness between people. As European countries in general rely on individual freedom and democracy, it is very difficult to close and shut down societies completely. It becomes crucial how different societies are capable are able to handle the crisis situations. This is typically reflected in literature as societal resilience, institutional trust being an important part of it.[14] As the crisis is not over, later developments will reveal what kind of role institutional trust eventually had on the wider picture, which also involves factors related to social contacts between people, and timely restrictions placed within societies. Our analysis was limited to a relatively short follow-up period and inability to control for all possible factors involved. We also wish to note that variation across countries exists. This involves for example the fact that high trust countries have adopted different societal strategies to tackle the COVID-19 crisis. Future studies should continue using social scientific evidence in the investigations of global epidemics.

Ethics approval and consent to participate

ESS data are publicly available and downloadable at the ESS website. The collection of their self-reported data is based on informed consent and it subscribes to the Declaration of Professional Ethics of the International Statistical Institute. All ESS surveys have gone through ethical review by ESS ERIC Research Ethics Board (http://www.europeansocialsurvey.org/about/ethics.html). Our analyses focused on creating country level information and no observations at the individual level were used. Other used data were also publicly available.

Competing interests statement

Authors report no conflict of interest.

Contributorship statement

AO – Conceptualization(Lead), Data curation (Supporting), Formal analysis (Equal), Investigation (Lead), Methodology (Equal), Project administration (Lead), Supervision (Lead), Visualization (Lead), Writing-original draft (Lead); **MK** – Conceptualization (Equal), Data curation (Equal), Formal analysis, (Equal), Investigation (Equal), Methodology (Equal), Writing-original draft (Supporting), Writing-review & editing (Equal); **RL** – Conceptualization (Supporting), Data curation (Equal), Investigation (Equal), Writing-original draft (Supporting), Writing-review & editing (Equal); **IS** – Conceptualization (Supporting), Data curation (Equal), Investigation (Equal), Writing-original draft (Supporting), Writing-review & editing (Equal); **NS** – Conceptualization (Supporting), Formal analysis (Supporting), Investigation (Supporting), Visualization (Equal), Writing-original draft (Supporting), Writing-review & editing (Equal); **AK** – Conceptualization (Equal), Data curation (Equal), Formal analysis (Equal), Investigation (Equal), Methodology (Equal), Writing-original draft (Supporting), Writing-review & editing (Equal).

Data sharing

All data and code is available via Open Science Framework (https://osf.io/wegrh/).

Exclusive license statement

The author warrant that 1) they are the sole authors of the contribution which is an original work, 2) the whole or a substantial part of the contribution has not previously been published, 3) they are the copyright owners of the contribution and 4) to the best of their knowledge that the contribution does not contain anything which is libellous, illegal or infringes any third party’s copyright or other rights.

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Tables

Table 1. Descriptive statistics on 25 European countries selected for the analysis.

Country	Population density	Old-age-dependency ratio	% male	Household size average	Children living with ≥ 65-yo	Life expectancy at birth	Health care exp./ inhab.	Tourist arrivals (millions)	Perceived sociability	Institutional trust
Austria	107	28.2	49.2	2.2	6.7	81.8	4248.0	30.8	2.9	25.8
Belgium	375	29.5	49.3	2.9	9.6	81.7	3744.0	9.1	2.7	24.6
Bulgaria	64	33.2	48.5	2.6	16.1	75.0	556.0	9.3	2.8	10.8
Cyprus	94	23.8	48.8	2.8	14.1	82.9	1474.0	3.9	2.4	17.9
Czechia	138	30.4	49.2	2.3	4.6	79.1	1193.0	10.6	2.6	22.2
Denmark	138	30.6	49.8	2.6	2.6	81.0	5014.0	12.7	2.9	30.7
Estonia	30	31.0	47.2	2.5	14.3	78.5	1072.0	3.2	2.5	24.0
Finland	18	35.1	49.4	2.4	6.1	81.8	3727.0	3.2	2.7	30.6
France	106	32.5	48.3	2.2	4.2	82.9	3847.0	89.3	2.9	21.0
Germany	235	33.2	49.3	2.6	6.3	81.0	4271.0	38.9	2.7	26.2
Hungary	107	29.3	47.8	2.4	11.9	76.2	853.0	17.6	2.5	23.1
Iceland	4	21.3	51.2	3.0	12.1	82.9	4539.0	2.3	2.9	27.3
Ireland	71	21.6	49.5	2.6	12.3	82.3	4242.0	10.9	2.7	23.1
Italy	203	35.7	48.7	2.7	14.5	83.4	2475.0	61.6	2.9	18.1
Lithuania	45	30.4	46.4	2.4	10.5	76.0	899.0	2.8	2.6	21.1
Netherlands	504	29.5	49.7	2.4	2.3	81.9	4274.0	18.8	2.8	28.2
Norway	17	26.4	50.4	2.6	4.0	82.8	6730.0	5.7	2.9	32.3
Poland	124	26.4	48.4	3.1	27.9	77.7	731.0	19.6	2.6	17.6
Portugal	113	33.9	47.2	2.6	15.8	81.5	1632.0	16.2	2.6	18.8
Slovakia	112	23.5	48.8	2.8	20.3	77.4	1061.0	2.3	2.4	15.8
Slovenia	103	30.5	49.9	3.2	31.1	81.5	1657.0	4.4	2.7	17.6
Spain	93	29.5	48.6	3.0	28.3	83.5	2159.0	82.8	2.7	18.8
Sweden	25	31.9	50.3	2.5	2.8	75.9	5123.0	7.4	2.9	28.0
Switzerland	214	27.8	49.6	2.8	5.7	83.8	8841.0	10.4	2.8	30.0
UK	274	28.9	49.4	2.3	5.6	81.3	3566.0	36.3	2.7	24.4

Table 2. Descriptive statistics on COVID-19 mortality and national restrictions in 25 European countries.

			National restrictions				
Country	**Deaths**	**Deaths / 1M habitants**	**Public events**	**Curfew**	**Land borders**	**Restau-rants**	**Schools**
Austria	384	43	10/03	16/03	14/03	16/03	16/03
Belgium	4157	361	10/03	17/03	20/03	14/03	16/03
Bulgaria	35	5	13/03	21/03	20/03	13/03	13/03
Cyprus	12	14	13/03	24/03	15/03	16/03	11/03
Czechia	161	15	13/03	16/03	16/03	14/03	13/03
Denmark	299	51	11/03		14/03	18/03	16/03
Estonia	31	23	13/03		17/03		13/03
Finland	64	12	13/03		19/03	30/03	18/03
France	15729	235	09/03	23/03	17/03	15/03	16/03
Germany	3294	40	09/03		16/03	20/03	13/03
Hungary	122	12	11/03	28/03	17/03	17/03	16/03
Iceland	8	22	16/03				16/03
Ireland	406	83	12/03			22/03	13/03
Italy	21067	349	09/03	09/03	09/03	21/03	05/03
Lithuania	29	10	13/03		16/03	16/03	12/03
Netherlands	2945	170	12/03		17/03	15/03	16/03
Norway	139	26	12/03		16/03	12/03	12/03
Poland	263	7	14/03		15/03	14/03	12/03
Portugal	567	55	20/03			22/03	16/03
Slovakia	2	0	10/03		13/03		09/03
Slovenia	56	27	16/03	30/03	18/03	16/03	16/03
Spain	18056	385		14/03	16/03	15/03	12/03
Sweden	1033	101	12/03				17/03
Switzerland	1174	137	28/02		17/03	16/03	13/03
UK	12107	182	16/03	23/03		20/03	20/03

Table 3. Multilevel mixed effects linear regression models predicting daily COVID-19 mortality in 25 European countries

	Model 1			Model 2			Model 3		
Fixed part	B	95% CI	p value	B	95% CI	p value	B	95% CI	p value
Constant	6.81	[4.05–9.56]	<0.001	5.75	[3.15–8.34]	<0.001	5.29	[2.67–7.90]	<0.001
Within country effects									
Time	0.16	[0.11–0.22]	<0·001	0.16	[0.10–0.22]	<0.001	0.16	[0.10–0.22]	<0.001
Between country effects									
Perceived sociality	7.04	[0.25–13.83]	0.042						
National restrictions after first death				2.55	[1.08–4.02]	0.001			
Institutional trust							-0.42	[-0.65–-0.19]	<0.001
Population	0.02	[-0.03–0.08]	0.422	0.02	[-0.03–0.07]	0.392	-0.02	[-0.08–0.05]	0.600
Population density	0.00	[0.00–0.01]	0.043	0.00	[0.00–0.01]	0.199	0.00	[0.00–0.01]	0.048
Old-age dependency ratio	-0.04	[-0.29–0.20]	0.729	0.03	[-0.20–0.26]	0.801	-0.04	[-0.26–0.18]	0.732
Country household size average	0.96	[-1.00–2.92]	0.336	0.98	[-0.94–2.91]	0.315	-0.55	[-2.45–1.35]	0.569
Life expectancy at birth	0.27	[-0.01–0.54]	0.058	0.37	[0.14–0.59]	0.002	0.29	[0.05–0.52]	0.015
Health care expenditure per inhabitant	-0.60	[-1.28–0.07]	0.080	-0.25	[-0.59–0.08]	0.142	0.46	[0.03–0.88]	0.034
High tourist arrival	0.65	[-0.62–1.93]	0.317	1.11	[-0.10–2.33]	0.072	2.12	[0.40–3.83]	0.016
The length of follow-up period	0.13	[0·06–0.20]	0.001	0.12	[0.05–0.19]	0.001	0.19	[0.12–0.26]	<0.001
Random part	SD	95% CI		SD	95% CI		SD	95% CI	
Time	0.10	[0.07–0.15]		0.10	[0.07–0.15]		0.11	[0.07–0.15]	
Const	3.58	[2.55–5.00]		3.60	[2.61–4.97]		3.59	[2.59–4.97]	

Figures

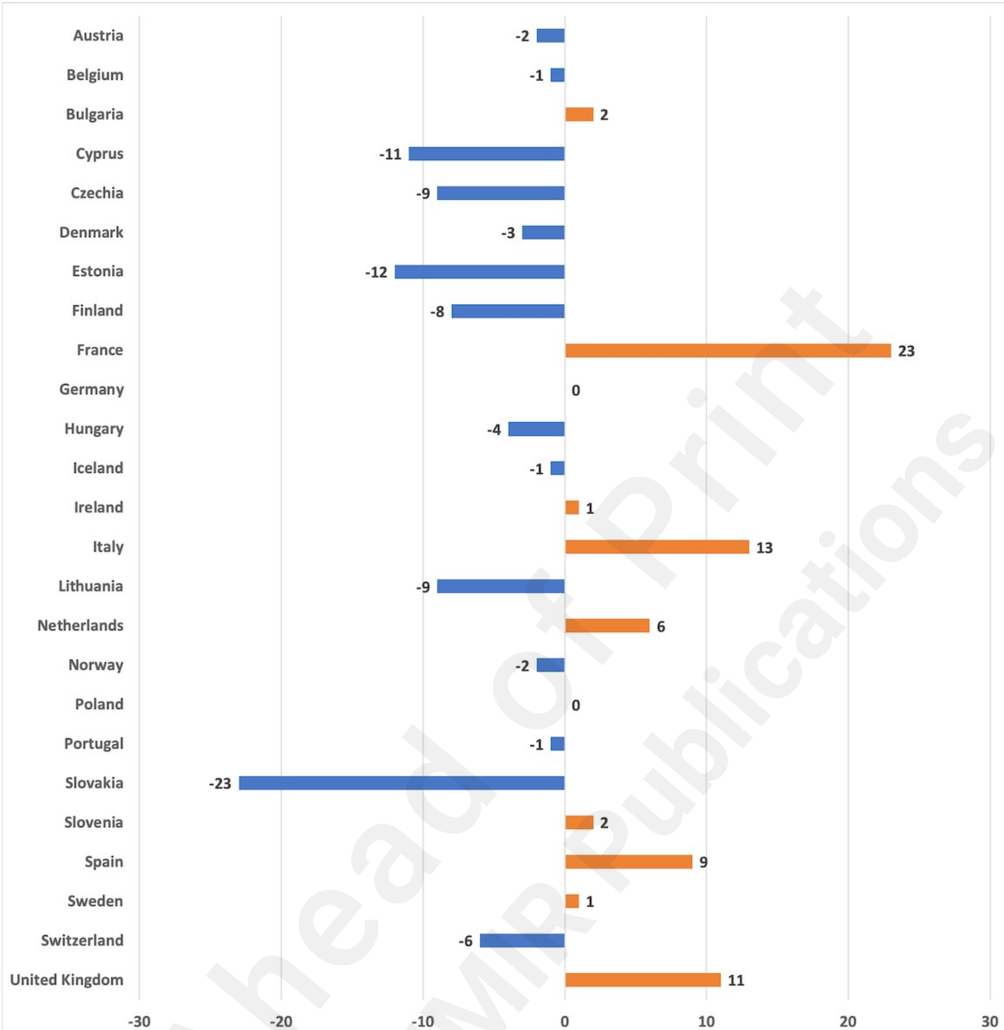


***Figure 1*. First national restrictions placed before (-) or after (+) the first COVID-19 death (days).**

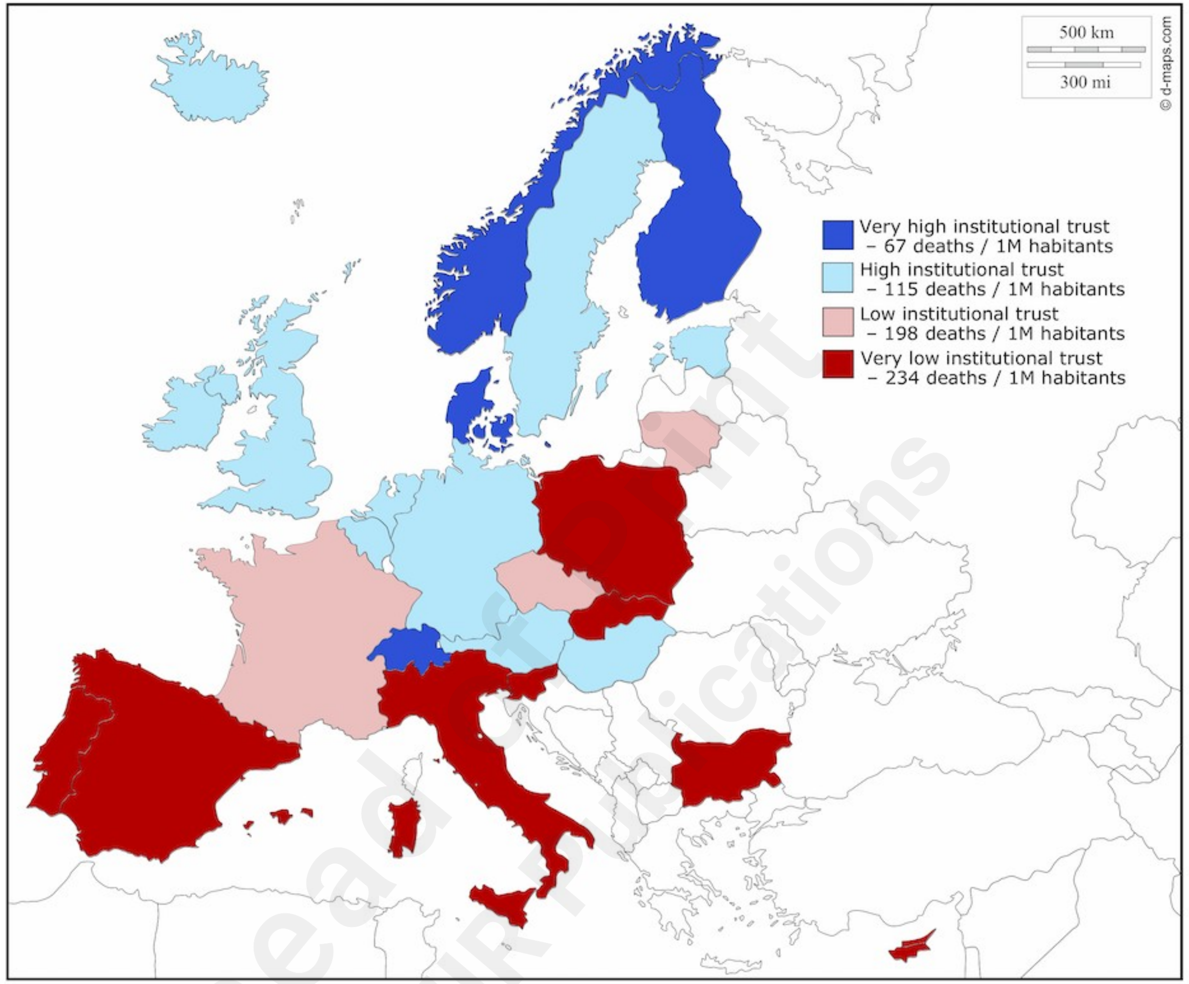


***Figure 2*. Mean deaths per million habitants by countries' level of institutional trust.**

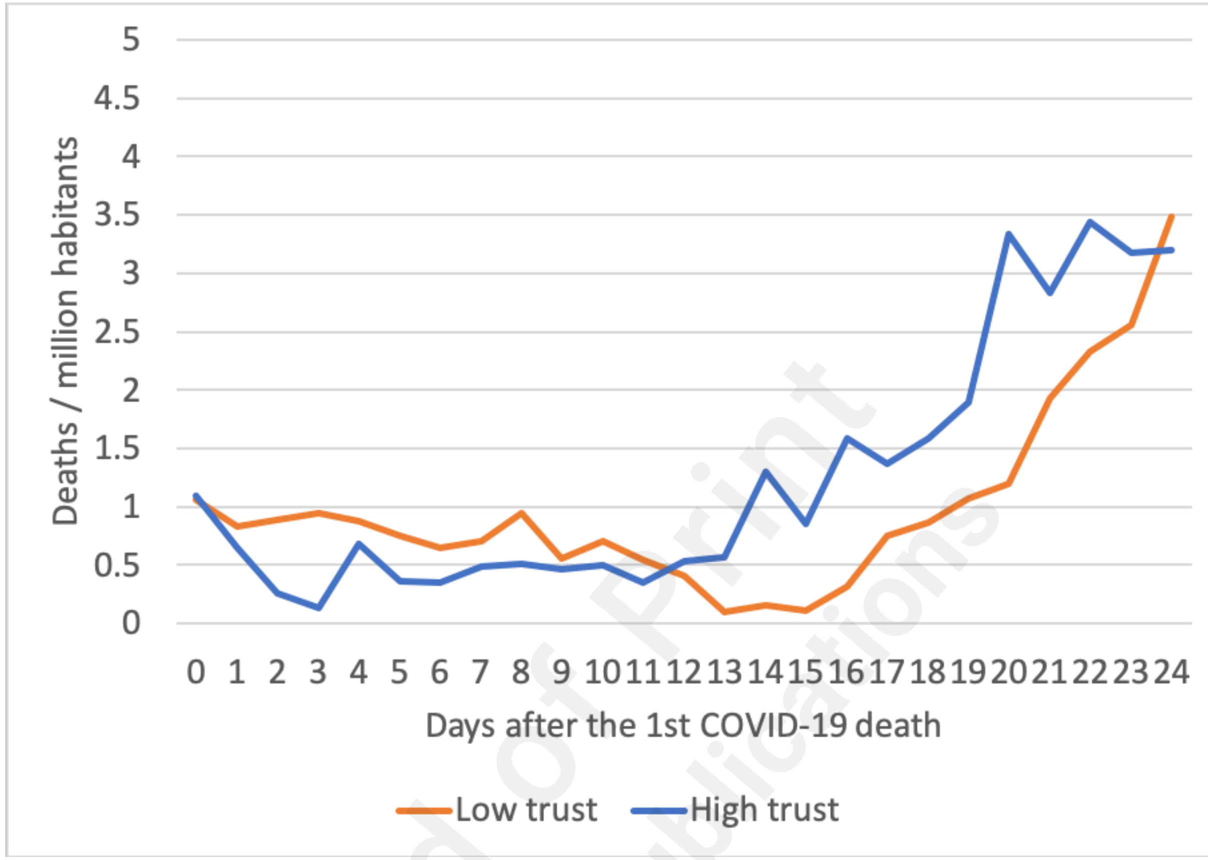


Figure 3. **Deaths per day after first COVID-19 death in low and high trust countries.**

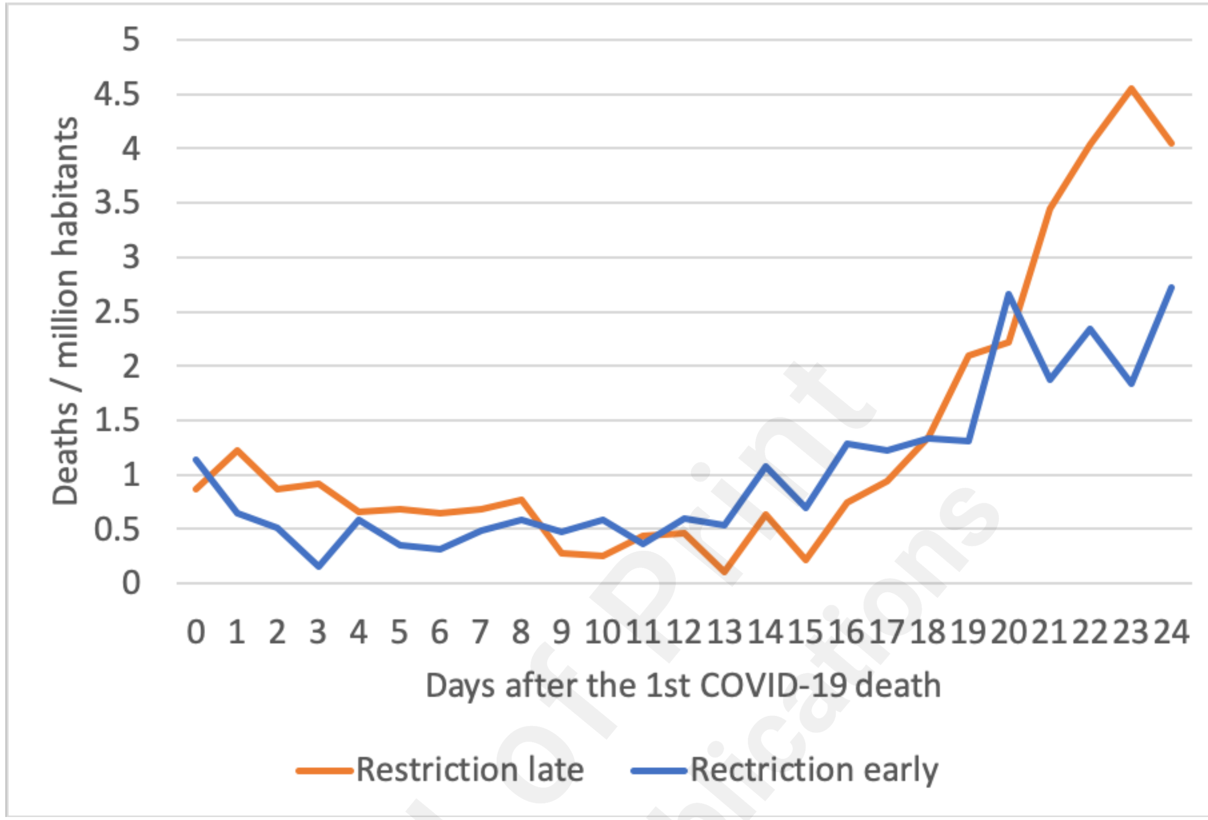
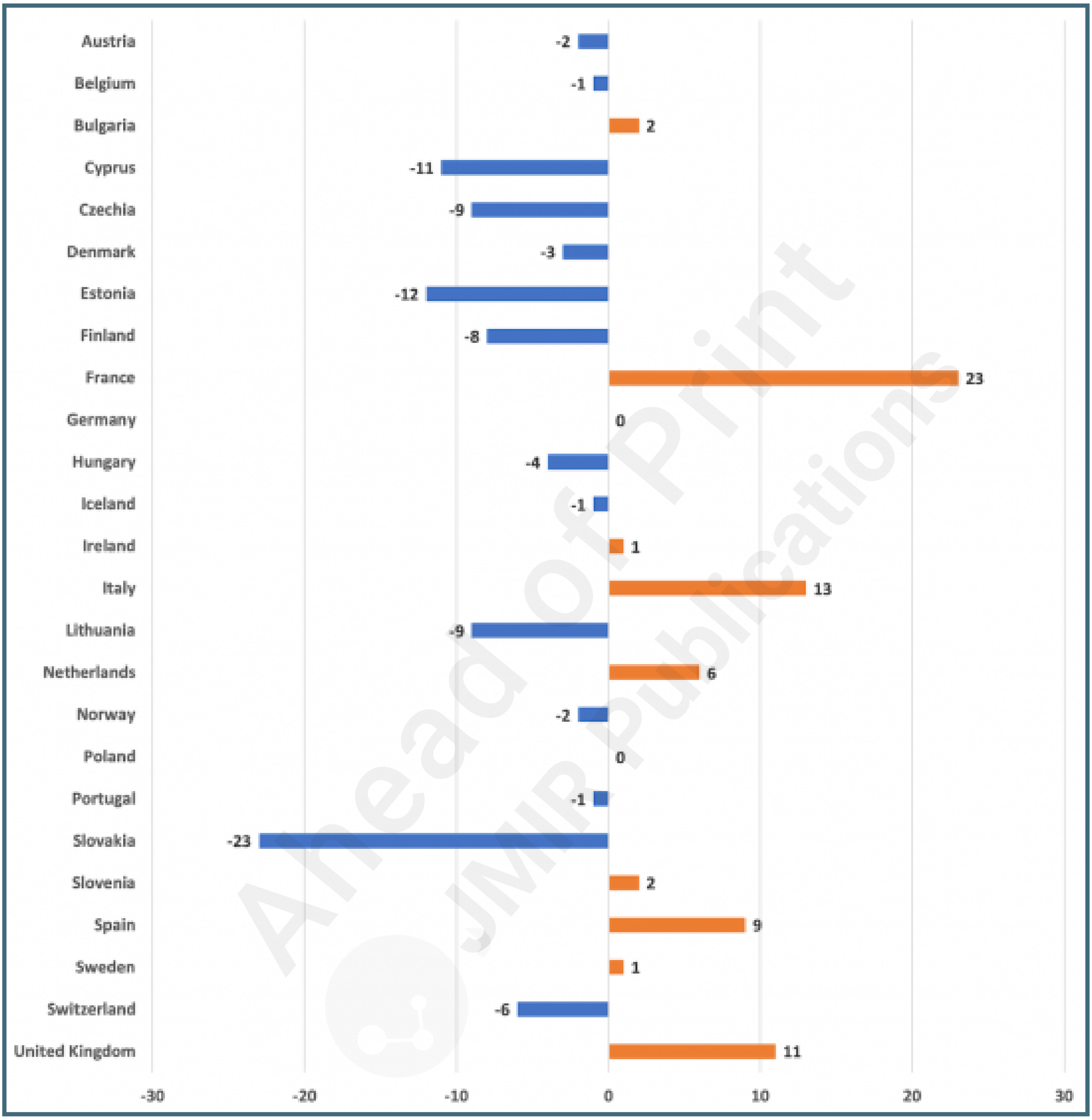


Figure 4. **Deaths per day after first COVID-19 death in countries reacting late and early.**

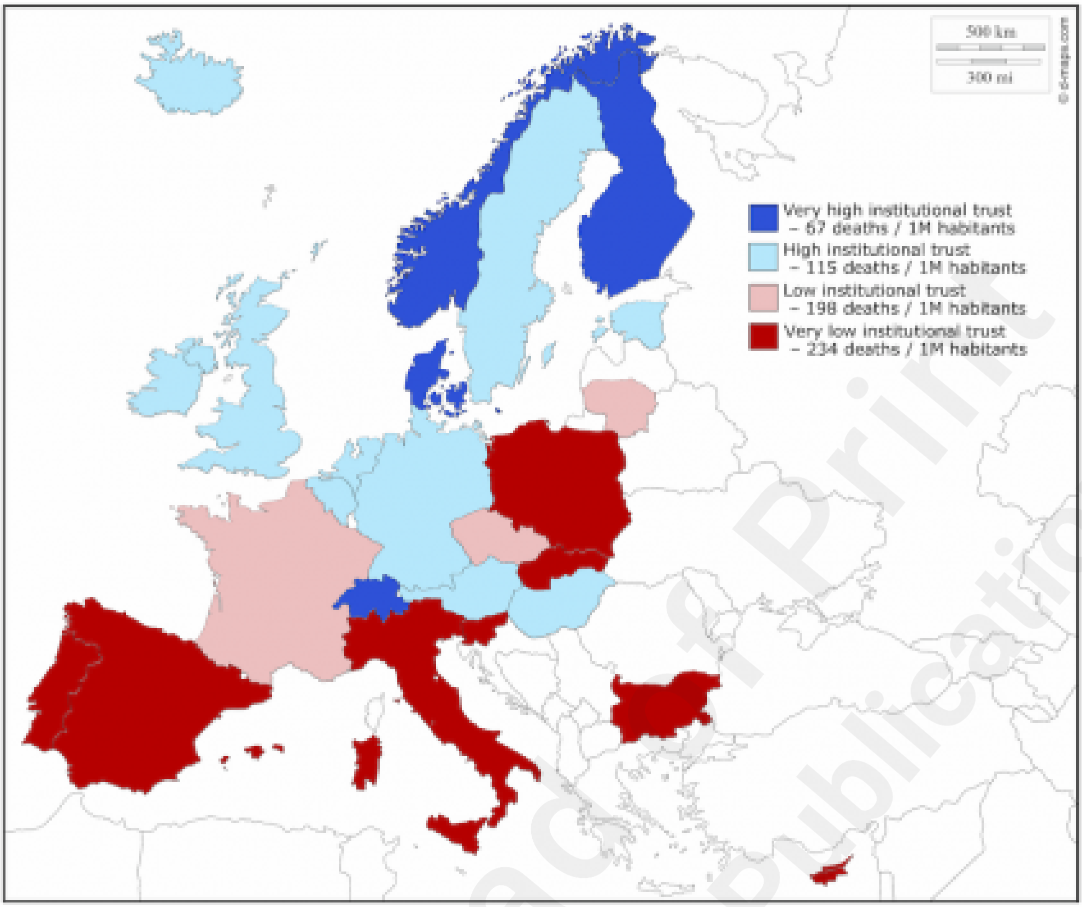
Supplementary Files

Figures

First national restrictions placed before (-) or after (+) the first COVID-19 death (days).



Mean deaths per million inhabitants by countries' level of institutional trust.



Deaths per day after first COVID-19 death in countries reacting late and early. COVID-19: coronavirus disease.