



# Effect of COVID-19 and lockdown on anxiety and depression

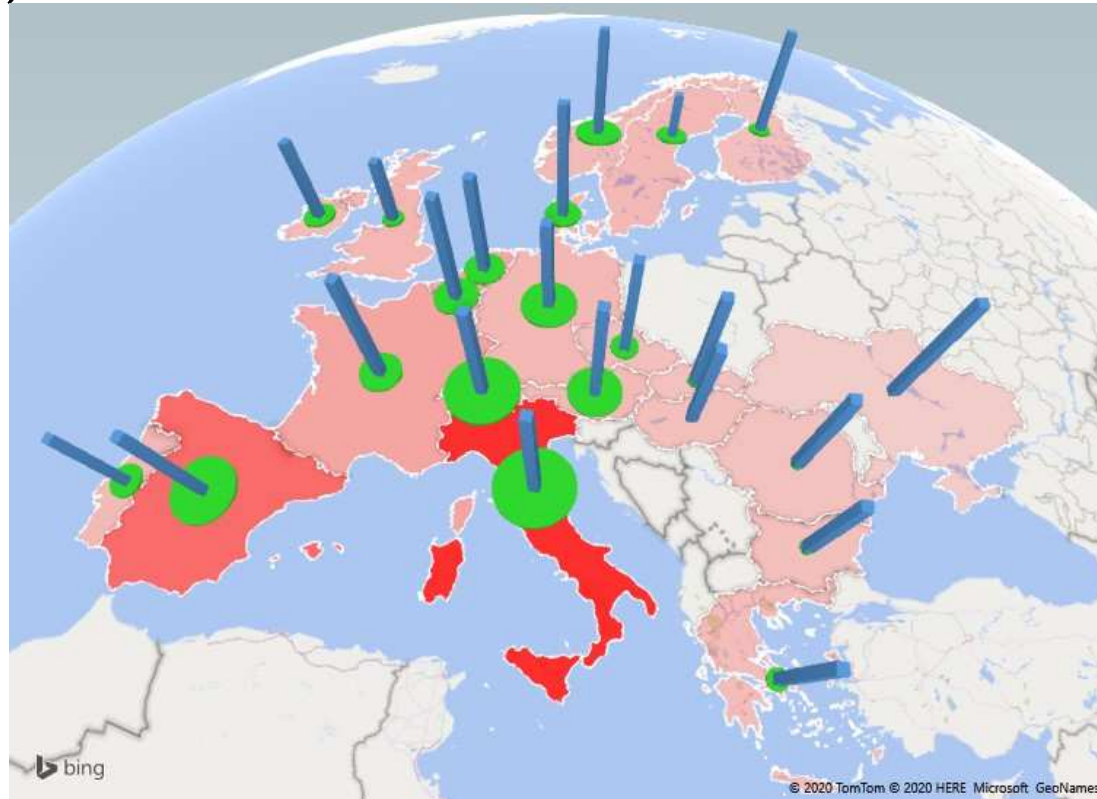
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[https://umurcia.zoom.us/rec/share/RCmQ-sHM481h1uFXuY7xVXZ4o3oO6LkLw2a57DIgpbqKHdx\\_WbeKNKJ6kDgJ5ud.sVZEUR2FqAqnbHEO?startTime=1599564197000](https://umurcia.zoom.us/rec/share/RCmQ-sHM481h1uFXuY7xVXZ4o3oO6LkLw2a57DIgpbqKHdx_WbeKNKJ6kDgJ5ud.sVZEUR2FqAqnbHEO?startTime=1599564197000)

# Preview

Stringency Index (blue bricks) and risk exposure (green circles) and deaths per million (red areas)  
Date: March 20<sup>th</sup>, 2020



Red areas correspond to the mortality rate (deaths per 1,000,000 inhabitants). Higher colour intensity denotes higher mortality rate. Data come from <https://ourworldindata.org/coronavirus-data-explorer>

Green circles correspond to the exposure rate to covid-19 (confirmed cases per 1,000,000 inhabitants). Larger diameter denotes higher exposure to the virus. Data come from <https://ourworldindata.org/coronavirus-data-explorer>

Blue Bricks corresponds to for covid-19 Government Response Stringency Index (Stringency Index). Higher height denotes higher stringency. Data come from <https://www.bsg.ox.ac.uk/research/research-projects/oxford-covid-19-government-response-tracker>

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# Motivation

- *Evidence from several pandemics and epidemics:*

- Chit-Mak et al, 200: infected of **SARS** in Hong-Kong exhibited a rise in moderate and severe mental disorders such as **anxiety and depression**.
- Kim et al. (2018): 40% of infected of **MERS** continued to use psychiatric medications after discharge.

- *Effects of the Lockdown.*

- Maunder (2009) documents such effects for **SARS**, Pfefferbaum et al. (2012) for **H1N1** and Jeong et al. (2016) for **MERS**.
- Some evidence concludes that home confinement gives rise to **feelings of boredom, frustration, and isolation** from the rest of the world (Blendon et al., 2004; Braunack-Mayer et al., 2013).
- Part of such effects result from difficulties in obtaining supplies, problems in receiving medical treatment or for other reasons not related to the health emergency (Blendon et al., 2004; Wilken et al, 2017).
- Pierce et al. (2020) compared mental health status before and during home confinement in UK and found that mental distress rose from 18.9% in 2018–2019 to 27.3% in April, 2020 after one month into lockdown.

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- Survey launched online through the website <https://covid19-survey.org/> (Fetzer et al., 2020) between March 20<sup>th</sup> and April 6<sup>th</sup>,
- Our sample of interest refers to the **22 European countries** with 48,434 observations: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Portugal, Romania, Slovakia, Spain, Sweden, Switzerland, Ukraine, United Kingdom.
- Specific weights used to control for the differences in age, gender, education and income between respondents and population in each country.
- **Dependent variables.**
- **Depression Index:** PHQ-9 (Patient Health Questionnaire) with the exception of ideas of suicide. (average interitem covariance: 283.55; alpha Cronbach: 0.8776).
- **Anxiety Index:** adding the four items ("nervous when I think in current circumstances", "worried about my health", "worried about the health of my family" and "stressed about leaving my house". ) and rescaled to lie between 0 and 100 (average interitem covariance: 219.80; Cronbach alpha: 0.8421).

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**Dates lockdown became effective**

Country	Day lockdown became effective	Stringency Index before lockdown	Stringency Index after lockdown
Austria	March 16th	57.27	84.79
Belgium	March 18th	53.04	75.26
Bulgaria	March 13th	29.49	71.83
Czech Republic	March 16th	48.02	67.59
Denmark	March 13th	79.49	84.12
Finland	March 16th	47.48	71.55
France	March 17th	53.17	89.41
Germany	March 17th	46.30	71.83
Greece	March 23th	57.27	76.32
Hungary	March 28th	59.78	78.44
Ireland	March 27th	57.40	79.63
Italy	March 9th	64.44	83.46
Netherlands	March 16th	48.80	74.86
Norway	March 12th	16.93	72.48
Portugal	March 19th	44.31	62.57
Romania	March 25th	67.06	80.95
Slovakia	March 16th	56.48	82.14
Spain	March 14th	47.10	71.69
Sweden	No lockdown	Stringency Index varies between 32.4 and 45.36	
Switzerland	March 17th	27.38	79.49
Ukraine	March 17th	51.59	92.06
United Kingdom	March 24th	37.83	75.13

Source: Own work using <https://ourworldindata.org/grapher/covid-stringency-index> (for Stringency Index) and <https://auravision.ai/covid19-lockdown-tracker/> (for lockdown dates).

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Combination of lockdown measures and fatality rate by date and country

	March												April					
	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6
Austria	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Belgium	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Bulgaria	Red	Red	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Czech Republic	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Denmark	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Finland	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
France	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Germany	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Greece	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Hungary	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Ireland	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Italy	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Netherlands	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Norway	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Portugal	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Romania	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Slovakia	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Spain	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Sweden	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Switzerland	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Ukraine	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
United Kingdom	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
White	No lockdown and fatality rate lower than 2%.																	
Yellow	Lockdown has become effective and fatality rate lower than 2%																	
Green	No lockdown, but fatality rate higher or equal than 2%.																	
Red	Lockdown has become effective and fatality rate higher or equal than 2%																	

Information from lockdown dates obtained from <https://auravision.ai/covid19-lockdown-tracker/>. The case fatality rate is the percentage of deaths with respect to confirmed cases. The category 5 corresponds to the highest level of the Pandemic Severity Index. Information of confirmed cases and deaths per 1,000,000 inhabitants obtained from <https://ourworldindata.org/coronavirus-data-explorer>

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# Model

To disentangle the effect of policy measures on mental health alongside exposure to a level 5 pandemic shock, we rely on a **difference-in-difference specification**

$$Y_{ict} = \beta_0 L_{ct} + \beta_1 P_{ct} + \beta_2 L_{ct} P_{ct} + \beta_3 X_{ict} + C_c + T_t + \varepsilon_{ict} \quad (3)$$

- $Y_{ict}$  refers to mental health of the individual  $i$  living in country  $c$ , who has answered the online survey on date  $t$ .
- $L_{ct}$  is a dummy variable taking the value 1 if a **lockdown order has come into force** for country  $c$  and day  $t$ , and 0 otherwise.
- $P_{ct}$  is a dummy variable taking the value 1 if the **pandemic has reached category 5 according to the Pandemic Severity Index** (i.e., the case fatality rate, which is the ratio between deaths and confirmed cases, is above 2%) for country  $c$  and day  $t$ , and 0 otherwise.
- $X_{ict}$  refers to **sociodemographic characteristics** (age, gender, marital status, years of education, number of household members, income, number of comorbidities).

We also include country fixed effects ( $C_c$ ) and day fixed effects ( $T_t$ ).

We obtain robust standard errors clustered at the day level.

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**Difference in difference model. PHQ-8 Depression Index and Anxiety Index**

	PHQ-8 Depression Index					Anxiety Index				
	M1	M2	M3	M4	M5	M1	M2	M3	M4	M5
Lockdown	1.230*** (0.213)	1.220*** (0.213)	1.193*** (0.213)	1.145*** (0.212)	1.227*** (0.213)	4.206*** (0.364)	4.249*** (0.364)	4.223*** (0.364)	4.004*** (0.364)	4.231*** (0.364)
Pandemic_cat5	2.774*** (0.217)	2.841*** (0.217)	2.831*** (0.217)	2.899*** (0.216)	<b>2.828***</b> <b>(0.217)</b>	5.602*** (0.370)	5.525*** (0.371)	5.506*** (0.371)	5.563*** (0.371)	<b>5.507***</b> <b>(0.371)</b>
Lockdown&Pand_cat5	-2.652*** (0.282)	-2.745*** (0.281)	-2.713*** (0.282)	-2.680*** (0.280)	<b>-2.665***</b> <b>(0.281)</b>	-5.450*** (0.481)	-5.356*** (0.481)	-5.323*** (0.482)	-5.298*** (0.481)	<b>-5.299***</b> <b>(0.482)</b>
Constant	57.676*** (0.813)	56.081*** (0.830)	56.192*** (0.856)	55.620*** (0.851)	55.545*** (0.856)	61.219*** (1.384)	60.863*** (-1.420)	60.460*** (-1.464)	60.037*** (-1.462)	60.184*** (-1.467)
N	48,434	48,434	48,434	48,434	48,434	48,434	48,434	48,434	48,434	48,434
R <sup>2</sup>	0.273	0.282	0.282	0.293	0.286	0.213	0.214	0.214	0.217	0.214
F	131.702	139.576	127.452	137.474	122.992	22.517	21.598	19.861	22.565	18.557
p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

M1 includes lockdown, pandemic of category 5, interaction between lockdown and pandemic of category 5, day fixed effects and country fixed effects. M2 includes the same explanatory variables than M1 and also male, other gender (omitted: women), age and its squared. M3 includes the same explanatory variables than M2 and also married (omitted: single), years of education and number of household members (omitted\_living alone). M4 includes the same explanatory variables than M3 and also having any comorbidity and number of comorbidities. M5 includes the same explanatory variables than M4 and also household income quartile (omitted: lowest quartile). Individual sample weights have been used to correct for differences in income, education, age and gender structure between the general population of the country and the corresponding sample. Robust standard errors. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% level.

- According to the M5 specification, the **Depression Index** increases 1.27pp if lockdown has been decreed and 2.83pp if the pandemic has reached level 5 according to the Pandemic Severity Index.
- However, the joint effect of both situations, that is, **confinement and high mortality, produces a decrease in the level of depression** of 2.67pp, which implies a decrease of 6.47% compared to the sample mean (0.18 std.dev. units).

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**Difference in difference model. PHQ-8 Depression Index and Anxiety Index**

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Constant	57.676*** (0.813)	56.081*** (0.830)	56.192*** (0.856)	55.620*** (0.851)	55.545*** (0.856)	61.219*** (1.384)	60.863*** (1.420)	60.460*** (1.464)	60.037*** (1.462)	60.184*** (1.467)
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M1 includes lockdown, pandemic of category 5, interaction between lockdown and pandemic of category 5, day fixed effects and country fixed effects. M2 includes the same explanatory variables than M1 and also male, other gender (omitted: women), age and its squared. M3 includes the same explanatory variables than M2 and also married (omitted: single), years of education and number of household members (omitted\_living alone). M4 includes the same explanatory variables than M3 and also having any comorbidity and number of comorbidities. M5 includes the same explanatory variables than M4 and also household income quartile (omitted: lowest quartile). Individual sample weights have been used to correct for differences in income, education, age and gender structure between the general population of the country and the corresponding sample. Robust standard errors. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% level.

- Confinement increases the **Anxiety Index** by 4.23pp, although the fact that the pandemic has reached level 5 has a more intense effect (+5.51pp).
- The **interaction effect is negative and significant** → Anxiety Index decreases by 8.95% compared to the sample mean (0.22 standard deviation units).

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- Comparing the **effect of the interaction for both indexes**, it is evident that confinement associated with a high mortality pandemic **reduces anxiety levels more intensively** (the effect is 1.38 times as compared to that of depression levels).

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- Our results indicate that policy measures, when the risk exposure is low, have a **detrimental effect on wellbeing**. This result is consistent with evidence suggesting emotional problems (Duan and Zhu, 2020), which might be driven by sleep deprivation and stress (Alvaro et al., 2013).
- The fact that the harmful effects on mental health of confinement are mitigated when it occurs in a context of high mortality, suggests that public health officials should emphasize the **transmission of correct information** on the transmission of the disease and on its containment mechanisms, including confinement at home.

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Thanks for your attention!!  
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