

Anxiety and Depression among Medical Doctors in Catalonia, Italy, and the UK during the COVID-19 Pandemic

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1 **Abstract**

2 Healthcare workers have had the longest and most direct exposure to COVID-19 and
3 consequently may suffer from poor mental health. We conducted one of the first repeated multi-
4 country analysis of the mental wellbeing of medical doctors (n=5,275) at two timepoints during the
5 COVID-19 pandemic (June 2020 and November/December 2020) to understand the prevalence of
6 anxiety and depression, as well as associated risk factors. Rates of anxiety and depression were
7 highest in Italy (24.6% and 20.1%, June 2020), second highest in Catalonia (24.6% and 17.4%, June
8 2020), and lowest in the UK (11.7% and 13.7%, June 2020). Across all countries, higher risk of
9 anxiety and depression symptoms are found among women, individuals below 60 years old, those
10 feeling vulnerable/exposed at work, and those in poor health. We did not find systematic differences
11 in mental health measures between the two rounds of data collection, hence we cannot discard that the
12 mental health repercussions of the pandemic are persistent.

13 **Introduction**

14 The coronavirus disease 2019 (COVID-19) pandemic has affected many individuals both
15 directly and indirectly, disrupting routines and introducing new stressors [1]. Recent studies have
16 shown that the pandemic has unequal effects on the psychological wellbeing of individuals, with
17 women, younger individuals, and ethnic minorities being disproportionately affected [2,3]. Effects
18 also vary by occupational groups as certain jobs expose workers more directly to the disease [4–6].
19 The mental wellbeing of healthcare workers has been particularly affected by the pandemic [7–10].

20 Healthcare workers have been directly involved in the management of COVID-19 patients
21 since the beginning of the pandemic. Drawing on the experiences of healthcare workers during the
22 2003 SARS outbreak, various mental health risk factors have been identified: lack of personal
23 protective equipment (PPE), overwhelming workload, lack of institutional support, and fear of
24 infecting others [11–14]. Several studies have documented high rates of anxiety and depression
25 symptoms among healthcare workers during the COVID-19 pandemic, with various risk factors such

26 as fear of infection being identified as important [7,8]. The majority of the studies are from China
27 [8,9,15] and a handful document similar patterns in other regions [10].

28 Various local and national mental health institutions around the world have begun to offer
29 psychological assistance to those in need, with some services targeted specifically at healthcare
30 workers [16–19]. Poor mental health among healthcare workers may have downstream effects on
31 patients via worsened attention span, cognitive function, and clinical-decision making [10]. Providing
32 such assistance to healthcare workers requires understanding the state of their mental wellbeing,
33 factors associated with mental health symptoms, and how these outcomes and factors vary across time
34 and countries.

35 This study provides one of the first repeated cross-country analyses of mental wellbeing among
36 healthcare workers during the COVID-19 pandemic. Our sample comprises medical doctors working
37 in Catalonia, Italy, or the UK in June (first data collection round) and November/December 2020
38 (second data collection round). In contrast to existing studies, these data allow us to quantify the
39 prevalence of and risk factors associated with anxiety and depression symptoms across countries and
40 to examine these outcomes at two timepoints. While previous studies have investigated heterogeneous
41 samples of healthcare workers, our analysis focuses on medical doctors. The results of our study can
42 inform how to protect and promote the mental wellbeing of medical doctors in current and future
43 pandemics.

44 **Methods**

45 We conducted an anonymous survey, The Healthcare Workers Survey, approved by the
46 University of Exeter Business School Research Ethics Committee (eUEBS003024). Informed written
47 consent was provided by all survey participants prior to their participation. Participants understood
48 that they may withdraw from the study at any time. We followed the reporting guidelines of the
49 American Association for Public Opinion Research ([S1 Appendix, Table S1](#)).

50 The study is a repeated cross-sectional survey among members of 6 medical organizations:
51 COMB (Barcelona Medical Council) and COMG (Girona Medical Council) in Catalonia (Spain),
52 Anaao-Assomed (Union of physicians and healthcare executives) and FIMMG (Union of general
53 practitioners) in Italy, as well as RCPSG (Royal College of Physicians and Surgeons of Glasgow) and
54 RCSEd (Royal College of Surgeons of Edinburgh) in the UK.

55 Due to different membership rules, members of the Catalan and Italian institutions work in
56 Catalonia and Italy, while the Scottish institutions have members who work in different parts of the
57 UK ([S1 Appendix, Table S2](#)). The survey was designed in Qualtrics and was distributed via email by
58 the corresponding institutions.

59 Participants

60 Our data collection relied on the mailing lists of the respective medical organizations. The
61 COMB invited 5,062 members in June and November 2020 (19.9%), focusing on those with medical
62 license numbers ending in 1 or 2. This random sampling was chosen to avoid over-burdening
63 members, given other surveys were taking place at the same time. The other institutions sent
64 invitations to all members. The COMG invited 3,120 members in June and November 2020. Similarly,
65 the Anaao-Assomed invited 23,379 members, and the FIMMG invited 17,686 members in June and
66 December 2020. The RCPSG invited 3,990 members in June 2020 and 4,300 members in November
67 2020 ([S1 Appendix, Figure S1](#)). The RCSEd invited 4,992 members in June 2020 and 4,912 members
68 in November 2020 ([S1 Appendix, Figure S2](#)). In the first round, out of approximately 55,000 invited
69 members, the final sample size was 3,025 (5.5%). In the second round, the final sample size was
70 2,250 (4.1%). [Table S3 \(S1 Appendix\)](#) documents the response rates across institutions.

71 Outcomes and covariates

72 The outcomes of the study are anxiety and depression symptoms. Anxiety is measured with the
73 Generalized Anxiety Disorder (GAD-7) questionnaire, a seven-item self-report anxiety questionnaire

74 designed to assess health status during the previous two weeks [20,21]. It has been validated as an
75 anxiety screening tool and severity measure in different populations [20,22–24]. GAD-7 scores range
76 from 0 to 21. When used as a binary anxiety indicator, a score of 10 is the recommended threshold for
77 referral for further evaluation [20,25]. Using this threshold, the GAD-7 has sensitivity of 89% and
78 specificity of 82% for generalized anxiety disorder [20,25].

79 Depression is measured with the depression module of the Patient Health Questionnaire (PHQ-
80 9), which focuses on the nine diagnostic criteria for DSM-IV depressive disorders [26]. It is a useful
81 tool to assist clinicians in diagnosing depression and a reliable and valid measure of depression
82 severity [26,27]. It has been validated in a variety of populations [21,28,29]. PHQ-9 scores range from
83 0 to 27. When used as a binary depression indicator, 10 is the recommended cut-off point. Using this
84 threshold, the PHQ-9 has sensitivity and specificity of 88% for major depression [26,28].

85 The following covariates were included in our analysis: demographic characteristics (sex, age,
86 household composition), survey round (June vs. November/December 2020), perceptions about
87 workplace safety (availability of PPE, reported feelings of vulnerability and exposure, perceived
88 workplace concerns about workers safety), COVID-19 exposure (symptoms, directly treating
89 COVID-19 patients, helping with COVID-19 tasks, healthcare worker deaths due to COVID-19 in the
90 workplace), and health and lifestyle factors (self-reported health status, underlying health condition,
91 working over 40 hours in the previous week, smoking behavior, whether the respondent had a flu
92 vaccine this season). [Table S4 \(S1 Appendix\)](#) describes all these variables. The replication data and
93 code will be available at [https://sites.google.com/site/climentquintanadomeque/healthcare-workers-](https://sites.google.com/site/climentquintanadomeque/healthcare-workers-survey)
94 [survey](#).

95 Statistical analysis

96 First, we described the demographic characteristics of our respondents. Second, we calculated
97 the prevalence of anxiety and depression symptoms by country over time. Third, we calculated the
98 prevalence of anxiety and depression by sex and age in each country. Fourth, we estimated the

99 perceptions of workplace safety and exposure to COVID-19 by country over time. Finally, we used
100 multivariable logistic regression to estimate odds ratios (ORs) for the association between anxiety
101 (and depression) symptoms and the aforementioned covariates, controlling for occupational categories
102 (e.g. in the UK: Consultant, SAS doctor, Specialty registrar, Junior doctor core training, Junior doctor
103 foundation year, General practitioner, General practitioner trainee) and institutional fixed effects (i.e.
104 COMB, COMG, Anaao-Assomed, FIMMG, RCPSG, RCSEd). Stata statistical software version 16.1
105 (StataCorp) was used for statistical analyses. P-values were 2-sided and statistical significance was set
106 at $p < 0.05$. Data were analyzed from March 4 to June 4, 2021.

107 Results

108 **Table 1** presents demographic characteristics of the participants by medical organization and
109 round. The total number of respondents is as follows: 1,849 in Catalonia (n=876 in round 1, n=973 in
110 round 2); 2,574 in Italy (n=1,637 in round 1, n=937 in round 2); 852 in the UK (n=512 in round 1,
111 n=340 in round 2). [Table S5 \(S1 Appendix\)](#) documents the number of observations from the raw data
112 to the study sample. The percentage of respondents who were women and men differs across
113 countries. In Italy, it is similar (50%). However, over 64% of respondents were women in Catalonia
114 and below 35% in the UK. The age distribution of respondents also varies by country. The percentage
115 of respondents younger than 60 years is over 83% in the UK, below 73% in Catalonia and below 60%
116 in Italy. Both the monthly COVID-19 case and rates increased between the two data collection rounds.
117 COVID-19 cases per 100,000 increased from 33.3 (June 2020) to 809.6 (November 2020) in
118 Catalonia, from 12.5 (June 2020) to 836.3 (December 2020) in Italy, and from 55.6 (June 2020) to
119 927.1 (November 2020) in the UK. Between the two rounds of data collection, COVID-19 deaths per
120 100,000 increased from 2.4 to 22.2 in Catalonia, from 2.2 to 30.7 in Italy, and from 4.4 to 17.8 in the
121 UK.

122 **Table 1:** Demographic characteristics of respondents and prevalence of and mortality from COVID-
123 19

Catalonia

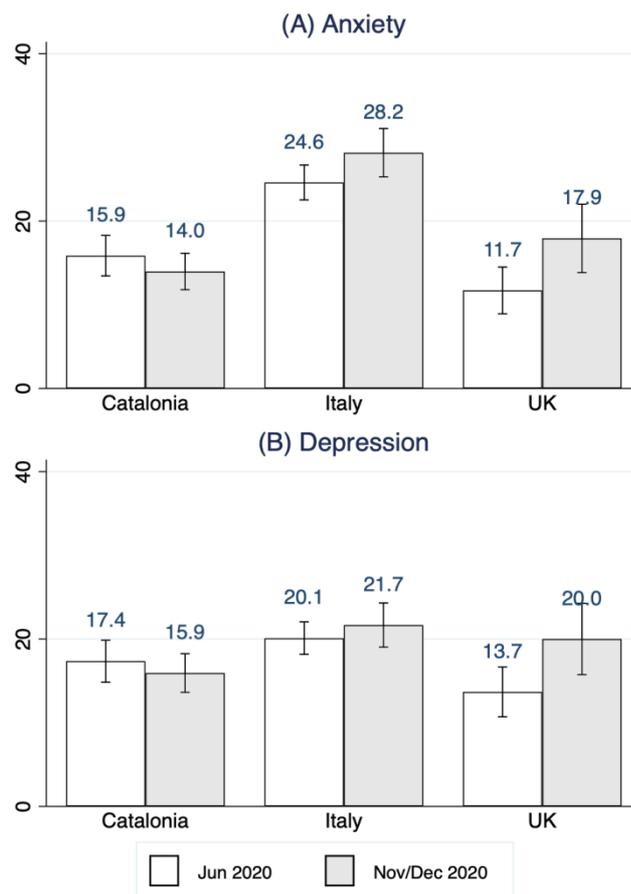
Italy

UK

	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2
Panel A. Demographic characteristics of respondents, n (%)						
Men	311 (35.50)	326 (33.50)	846 (51.68)	468 (49.95)	358 (69.92)	358 (65.00)
Women	565 (64.50)	647 (66.50)	791 (48.32)	469 (50.05)	154 (30.08)	154 (35.00)
Age < 60	633 (72.26)	702 (72.15)	907 (55.41)	562 (59.98)	427 (83.40)	427 (84.12)
Age ≥ 60	243 (27.74)	271 (27.85)	730 (44.59)	375 (40.02)	85 (16.60)	85 (15.88)
Panel B. Prevalence of and mortality from COVID-19, per 100,000						
COVID-19 cases per 100,000	33.3	809.6	12.5	836.3	55.6	927.1
COVID-19 deaths per 100,000	2.4	22.2	2.2	30.7	4.4	17.8

124 Notes: Percentages reported in parentheses. Data on COVID-19 cases comes from idescat.cat
 125 (Catalonia), ourworldindata.org (Italy), and GOV.UK (UK). Round 1 corresponds to June 2020 for all
 126 countries; Round 2 corresponds to November 2020 for Catalonia and the UK and December 2020 for
 127 Italy.

128 **Fig 1** documents the prevalence of moderate/above-moderate symptoms of anxiety (GAD-7≥10)
 129 and depression (PHQ-9≥10) by country over time. In June 2020 the prevalence of moderate anxiety
 130 (panel A) was higher in Italy (24.6% [95% CI, 22.5%-26.7%]) than in Catalonia (15.9% [95% CI,
 131 13.4%-18.3%]) and the UK (11.7% [95% CI, 8.9%-14.5%]). A similar conclusion emerges when
 132 looking at round 2. In June 2020, the prevalence of moderate/above-moderate depression (panel B)
 133 was highest in Italy (20.1% [95% CI, 18.2%-22.0%]), second highest in Catalonia (17.4% [95% CI,
 134 14.8%-19.9%]), and lowest in the UK (13.7% [95% CI, 10.7%-16.7%]). In round 2, the prevalence of
 135 moderate/above-moderate depression is higher in Italy (21.7% [95% CI, 19.0%-24.3%]) than in
 136 Catalonia (15.9% [95% CI, 13.6%-18.2%]). [Figure S3 \(S1 Appendix\)](#) presents a further breakdown of
 137 the prevalence of symptoms depending on intensity.

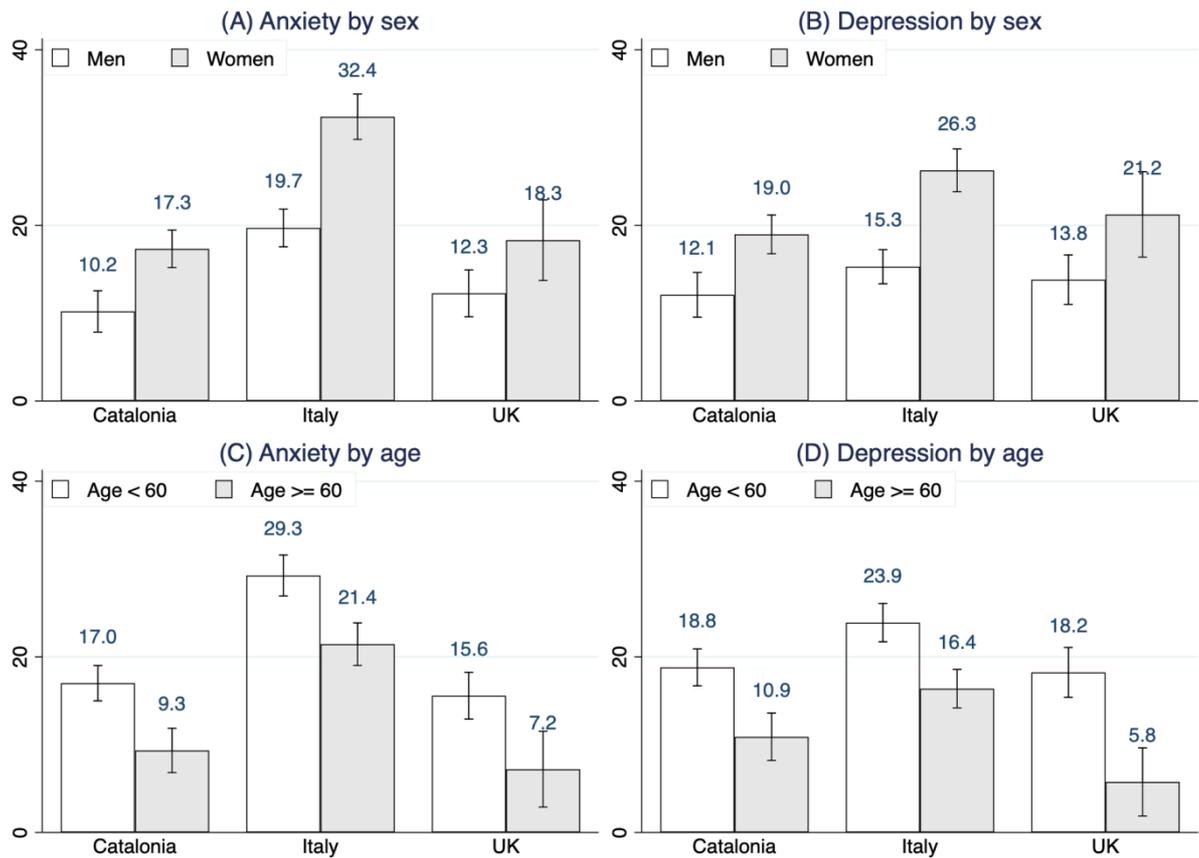


138

139 **Fig 1. Prevalence of anxiety and depression symptoms by country over time.** Grey bar
140 corresponds to Nov 2020 for Catalonia and UK, and to Dec 2020 for Italy. Anxiety symptoms =1 if
141 GAD-7 \geq 10 and depression symptoms =1 if PHQ-9 \geq 10. 95% confidence intervals.

142 **Fig 2** investigates the differences in the prevalence of moderate/above-moderate symptoms of
143 anxiety and depression by sex and age across countries. Panel A shows that the prevalence of
144 moderate/above-moderate symptoms of anxiety is higher among women than among men in Catalonia
145 (women: 17.3%, [95% CI, 15.2%-19.5%], men: 10.2%, [95% CI, 7.9%-12.6%]) and Italy (women:
146 32.4%, [95% CI, 29.8%-35.0%], men: 19.7%, [95% CI, 17.6%-21.9%]). Panel B shows that the
147 prevalence of moderate/above-moderate symptoms of depression is higher among women than among
148 men in Catalonia (women: 19.0%, [95% CI, 16.8%-21.2%], men: 12.1%, [95% CI, 9.6%-14.6%]) and
149 Italy (women: 26.3%, [95% CI, 23.8%-28.7%], men: 15.3%, [95% CI, 13.4%-17.3%]). Panel C
150 shows that the prevalence of moderate/above-moderate symptoms of anxiety is higher among younger
151 (<60 y) than older (\geq 60 y) respondents in all three countries: Catalonia (<60 y: 17.0%, [95% CI,

152 15.0%-19.0%], ≥ 60 y: 9.3%, [95% CI, 6.8%-11.9%]), Italy (<60 y: 29.3%, [95% CI, 26.9%-31.6%],
 153 ≥ 60 y: 21.5%, [95% CI, 19.0%-23.9%]), and the UK (<60 y: 15.6%, [95% CI, 12.9%-18.2%], ≥ 60 y:
 154 7.2%, [95% CI, 2.8%-11.5%]). Similarly, Panel D shows that the prevalence of moderate/above-
 155 moderate symptoms of depression is higher among younger (<60 y) than older (≥ 60 y) respondents
 156 across all countries.

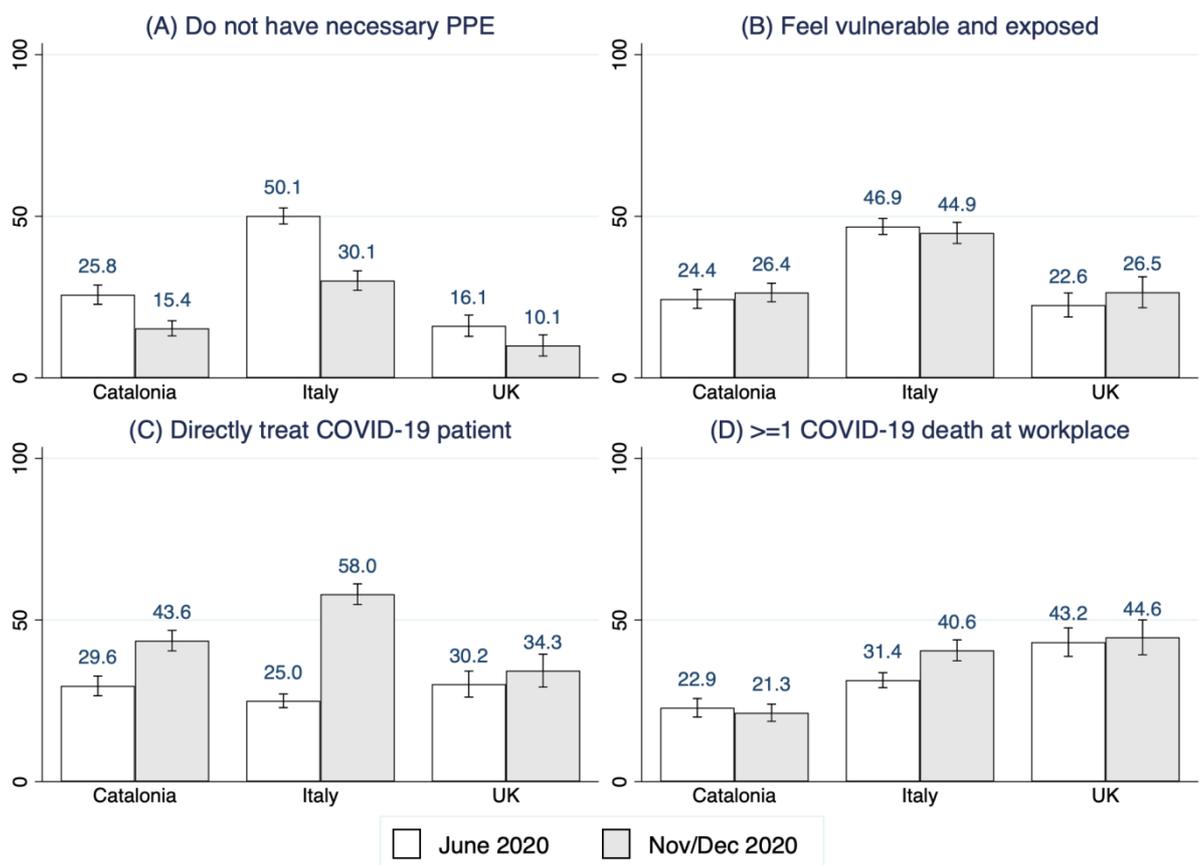


157

158 **Fig 2. Prevalence of anxiety and depression by sex and age across countries.** Grey bars are
 159 for women (panel A and B) and over 60 (panels C and B). Anxiety symptoms =1 if GAD-7 ≥ 10 and
 160 depression symptoms =1 if PHQ-9 ≥ 10 . 95% confidence intervals.

161 **Fig 3** describes perceptions of workplace safety and exposure to COVID-19. Around half of
 162 Italian respondents disagreed with the statement “my workplace is providing me with the necessary
 163 PPE” was found in Italy in June 2020 (50.1%, [95% CI, 47.6%-52.6%]) (panel A). This decreased to
 164 30.1% [95% CI, 27.1%-33.1%] in December 2020. In Catalonia, the percentage was 25.8% [95% CI,
 165 22.8%-28.7%] in June 2020, and decreased to 15.4% [95% CI, 13.0%-17.7%] in November 2020. In

166 the UK, 16.1% [95% CI, 12.9%-19.4s%] of respondent disagreed with this statement in June 2020
 167 and only 1 in 10 respondents disagreed with this statement in November 2020 (10.1%, [95% CI,
 168 6.8%-13.3%]). Panel B shows that the percentage of respondents who agreed with the statement “I
 169 feel vulnerable and exposed at work” remained constant between rounds; including 1 in 5 respondents
 170 in Catalonia and the UK, and nearly 1 in 2 in Italy. It is notable that the country with the lowest rates
 171 of perceived workplace safety (Italy) also has the highest rates of anxiety symptoms.



172

173 **Fig 3. Perceptions of safety and COVID-19 exposure in the workplace.** Panel A: Percentage
 174 of respondents who do not agree with the statement “my workplace is providing me with the
 175 necessary Protective Personal Equipment”. Panel B: Percentage of respondents who agree/strongly
 176 agree with the statement “I feel vulnerable and exposed at work”. Panel C: Percentage of percentage
 177 of respondents who “directly looked after COVID-19 patients last week. Panel D: Percentage of
 178 respondents who are aware of “at least one COVID-19 death among healthcare workers in their
 179 workplace”.

180 Panel C illustrates that the proportion of respondents that have “directly looked after COVID-
181 19 patients last week” increased between June and November 2020 in Catalonia (29.6%, [95% CI,
182 26.6%-32.7%] to 43.4%, [95% CI, 40.4%-46.8%]) and between June and November 2020 in Italy
183 (25.0% [95% CI, 22.9%-27.1%] to 58.0% [95% CI, 54.8%-61.2%]). In contrast, the percentage
184 remained similar between the two rounds in the UK (30.2% [95% CI, 26.1%-34.2%] vs. 34.3% [95%
185 CI, 29.2%-39.4%]). Lastly, Panel D shows that 1 in 5 respondents in Catalonia were aware of at least
186 one COVID-19 death among healthcare workers in their workplace in June 2020 and November 2020.
187 In Italy, this ratio increased from 1 in 3 in June 2020 (31.4%, [95% CI, 29.1%-33.7%]) to 2 in 5 in
188 December 2020 (40.6%, [95% CI, 37.4%-43.8%]). In the UK, it remained constant at about 1 in 3
189 respondents. The increase across survey rounds in the percentage of medical doctors directly treating
190 COVID-19 patients in the last week in Catalonia and Italy, matches the evolution of the pandemic
191 reported in Table 1.

192 After pooling together all countries and the two rounds of data, **Fig 4** displays the odds-ratios
193 (ORs) of various risk factors estimated using a multivariable logit specification with binary anxiety
194 and depression indicators as the dependent variables. Controlling for health behaviors (smoking
195 behavior, having had the flu vaccine), household composition (living with children under 5 and living
196 with someone over 60), occupational categories and medical organizations indicators, women,
197 younger individuals (< 60 years), those who feel vulnerable and exposed at work, those who think that
198 their workplace has shown little concern for their safety, those who directly looked after COVID-19
199 patients last week, those with poor health status, and those who worked over 40 hours last week had
200 higher odds of anxiety and/or depression symptoms.



201

202 **Fig 4. Risk factors of anxiety and depression symptoms, odds ratios and 95 % CI.** The

203 figure displays the odds ratio of each variable (and its corresponding 95% CI) from a multivariable

204 logistic regression pooling across all countries and timepoints. The dependent variable are binary

205 indicators for anxiety (circle markers) or depression (diamond markers). In addition to the variables

206 listed in the figure, the regression also controls for indicators for smoking, a flu vaccine this season,

207 living with a child under 5, living with someone over 60, occupational codes, and institutional codes.

208 [Table S6 \(S1 Appendix\)](#) reports full regression tables for the pooled sample and separate countries.

209 Women had higher odds of anxiety (OR=1.77 [95% CI, 1.50-2.07]) and depression (OR=1.76

210 [95% CI, 1.49-2.09]) compared to men. Compared with individuals above 60 years, younger

211 individuals had higher odds of anxiety (OR=1.49 [95% CI, 1.22-1.82]) and depression (OR=1.58 [95%

212 CI, 1.28-1.96]). A reported lack of necessary PPE in the workplace was associated with higher odds

213 of anxiety (OR=1.39 [95% CI, 1.15-1.68]) and depression (OR=1.27 [95% CI, 1.04-1.56]).

214 Respondents who felt vulnerable or exposed in their workplace had greater odds of anxiety and

215 depression symptoms compared with people who did not feel vulnerable or exposed (OR=1.68 [95%
216 CI, 1.41-2.00]; OR=1.72 [95% CI, 1.43-2.06]). Compared with people who reported a fair/good
217 health status, individuals who reported a poor health status had higher odds of anxiety (OR=2.58 [95%
218 CI, 2.13-3.13]) and depression (OR=3.35 [95% CI, 2.76-4.06]). Compared with individuals who
219 worked below 40 hours, those who worked 40 hours or more last week had higher odds of anxiety
220 (OR=1.44 [95% CI, 1.21-1.70]) and depression (OR=1.27 [95% CI, 1.07-1.52]). [Table S6 \(S1](#)
221 [Appendix](#)) shows that these patterns hold for specific countries too.

222 Discussion

223 This is one of the few studies to provide a multi-country analysis of the mental wellbeing of
224 medical doctors at two timepoints during the COVID-19 pandemic. Among respondents from Italy,
225 Catalonia and the UK, the prevalence of anxiety and depression was highest among medical doctors
226 in Italy, with 1 in 4 suffering from anxiety symptoms in June and December 2020 and 1 in 5 suffering
227 from depression symptoms over the same period. Within each country, no difference in the prevalence
228 of anxiety and depression were reported between the first and second rounds of the survey. Hence, we
229 cannot discard that the mental health repercussions of the pandemic are persistent.

230 In Catalonia, Italy, and the UK, higher risk of anxiety and depression symptoms are found
231 among women, individuals below 60 years old, those feeling vulnerable/exposed at work, and those in
232 poor health. These associated risk factors provide a few possible reasons for the variation in the
233 prevalence of anxiety and depression across countries. For example, the percentage of respondents
234 who report a lack of necessary PPE and report feeling vulnerable and exposed at work are highest in
235 Italy, where rates of anxiety and depression are also highest.

236 Our findings are consistent with other studies that have examined the rates of anxiety and
237 depression among healthcare workers during the pandemic. In Spain, Alonso et al [30] find that
238 among 9,138 respondents (26.4% physicians, 77.3% women) working in 6 places (including
239 Catalonia) during May and September 2020, the prevalence of depression (PHQ-8 \geq 10) and anxiety

240 (GAD-7 \geq 10) is 22.4% (vs. 16.5% in our Catalan sample) and 17.0% (vs. 14.9% in our Catalan
241 sample). In Italy, Rossi et al [31] find that among 1,379 respondents (31.4% physicians, 77.2%
242 women) surveyed in March 2020, the prevalence of depression (PHQ-9 \geq 15) and anxiety (GAD-7 \geq 15)
243 was 24.7% (vs. 6.6% in our Italian sample) and 19.8% (vs. 9.5% in our Italian sample). Conti et al
244 [32,33] find similar magnitudes. In the UK, Greenberg et al [34] find that among 709 staff (41%
245 doctors) working in English hospitals in summer 2020, the prevalence of moderate (PHQ-9 \geq 10) and
246 severe (PHQ-9 \geq 20) depression was 37% and 6%, respectively (26% and 6% among doctors, vs. 16.2%
247 and 2.7% in our UK sample), and that the prevalence of moderate (GAD-7 \geq 10) and severe (GAD-
248 7 \geq 15) anxiety was 27% and 11%, respectively (20% and 8% among doctors, vs. 14.2% and 5.9% in
249 our UK sample). Greene et al [35] find comparable rates.

250 Our findings are also consistent with studies investigating risk factors of mental health among
251 healthcare workers. In a review of 24 studies, De Kock et al. [7] show that risk factors include
252 underlying health, being female, concerns about workplace safety [36,37], contact with COVID-19
253 [8,38,39], and concerns about the wellbeing of others [36]. In Spain, Alonso et al [30] find that
254 healthcare professionals frequently exposed to COVID-19 patients are statistically significantly more
255 like to experience mental health disorders (OR=3.98, 95% CI: 3.27-4.85). In Italy, Rossi et al [31]
256 find that being female is associated with higher GAD-7 (OR=2.18, 95% CI: 1.49-3.19) and PHQ-9
257 scores (OR=2.03, 95% CI: 1.44-2.87). In the UK, Siddiqui et al. [40] find that among 558 healthcare
258 professionals (51% doctors, 31% nurses), concerns about exposure to COVID-19 and the lack of PPE
259 are important causes of anxiety.

260 **Contributions.** Our study contributes to monitoring the mental wellbeing of medical doctors
261 during the COVID-19 pandemic. Including multiple countries and timepoints allow comparison
262 between different settings, and how the pandemic has impacted medical doctors at different points
263 during the pandemic. The similar patterns across countries suggest that our findings may be
264 generalizable to other European settings. Rather than relying on online convenience samples, our
265 sampling technique relies on the institutional mailing lists of medical organizations. In comparison to
266 previous studies, we focus on medical doctors rather than a broader group of healthcare workers.

267 **Limitations.** This study has several limitations. First, when comparing two cross-sectional
268 surveys for each country, we were not comparing the same individuals. Differences in prevalence of
269 mental health symptoms could be driven by changes in sample composition across waves. Relatedly,
270 the survey did not take place at the same point during an epidemic wave in data collections round 1
271 and 2.

272 Second, participants in our survey are not necessarily representative of the underlying
273 populations of medical doctors and may be self-selected since they voluntarily take part in the survey.
274 Reporting bias is likely. If individuals with symptoms were more likely to respond (e.g. to express
275 grievances), then our estimates may be higher than the population average. Conversely, if individuals
276 with above-average symptoms are less likely to respond (e.g. due to time constraints), then our
277 estimates may be below the population average.

278 Third, anxiety and depression symptoms may not be comparable across countries due to
279 different reporting norms in the GAD-7 and PHQ-9 questionnaires. Reassuringly, our pooled
280 multivariable logistic regressions produce similar results even when controlling for occupation and
281 institution fixed effects.

282 Finally, our measures of anxiety and depression are not based on an objective diagnosis made
283 by a clinician.

284 **Conclusion**

285 The COVID-19 pandemic has been classified as a traumatic event [1]. Healthcare workers have
286 arguably had the most direct and longest exposure to this disease. Our study identified a high
287 prevalence of anxiety and depression among medical doctors in both first and second wave of the
288 pandemic, contributing to a wider literature examining the effects of traumatic events on mental
289 wellbeing [41], especially on those who are most exposed because of the demands of their occupation.
290 The results of this study suggest that institutional support for healthcare workers, and in particular

291 medical workers, is important in protecting and promoting their mental health in the current and in
292 future pandemics.

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