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## Short communication

## Frequency and correlates of anxiety symptoms during the COVID-19 pandemic in low- and middle-income countries: A multinational study



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## ABSTRACT

**Objective:** Studies have documented the significant direct and indirect psychological, social, and economic consequences of the Coronavirus disease 2019 (COVID-19) in many countries but little is known on its impact in low- and middle-income countries (LMICs) already facing difficult living conditions and having vulnerable health systems that create anxiety among the affected populations. Using a multinational convenience sample from four LMICs (DR Congo, Haiti, Rwanda, and Togo), this study aims to explore the prevalence of anxiety symptoms and associated risk and protective factors during the COVID-19 pandemic.

**Methods:** A total of 1267 individuals (40.8% of women) completed a questionnaire assessing exposure and stigmatization related to COVID-19, anxiety, and resilience. Analyses were performed to examine the prevalence and predictors of anxiety.

**Results:** Findings showed a pooled prevalence of 24.3% (9.4%, 29.2%, 28.5%, and 16.5% respectively for Togo, Haiti, RDC, and Rwanda,  $\chi^2 = 32.6, p < .0001$ ). For the pooled data, exposure to COVID-19 ( $\beta = 0.06, p = .005$ ), stigmatization related to COVID-19 ( $\beta = 0.03, p < .001$ ), and resilience ( $\beta = -0.06, p < .001$ ) contributed to the prediction of anxiety scores. Stigmatization related to COVID-19 was significantly associated to anxiety symptoms in all countries ( $\beta = 0.02, p < .001$ ;  $\beta = 0.05, p = .013$ ;  $\beta = 0.03, p = .021$ ;  $\beta = 0.04, p < .001$ , respectively for the RDC, Rwanda, Haiti, and Togo).

**Conclusions:** The findings highlight the need for health education programs in LMICs to decrease stigmatization and the related fears and anxieties, and increase observance of health instructions. Strength-based mental health programs based on cultural and contextual factors need to be developed to reinforce both individual and community resilience and to address the complexities of local eco-systems.

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## 1. Introduction

The Coronavirus Disease 2019 (COVID-19) caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS CoV-2) has provoked about 498,000 deaths among 9.9 million confirmed cases worldwide, on June 27, 2020 (John Hopkins University, 2020). In low-and middle-income countries (LMICs) the pandemic has provoked specific concerns because of the relative fragility of the health systems, of the major consequences on the economy, and of the limitations of social policies (Cénat, 2020a). In addition, in LMICs, the pandemic has caused significant concern among local populations who feared being infected or having someone close to them be infected, knowing the lack of resources of the health systems and their inability to address the health needs of populations even before the pandemic (Bong et al., 2020). Despite these concerns, precariousness, poverty, and lack of confidence in public health authorities have been shown to lead to poor adherence to public health measures such as confinement and physical distancing (Cénat, 2020b). Furthermore, individuals who have contracted the COVID-19 have been stigmatized to the point of discouraging others with symptoms from getting tested (Bruns et al., 2020). All these factors may have contributed to anxiety-related behaviors associated with the pandemic (De Sousa et al., 2020).

Studies among populations affected by the COVID-19 pandemic have shown that the COVID-19 pandemic is linked to stress related mental health problems, including anxiety symptoms (Pappa et al., 2020). A meta-analysis showed a prevalence of 21% of anxiety symptoms among health professionals (Pappa et al., 2020). Although the consequences of the pandemic can be quite different in LMICs, no research has yet documented the prevalence and risk and protective factors related to anxiety symptoms during the pandemic. Using a multinational convenience sample from four LMICs, DRC, Haiti, Rwanda, and Togo, this study aims to explore the prevalence of anxiety symptoms and associated risk and protective factors during the COVID-19 pandemic.

## 2. Methods

### 2.1. Study design and participants

The four LMIC countries included in this study are all undergoing the pandemic presently: Haiti (5777 confirmed cases), the Democratic Republic of the Congo (DRC; 6690), Rwanda (878), and Togo (615), with death totals related to COVID-19 of 100, 2, 153, and 14 deaths respectively (John Hopkins University, 2020). However, these estimates are considered to fall short compared to reality.

From March to May 2020, we recruited participants from four countries: DRC, Haiti, Rwanda, and Togo via the social networks Facebook, Twitter, WhatsApp, and via telephone. Participants all agreed to participate in the study by signing the informed electronic consent form or by giving vocal consent. The study protocol was approved by research ethics boards of the University of Ottawa and the Institut National de Recherche Biomédicale. The sample included 1267 participants (40.8% women), with an average age of 32 (SD = 10.1). Participants were recruited from: RDC (626, 43.4% women), Haiti (225, 42.0% women), Rwanda (174, 40.5% women), and Togo (242, 33.2% women).

### 2.2. Measures

Participants completed the questionnaire in the language of their choice: French, Creole, English, or Kinyarwanda. All participants completed a socio-demographic questionnaire.

#### 2.2.1. Exposure to COVID-19

Level of exposure to COVID-19 was assessed using a 5-item questionnaire with a Yes or No format. This questionnaire is a short form inspired by the Exposure to Infectious Disease Questionnaire (Cénat et al., 2020c). This scale has been used in the past to assess exposure

level to Ebola Virus Disease (e.g., Have you been in a town or village where people have fallen ill with the Coronavirus? Have you been sick with the Coronavirus yourself?). Our sample's Cronbach alpha was .68 (lower than expected).

#### 2.2.2. Stigmatization related to COVID-19

We used an adapted and short version of the Stigmatization Related to Ebola Virus Disease Questionnaire to assesses stigmatization related to COVID-19 (Cénat et al., 2020c). This scale was developed in our laboratory according to WHO studies and with a panel of experts. It has proven to be robust and of good internal consistency. In our sample, the Cronbach's alpha was .81.

#### 2.2.3. Anxiety symptoms

Anxiety symptoms were assessed using the Hopkins Symptom Checklist (HSCL) subscale (Winokur et al., 1984). The HSCL anxiety subscale is a 10-item scale ranging from 1 to 4 ("Not at all", "A little", "Quite a bit", "Extremely"). This subscale is one of the most reliable measures for assessing anxiety symptoms in different cultures (Tay et al., 2017). In our sample, Cronbach's alpha was .91. An average score of 1.75 indicates a significant level of distress and this was the cutoff point used in our analyses (Winokur et al., 1984).

#### 2.2.4. Resilience

To assess resilience, we used the CD-RISC2 which is a shortened version of the Connor-Davidson Resilience Scale (CD-RISC) (Connor and Davidson, 2003; Vaishnavi et al., 2007). This scale includes two items from the long version of the questionnaire (item 1: "Able to adapt to change", and item 8: "Tend to bounce back after illness or hardship"). This measure was widely used in previous studies and it has shown good internal consistency in different cultures. In our sample, the Cronbach's alpha was .72.

### 2.3. Data analysis

All analyses were performed using the Statistical Package for Social Science (SPSS) – version 26 for Mac. We computed frequencies and chi-squared tests (95% confidence intervals) to examine the prevalence of anxiety symptoms with respect to country, gender, age, and marital status. A one-way ANOVA was conducted to compare the mean score of exposure level to COVID-19 and its stigmatization among those who are clinically symptomatic or not.

Lastly, multivariate linear regressions were carried out to investigate the relationship between both exposure to COVID-19 and stigmatization due to Covid-19, and anxiety symptoms. All the regression models were performed by adding the score of resilience as a covariate and controlling for the sociodemographic characteristics mentioned above.

Normality and heterogeneity were assessed through the Shapiro test, Skewness and Kurtosis values, and the Levene test.

## 3. Results

Results showed that 24.3% of the combined populations reported a high level of anxiety symptoms. Prevalence considerably varied among the four countries (9.4%, 29.2%, 28.5%, and 16.5% respectively for Togo, Haiti, RDC, and Rwanda) with a statistically significant differences  $\chi^2 = 32.6, p < .0001$  (Table 1).

Overall, female and male participants did not demonstrate any significant difference in the frequency of anxiety symptoms in the pooled data (Table 1). The same pattern was noted within three countries (Togo, DRC, Rwanda), except for Haiti where prevalence was two times higher among women compared to men (respectively 42.4% and 18.1%;  $\chi^2 = 10.7, p = .005$ ). The results showed no significant difference between participants under 24 years of age, those aged 24 to 34, and those aged 35 and over, except for Haiti (60.87%, 30.67%, 13.89%, respectively,  $\chi^2 = 14.4, p = .001$ ).

**Table 1**

Frequency of anxiety symptoms over gender, age and matrimonial status, and mm mean (standard deviation) scores of exposure to COVID-19 and stigmatization over clinical anxiety (N = 1267).

	Countries				
	Pooled %	DRC %	Rwanda %	Haiti %	Togo %
Total	24.25	28.53	16.67	29.19	9.41
Gender					
Male	21.69	28.28	12.50	18.07	7.07
Female	27.89	29.00	16.36	42.42	15.69
Non-binary	21.74	20.00	44.44	33.33	5.00
$\chi^2$	5.42	.22	5.70	10.66	3.45
<i>p</i>	.067	.897	.058	.005	.178
Age					
Less than 24 years	29.85	32.18	14.29	60.87	14.04
25–34 years	24.80	26.41	20	30.67	9.52
35 and more	21.68	28.64	14.06	13.89	8.51
$\chi^2$	5.40	1.62	.63	14.43	.93
<i>p</i>	.067	.445	.731	.001	.628
Matrimonial status					
Single	25.42	26.97	19.51	38.71	10.31
In relationship	22.08	29.39	15.58	16.39	7.04
Other	30.91	34.09	0	16.67	50.0
$\chi^2$	2.94	1.12	.91	9.33	4.42
<i>p</i>	.23	.57	.635	.009	.11
<i>Analyse of Variance - Mean (SD)</i>					
Exposure to COVID-19					
Clinical Anxiety	.82 (1.04)	.82 (1.08)	1.25 (1.25)	.68 (.89)	.63 (.62)
No clinical Anxiety	.65 (.83)	.70 (.83)	.92 (.98)	.47 (.82)	.45 (.63)
<i>F</i>	7.22	2.25	1.72	2.19	1.07
<i>p</i>	.007	.134	.192	.141	.30
Stigmatization due to COVID-19					
Clinical Anxiety	4.27 (4.28)	4.56 (4.40)	3.35 (3.56)	3.96 (4.38)	2.75 (2.79)
No clinical Anxiety	2.38 (3.37)	2.95 (3.70)	1.61 (2.69)	1.97 (3.00)	1.58 (2.69)
<i>F</i>	53.42	21.20	6.21	10.72	2.74
<i>P</i>	<.0001	<.0001	.014	.001	.1

Distribution of mean scores of exposure to COVID-19 and stigmatization related to COVID-19 across the participants that are diagnosed with high anxiety symptoms or not are presented in the second part of Table 1. For both exposure to COVID-19 and stigmatization related to COVID-19, statistically significant higher mean scores were observed among those with high anxiety symptoms in pooled data ( $0.8 \pm 1.0$  VS  $0.7 \pm 0.8$ ,  $p = .007$  and  $4.3 \pm 4.3$  VS  $2.4 \pm 3.4$ ,  $p < .001$  respectively for exposure to COVID-19 and stigmatization). While the same pattern was maintained for stigmatization due to COVID-19 when each country was considered individually, no significant difference was found for exposure to COVID-19.

To explore the variance in anxiety symptoms associated with risk and protective factors, multivariate linear regression analyses were performed for the pooled sample and for each country. Results of the multivariate linear regression (Table 2) for the pooled data showed a significant relationship between both exposure to COVID-19 ( $\beta=0.06$ ,  $p = .005$ ) and stigmatization related to COVID-19 ( $\beta=0.03$ ,  $p < .001$ ). Additionally, resilience was negatively associated with anxiety scores ( $\beta = -0.06$ ,  $p < .001$ ). Compared to the RDC as the reference country, participants from Togo were more likely to report lower anxiety scores ( $\beta=-0.14$ ,  $p = .006$ ) while the opposite was noted for Haiti ( $\beta=0.16$ ,  $p = .002$ ).

When performing national regression models, exposure to COVID-19 was statistically associated with anxiety scores only for Haiti ( $\beta = 0.25$ ,  $p = .001$ ). However, stigmatization related to COVID-19 was constantly significant for each country ( $\beta = 0.02$ ,  $p < .001$ ;  $\beta = 0.05$ ,  $p = .013$ ;  $\beta = 0.03$ ,  $p = .021$ ;  $\beta = 0.04$ ,  $p < .001$ , respectively for the RDC, Rwanda,

**Table 2**

Results of multivariate linear regression analyses predicting anxiety symptoms.

	$\beta$	<i>t</i>	<i>p</i>	% 95 CI	
Pooled – F(11, 963) = 13.86, $p < .0001$ , $R^2 = 13.7$					
Age	-.002	-.91	.363	-.006	.002
Sex <sup>a</sup>					
Female	.063	1.836	.067	-.004	.13
Other	.008	.095	.924	-.162	.178
Matrimonial status					
In relationship	.004	.091	.927	-.076	.084
Other	.045	.554	.579	-.114	.204
Country <sup>b</sup>					
Togo	-.141	-2.776	.006	-.24	-.041
Haiti	.155	3.067	.002	.056	.255
Rwanda	-.003	-.048	.962	-.11	.105
Exposition to COVID-19	.056	2.831	.005	.017	.095
Stigmatization related to Covid-19	.027	5.917	<.001	.018	.036
Resilience	-.055	-6.378	<.001	-.071	-.038
RDC – F(8, 587) = 8.6, $p < .0001$ , $R^2 = 1.4$					
Age	-.003	-1.149	.251	-.007	.002
Sex <sup>a</sup>					
Female	.04	.923	.357	-.045	.124
Other				-.554	.459
Matrimonial status					
In relationship	-.048	-1.185	.853	-.04	.163
Other	.118	1.308	.191	-.059	.296
Exposition to COVID-19	.026	1.09	.276	-.02	.072
Stigmatization related to Covid-19	.024	4.386	<.001	.013	.034
Resilience	-.053	-5.305	<.001	-.073	-.033
Rwanda – F(8, 101) = 2.0, $p = .05$ , $R^2 = 13.8$					
Age	-.001	-1.171	.864	-.017	.014
Sex <sup>a</sup>					
Female	.014	.107	.915	-.238	.266
Other	.208	.664	.508	-.414	.831
Matrimonial status					
In relationship	-.036	-2.233	.816	-.34	.268
Other	-.448	-1.16	.249	-1.213	.318
Exposition to COVID-19	.094	1.33	.186	-.046	.235
Stigmatization related to Covid-19	.054	2.525	.013	.012	.097
Resilience	-.054	-1.266	.208	-.139	.031
Haiti – F(8, 120) = 4.4, $p < .001$ , $R^2 = 22.8$					
Age	-.021	-2.017	.046	-.042	0
Sex <sup>a</sup>					
Female	-.128	-1.118	.266	-.355	.099
Other	-.168	-.829	.409	-.57	.234
Matrimonial status					
In relationship	-.136	-1.093	.277	-.383	.111
Other	-.048	-1.151	.88	-.674	.578
Exposition to COVID-19	.245	3.341	.001	.1	.391
Stigmatization related to Covid-19	.033	2.335	.021	.005	.062
Resilience	-.032	-1.024	.308	-.095	.03
Togo – F(8, 131) = 6.282, $p < .001$ , $R^2 = 27.7$					
Age	.005	1.21	.228	-.003	.014
Sex <sup>a</sup>					
Female	.059	.966	.336	-.062	.181
Other	.013	.163	.871	-.142	.167
Matrimonial status					
In relationship	-.056	-.752	.453	-.202	.091
Other	-.058	-.255	.799	-.505	.389
Exposition to COVID-19	.079	1.848	.067	-.006	.164
Stigmatization related to Covid-19	.038	3.778	<.001	.018	.058
Resilience	-.077	-4.837	<.001	-.109	-.046

<sup>a</sup> Reference is male.

<sup>b</sup> Reference is DRC.

Haiti, and Togo). For the combined data, 14% of the variance was explained by the model; the  $R^2$  value varied from 10% to 28% for the individual regression models (Table 2).

#### 4. Discussion

We analyzed data from a multinational convenience sample recruited from four countries (DRC, Haiti, Rwanda, and Togo) to document the prevalence and risk and protective factors associated with high anxiety symptoms in populations in LMICs affected by the COVID-19 pandemic. The results first showed that overall, approximately one in four people were diagnosed with a significant level of anxiety symptoms. The results also showed significant differences between countries. In fact, while the frequency of anxiety symptoms is of more than one person out of three in Haiti (29.19%) and the DRC (28.53%), in Rwanda it is of one person out of six (16.67%), and less than one person out of 10 in Togo (9.41%). The fact that the frequency of anxiety symptoms is higher in the countries most affected by the pandemic may be significant even in the absence of pre-pandemic levels of anxiety symptoms collected with the same instrument. The latest World Health Organization study on common mental health disorders in these countries found significantly lower prevalence of anxiety symptoms ranging from 2.8% to 5.5% (World Health Organization, 2017). The results of this study thus suggest that the frequency of anxiety symptoms is 4–10 times higher during the COVID-19 pandemic than it was before.

Although the number of confirmed cases and deaths associated with COVID-19 are far below reality in Haiti and the DRC, both countries have reported about 5000 confirmed cases and about 100 deaths (John Hopkins University, 2020). In Rwanda and Togo, where the prevalence of anxiety symptoms is much lower, the number of confirmed cases is less than 700 for both countries with 13 deaths respectively (John Hopkins University, 2020).

The results also showed that there were no significant gender differences in the overall sample, except for Haiti. Recent studies among populations affected by Ebola Virus Disease in the DRC have also shown non-significant gender differences for psychological distress, depression, post-traumatic stress disorder, and anxiety (Cénat et al., 2020c). Although these results should be further investigated through longitudinal and mixed-methods studies, they should provoke reflections on the role of gender in the development of anxiety symptoms during epidemics, internalized disorders in general, and differences between Western countries and ‘collectivist’ cultures. A new meta-analysis conducted on mental health problems during the COVID-19 pandemic also found no gender differences in China, while there were significant gender differences for Western and Middle Eastern countries. For Haiti, the significant differences observed corroborate recent studies that have shown significant gender differences during crises. The same observation was made for age, where the differences were only significant for Haiti; the older participants are, the less anxious they are. Studies have already shown high prevalence rates of anxiety symptoms among different groups of young people in Haiti following the earthquake (Cénat et al., 2020; Derivois et al., 2017). However, these results may also be indicative of experiences similar to other events (e.g., cholera, earthquake, and other natural disasters) for older participants, which may make them less anxious.

Prediction analyses showed that in the pooled data, the level of exposure to COVID-19 predicted anxiety symptoms, but when countries were taken separately, it predicted anxiety symptoms only for Haiti. However, stigmatization associated with COVID-19 was consistent in predicting anxiety symptoms in the pooled sample and in each country. A recent publication among Ebola-affected populations showed that stigmatization related to Ebola was one of the best predictors of psychological distress. These results indicate that COVID-19 related education in LMICs could play a role by decreasing stigma and by enhancing the mental health of communities. Moreover, the findings can explain the fact that beyond poor access to testing, few people are

willing to be tested and in some countries, families are hiding that their relatives have died from COVID-19. In Haiti, for example, the local population has invented another fever epidemic, but with the same symptoms of COVID-19, in order to avoid stigmatization related to the pandemic (Cénat, 2020b; Journal de Montréal, 2020).

The results also illustrate the role of resilience as a protective factor in the development of anxiety symptoms related to COVID-19, except for Rwanda and Haiti. This finding corroborates those of a study that showed that resilience plays a major protective role against mental health problems during the COVID-19 pandemic (Killgore et al., 2020). However, different studies in Haiti and Rwanda have consistently shown that resilience, as measured through scales, appears to play less of a protective role for mental health problems. This topic should be explored in future research in LMICs. However, for Togo and DRC, resilience seems offer better adaptive capacities and can help people to cope better with concerns related to fears, anxieties, and changes brought by the pandemic in daily lives, as well as risks of stigmatization related to COVID-19.

#### 5. Limitations

Although this is the first multinational study in LMIC, it has a number of limitations. First, it is a cross-sectional study whereas longitudinal studies are needed to investigate the causal relationships between exposure to COVID-19, stigmatization, and the development of anxiety symptoms. Also, key risk factors like socio economic status are not considered. Second, it is a study with self-reported questionnaires. This method is necessary in this particular time of the pandemic, when information must be collected quickly from a large number of people. Finally, it is a web-based study in countries where Internet access is often reserved for a restricted group of people. This prompted us to make a major effort to pass questionnaires via telephone. These measures were appropriate to prevent the spread of COVID-19 and to respect the ethics board decision.

#### 6. Conclusions

Despite these limitations, this study remains the first to document anxiety symptoms in a multinational sample from low and middle-income countries and offers another perspective related to the predictive role of stigmatization related to COVID-19. The results show the importance of implementing health education programs in low-and middle-income country populations, to decrease stigma and the associated worries, fears, and anxieties. Health education programs can also help people deal with exposure and allow them to better protect themselves through observing health instructions. These results suggest that developing mental health programs need to take into account cultural and contextual specificities and should be adapted to local realities. Strength-based programs could be developed to help individuals and populations build resilience and better prevent or cope with the mental health consequences of COVID-19. Further studies should also explore the role of community resilience to address the complexities of local ecosystems. This is an avenue that global mental health should explore to help prevent mental health problems during epidemics and facilitate interventions aimed at empowering local communities.

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## Declaration of competing interest

No conflict of interest for any author.

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## References

- Bong, C.L., Brasher, C., Chikumba, E., McDougall, R., Mellin Olsen, J., Enright, A., 2020. The COVID-19 pandemic: effects on low- and middle-income countries. *Anesth. Analg.* 131, 86–92. <https://doi.org/10.1213/ANE.0000000000004846>.
- Bruns, D.P., Kraguljac, N.V., Bruns, T.R., 2020. COVID-19: facts, cultural considerations, and risk of stigmatization. *J. Transcult. Nurs.* 31, 326–332. <https://doi.org/10.1177/1043659620917724>.
- Cénat, J.M., 2020a. The vulnerability of low-and middle-income countries facing the COVID-19 pandemic: the case of Haiti. *Trav. Med. Infect. Dis.* 101684. <https://doi.org/10.1016/j.tmaid.2020.101684>.
- Cénat, J.M., 2020b. US Deportation Policies in the Time of COVID-19: A Public Health Threat to the Americas. *Public Health*. <https://doi.org/10.1016/j.puhe.2020.05.017>.
- Cénat, J.M., McIntee, S.E., Blais-Rochette, C., 2020b. Symptoms of posttraumatic stress disorder, depression, anxiety and other mental health problems following the 2010 earthquake in Haiti: a systematic review and meta-analysis. *J. Affect. Disord.* <https://doi.org/10.1016/j.jad.2020.04.046>.
- Cénat, J.M., McIntee, S.E., Guerrier, M., Derivois, D., Rousseau, C., Dalexis, R.D., Bukaka, J., Makila-Balayulu, O., 2020c. Psychological distress among adults from the urban and rural areas affected by the Ebola virus disease in the Democratic Republic of the Congo. *Soc. Psychiatr. Epidemiol.* 1–6. <https://doi.org/10.1007/s00127-020-01904-x>.
- Connor, K., Davidson, J., 2003. Development of a new resilience scale: the Connor-Davidson resilience scale (CD-RISC). *Depress. Anxiety* 18, 76–82. <https://doi.org/10.1002/da.10113>.
- De Sousa, A., Mohandas, E., Javed, A., 2020. Psychological interventions during COVID-19: challenges for low and middle income countries. *Asian J. Psychiatr.* 51, 102128. <https://doi.org/10.1016/j.ajp.2020.102128>.
- Derivois, D., Cénat, J.M., Joseph, N.E.N.E., Karray, A., Chahraoui, K., 2017. Prevalence and determinants of post-traumatic stress disorder, anxiety and depression symptoms in street children survivors of the 2010 earthquake in Haiti, four years after, 67, 174-181. <https://doi.org/10.1016/j.chiabu.2017.02.034>.
- John Hopkins University, 2020. Coronavirus COVID-19 (2019-nCoV) [WWW Document]. John Hopkins Univ. URL <https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6>.
- Journal de Montréal, 2020. Haïti atteint un pic dans l'épidémie. moins virulente que prévu [WWW Document]. J. Montréal. URL <https://www.journaldemontreal.com/2020/06/15/haiti-atteint-un-pic-dans-lepidemie-moins-virulente-que-prevu>. . accessed 6.22.20.
- Killgore, W.D.S., Taylor, E.C., Cloonan, S.A., Dailey, N.S., 2020. Psychological resilience during the COVID-19 lockdown. *Psychiatr. Res.* 291, 113216. <https://doi.org/10.1016/j.psychres.2020.113216>.
- Pappa, S., Ntella, V., Giannakas, T., Giannakoulis, V.G., Papoutsis, E., Katsaounou, P., 2020. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: a systematic review and meta-analysis. *Brain Behav. Immun.* <https://doi.org/10.1016/j.bbi.2020.05.026>.
- Tay, A.K., Jayasuriya, R., Jayasuriya, D., Silove, D., 2017. Measurement invariance of the Hopkins Symptoms Checklist: a novel multigroup alignment analytic approach to a large epidemiological sample across eight conflict-affected districts from a nationwide survey in Sri Lanka Andrew Rasmussen. Nuwan Jayawickreme. *Confl. Health* 11, 1–12. <https://doi.org/10.1186/s13031-017-0109-x>.
- Vaishnavi, S., Connor, K., Davidson, J.R.T., 2007. An abbreviated version of the Connor-Davidson Resilience Scale (CD-RISC), the CD-RISC2: psychometric properties and applications in psychopharmacological trials. *Psychiatr. Res.* 152, 293–297. <https://doi.org/10.1016/j.psychres.2007.01.006>.
- Winokur, A., Winokur, D.F., Rickels, K., Cox, D.S., 1984. Symptoms of emotional distress in a family planning service: stability over a four-week period. *Br. J. Psychiatry* 144, 395–399. <https://doi.org/10.1192/bjp.144.4.395>.
- World Health Organization, 2017. *Depression and Other Common Mental Disorders: Global Health Estimates*. Geneva.