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Levels and predictors of depression, anxiety, and suicidal risk during COVID-19 pandemic in Argentina: the impacts of quarantine extensions on mental health state

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ABSTRACT

This research is aimed to: analyze differences in mental health state (MHS) indicators (depression, state-anxiety, trait-anxiety, and suicidal risk), during three quarantine sub-periods (starting since the first quarantine extension); assess multiple relationships between each MHS indicator and potentially affecting factors. We used a cross-sectional design with a convenience sample including 1100 participants. Data were collected online. Depression revealed a worsening pattern as quarantine sub-periods went by. Anxiety (both state and trait), just like suicidal risk, partially follow such a pattern, with mean scores increasing from the first to the second/third quarantine extensions, but then maintaining to the fourth extension. Predictors having protective effects on almost all the MHS indicators were: availability of current economic income (except for state-anxiety, without significant effect) and absence of suicide attempt history. Conversely, sex (woman), younger age, and mental disorder history had an increasing risk effect on all the MHS indicators. Overall, our findings indicate that quarantine have negative mental health impacts and that quarantine duration is a relevant aspect to be taken into account when measuring such an impact. More attention needs to be paid to vulnerable groups such as the young, women, and people with history of mental disorder.

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COVID-19; quarantine; anxiety disorders; depression; suicidal ideation; psychological distress

Introduction

Coronavirus disease (COVID-19) is an infectious illness caused by a newly discovered coronavirus (Zhu et al., 2020). The current outbreak started in China on 31 December 2019 (Wuhan City Health Committee, 2020), but quickly and subsequently spreads around the world, leading to the current COVID-19 pandemic declared on 11 March 2020 (World

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Health Organization, 2020a). Nowadays, the most affected countries are European and American (World Health Organization [WHO], 2020). Until effective vaccines against COVID-19 are available, old-style public health measures, such as isolation, quarantine, social distancing, and community containment, have a pivotal role for containing the disease spread-rates (Wilder Smith & Freedman, 2020). As global public health agencies, such as the WHO and the Centers for Disease Control and Prevention, recommend quarantine for controlling this pandemic, by the end of March 2020, a third of the world's population was living under quarantine (CNN, 2020). In Latin America, the Argentina Government initially announced a mandatory quarantine for two-week duration; however, several successive extensions were implemented (Argentinean Government, 2020).

Despite the sanitary measures adopted, the COVID-19 pandemic still has a rising burden of disease and mortality (WHO, 2020), which do not seem to be the only consequences of this pandemic. Furthermore, there would be significant socio-economic and psycho-social impacts. Based on information derived from previous experiences with coronavirus infections (Torales et al., 2020) and other epidemics, pandemics, and quarantine-related situations (Brooks et al., 2020), negative consequences for mental health during and after the COVID-19 pandemic are to be expected. Symptoms related with mental disorders such as depression (López Steinmetz et al., unpublished; Ni et al., 2020; Özdin & Bayrak Özdin, 2020; Wang et al., 2020) anxiety (Cao et al., 2020; López Steinmetz et al., unpublished; Ni et al., 2020; Özdin & Bayrak Özdin, 2020; Wang et al., 2020), and post-traumatic stress (Liu et al., 2020), among others, are being reported oftentimes during the current COVID-19 pandemic. In addition, there are some factors that may increase the risk of developing such conditions as described female sex, younger age, higher level of education, lower socioeconomic status, interpersonal conflicts, frequent social media use, and lower resilience and social support (Özdin & Bayrak Özdin, 2020; Torales et al., 2020; Wang et al., 2020). Likewise, loneliness resulting from lengthy quarantine sanitary measures is likely to have a negative mental health impact on the population (Banerjee & Rai, 2020). It has been also suggested that having history of psychiatric illness may be a pre-quarantine predictor for negative psychological impact (Jeong et al., 2016), while longer durations of quarantine (e.g., ten-day period) (Hawryluck et al., 2004) were reported to either result in higher negative mental health effects (Hawryluck et al., 2004; Reynolds et al., 2008) or having no significant effect (e.g., in anxiety levels) (Urquijo as cited in Esteban, 2020; Hu et al., 2020). However, it is suspected that an extension of quarantine duration, irrespective of how small, is likely to exacerbate negative mental health effects (Brooks et al., 2020; Rona et al., 2007).

Weighing mental health costs of the epidemiological benefits of mandatory mass quarantine is a current pending task and a gap of research (Rubin & Wessley, 2020). In Argentina, having the whole country population under quarantine was unprecedented and the subsequent mental health impacts are unknown. However, based on the available worldwide literature, we hypothesized that negative mental health impacts would emerge among the Argentinean population during mandatory quarantine; these expected mental health impacts would be worsening over time, likely showing significant differences with each extension of quarantine duration. Likewise, we expected that some potentially affecting factors (being woman, younger, not having economic income, living alone, having a background of mental disorder and/or suicide attempt) might be related to the

worst negative mental health outcomes. Thus, in general terms, the purpose of this research was to evaluate differences in the levels of mental health state (MHS) indicators in Argentineans during the COVID-19 pandemic and to examine the associated factors. Specifically, the aims were two-fold: 1) to analyze differences in Argentineans' MHS indicators (in terms of depression, state-anxiety, trait-anxiety, and suicidal risk), during three quarantine sub-periods (starting since the first quarantine extension); 2) to assess multiple relationships between each MHS indicator and potentially affecting factors in the entire sample.

Method

Sample and procedure

This study used a cross-sectional design. Successive convenience samplings were used. The final sample was composed of 1100 Argentineans (80.27% women) from 18 years of age (M_{age} = 31.45, std. error ±0.35; Median = 28). Data were collected during the mandatory quarantine but starting after the first announcement of its extension (Figure 1). Collection procedure was carried out via online, using LimeSurvey software (UNC license). This study was advertised in social networks with a brief mention to the general aim, inclusion criteria, and the link for the online survey. Upon accessing the survey, participants were initially presented with the information sheet and informed consent form approved by the Ethics Committee of the Institute of Psychological Research, Faculty of Psychology, National University of Córdoba (CEIIPsi-UNC-CONICET).

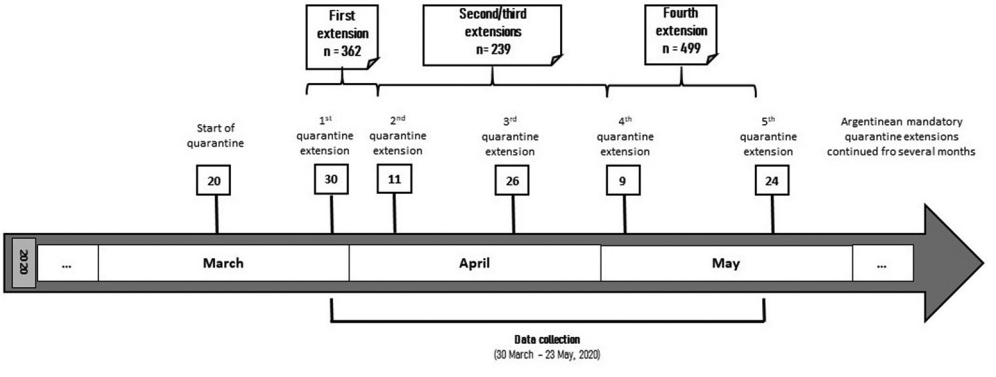

Figure 1. Dates of data collection and quarantine sub-periods. Data were collected during the mandatory quarantine but starting after the first announcement of its extension, since 30th March (i.e., the day after the first announcement of the Argentinean quarantine extension) until 23 May 2020. For addressing the first aim of this research, we divided the entire sample into three groups according to quarantine sub-periods: a) participants answering during 30 March-10 April 2020, i.e., sub-period after the first quarantine extension, named as *first extension* (n = 362); b) participants answering during 11 April-8 May 2020, i.e., sub-period after the second quarantine extension and including the third extension, named as *second/third extensions* (n = 239); c) participants answering during 09–23 May 2020, i.e., sub-period after the fourth quarantine extension, named as *fourth extension* (n = 499).

Instruments

Sociodemographic questionnaire. We developed a brief ad hoc questionnaire on socio-demographic data and other factors potentially affecting MHS. With this instrument we asked the participants about: sex; age; current site of residence (options available between each one of the 23 Argentinean provinces, the City of Buenos Aires, or currently stranded abroad); maximum educational level reached (incomplete elementary school, completed elementary school, incomplete high school, completed high school, incomplete tertiary or university, completed tertiary or university, incomplete postgraduate, or completed postgraduate); availability of current economic income (yes or no); living with somebody or alone; mental disorder history (yes or no); suicide attempt history (yes or no); date (automatically recorded by the online survey system).

Beck Depression Inventory (BDI-II) (Beck et al., 1996). We used the Argentinean version (Cronbach's alpha = 0.86) of the BDI-II (Brenlla & Rodríguez, 2006). This is a 21-item instrument measuring *depression* and its severity. Its items describe the most frequent clinical symptoms of depressed subjects. In non-clinical populations, scores above 20 indicate depression (Kendall et al., 1987).

State-Trait Anxiety Inventory (STAI) (Spielberger et al., 1983). We used the Spanish version of the 20-items subscale for measuring *state-anxiety* (Cronbach's alpha = 0.90/0.93). State-anxiety is defined as a transient emotional condition of the organism, characterized by subjective feelings of tension and apprehension. Likewise, we used the 20-items subscale for measuring *trait-anxiety* (Cronbach's alpha = 0.84/0.87). This subscale measures anxiety-related symptoms, such as restlessness, nervousness, and agitation. Trait-anxiety is defined as a stable anxious propensity that makes people and situations be perceived as threatening, thus raising anxiety. Higher scores indicate more anxiety-related symptoms (both state and trait), but since there are no cutoff scores for the STAI, we classified as *low* to scores below mean and as *high* to scores equal or above mean.

Inventory of suicide Orientation (ISO-30) (King & Kowalchuk, 1994). We used the Argentinean validation (Cronbach's alpha = 0.88) of the ISO-30 (Fernández Liporace & Casullo, 2006), a 30-item evaluation tool which helps in identifying *suicidal risk*. Raw scores < 30 indicate low risk, raw scores between 30 and 44 indicate moderate risk, and raw scores ≥ 45 indicate high risk (King & Kowalchuk, 1994).

Data analysis

We performed all data analysis with RStudio version 4.0.0 (R Core Team, 2020). Reproducible code was deposited at an open online repository (López Steinmetz, 2020). We considered p-values ≤ 0.05 as statistically significant. We report exact p-values, except for p-values under 0.001, where we report as < 0.001. Likewise, 95% confidence intervals are informed when corresponded. Skewness and kurtosis in each MHS indicator were in the range of acceptable values or near to (−3 and 3; Brown, 2006); therefore, parametric tests were applied.

For addressing the first aim of this research, we divided the entire sample into three groups according to quarantine sub-periods (Figure 1). For analyzing differences in each MHS indicator during the three quarantine sub-periods, we applied one-way between-

groups ANOVA. We run pairwise comparisons using *t*-tests with pooled standard deviation, alternative hypothesis two-tailed, and *p*-values adjusted based on Bonferroni's method.

For addressing the second aim, we created an initial model for each MHS indicator including all the following predictors: sex, age, current site of residence, maximum educational level reached, availability of current economic income, living with somebody or alone, mental disorder history, suicide attempt history, and sub-period of quarantine extension in which participants answered. Then, we ran multiple linear regressions for each MHS indicator considering the entire sample. We performed a stepwise selection (both directions) for each initial model by using the *stepAIC* function from the *MASS* package. This function performs stepwise selection by using exact Akaike's Information Criteria (AIC) to compare fitted models; a smaller AIC indicates a better fit. For each MHS indicator, we tried only additive models. For the models best fitting, we reported 95% confidence interval, the coefficient of determination (r^2), and the adjusted R-squared. Likewise, for providing a measure of error prediction, we calculated the error rate by dividing the residual standard error (RSE) by the mean outcome variable. Additionally, by considering the predictors included in the best-fitted models, we analyzed the smallest linear model for each MHS indicator by means of all two-predictor combinations. We analyzed the three best models for two-predictor subset size. For these analyses, we used the *regsubsets* function from the *leaps* package.

Results

Differences in Argentineans' MHS indicators during quarantine sub-periods

In the entire sample, 29.64% scored as depressed, 48.55% and 47.91% had high state-anxiety and trait-anxiety, respectively, and 42.27% had levels of suicidal risk worthy of consideration (19.36% high risk, 22.91% moderate risk). Distributions by cutoff scores for each MHS indicator through quarantine sub-periods are shown in Table 1 (see also **Figures S1** to **S4**). Statistically significant differences were found according to quarantine sub-periods in all the MHS indicators studied: depression ($F_{(2)} = 10.86$, *p*-value < 0.001, RSE = 11.00), state-anxiety ($F_{(2)} = 6.81$, *p*-value = 0.001, RSE = 14.40), trait-anxiety ($F_{(2)} = 4.45$, *p*-value = 0.01, RSE = 12.11), and suicidal risk ($F_{(2)} = 4.04$, *p*-value = 0.02, RSE = 16.30). On the one hand, these differences were found between the first and the second/third extensions (higher mean scores in the latter) in depression, trait-anxiety, and state-anxiety. On the other hand, these differences were found between the first and the fourth extension (higher mean scores in the latter) in all the MHS indicators. However, effect sizes were small (Table 2).

Regression models for MHS indicators

The initial regression model for each MHS indicator included the predictors mentioned above (see *Methods: Data analysis*). All ensuing regression models ran by stepwise selection were statistically significant (*p*-values < 0.001, **Table S1**).

Table 1. Scores for each mental health state (MHS) indicator through quarantine sub-periods.

MHS indicator	Sub-periods	Mean by sub-periods (Std. Error)	Mean in the entire quarantine (Std. Error)	Percentage distributions[a] by cutoff scores[b]
Depression	1st	13.55 (0.53)	15.69 (0.33)	Non depressed: 25.27%; Clinical depression: 7.64%
	2nd/3rd	16.07 (0.78)		Non depressed: 15.00%; Clinical depression: 6.73%
	4th	17.07 (0.50)		Non depressed: 30.09%; Clinical depression: 15.27%
Anxiety-state	1st	29.50 (0.72)	31.77 (0.44)	Low: 19.27%; High 13.64%
	2nd/3rd	33.24 (1.01)		Low: 9.54%; High 12.18%
	4th	32.72 (0.64)		Low: 22.64%; High 22.73%
Anxiety-trait	1st	25.34 (0.63)	26.90 (0.37)	Low: 18.36%; High 14.54%
	2nd/3rd	27.80 (0.83)		Low: 11.00%; High 10.73%
	4th	27.59 (0.53)		Low: 22.73%; High 22.64%
Suicidal risk	1st	28.33 (0.79)	30.32 (0.49)	Low: 20.73%; Moderate: 7.82%; High: 4.36%
	2nd/3rd	31.43 (1.15)		Low: 11.82%; Moderate: 5.00%; High: 4.91%
	4th	31.23 (0.74)		Low: 25.18%; Moderate: 10.09%; High: 10.09%

Note: Std. Error, Standard error; Sub periods: sub-periods of quarantine extension (1st extension, 2nd/3rd extensions, or 4th extension).

[a]Percentage distributions based on cutoff scores corresponding to the entire quarantine.

[b]Cutoff scores: There are no cutoff scores for the instrument used for measuring anxiety (both state and trait). Thus, for these MHS indicators we classified as *low* to scores below mean and as *high* to scores equal or above mean. For depression: scores above 20 indicate clinical depression (Kendall et al., 1987)). For suicidal risk: raw scores < 30 indicate low risk, raw scores between 30–44 indicate moderate risk, and raw scores ≥ 45 indicate high risk (King & Kowalchuk, 1994).

Table 2. Results of pairwise comparisons between means of each mental health state (MHS) indicator in function of quarantine sub-periods, with effect sizes and confidence intervals.

		Pairwise comparisons[a]		95% CI	
MHS indicator	Sub-periods	p adj[b]	Effect size	Lower	Upper
Depression	2nd/3rd vs 1st	0.02	0.14	0.08	0.20
	4th vs 1st	< 0.001			
	4th vs 2nd/3rd	0.76			
Anxiety-state	2nd/3rd vs 1st	0.006	0.11	0.05	0.17
	4th vs 1st	0.004			
	4th vs 2nd/3rd	1.00			
Anxiety-trait	2nd/3rd vs 1st	0.05	0.09	0.02	0.15
	4th vs 1st	0.02			
	4th vs 2nd/3rd	1.00			
Suicidal risk	2nd/3rd vs 1st	0.07	0.09	0.01	0.14
	4th vs 1st	0.03			
	4th vs 2nd/3rd	1.00			

Note: p adj, Adjusted p-value; Sub periods: sub-periods of quarantine extension (1st extension, 2nd/3rd extensions, or 4th extension); 95% CI, 95% Confidence Intervals.

[a]Pairwise comparisons using *t*-tests with pooled standard deviation (two-tailed) and p-values adjusted based on Bonferroni's method.

[b]Exact adjusted p-values are informed, except for p-values under 0.001, which are informed as < 0.001.

However, for depression, the minimum suitable model included the following predictors: sex (woman), age (younger), economic income (having an inverse effect when it is available), presence of mental disorder history, suicide attempt history (having an inverse effect when it is absent and having a direct effect when it is present), and longer duration of quarantine extensions (second/third extensions, and fourth extension)

($F_{(8 \text{ and } 1091)} = 55.19$, p-value < 0.001, Residuals: −25.52 to 34.13; AIC = 4938.70; Table 3, **Figure S5**). This model explained 28% of variance in participants' depression according to r^2 and adjusted r^2. The RSE was 9.40, corresponding to a 60% error rate.

As for state-anxiety, the minimum suitable model included the predictors: sex (woman), age (younger), presence of mental disorder history, suicide attempt history (having an inverse effect when it is absent and having a direct effect when it is present), and longer duration of quarantine extensions (second/third extensions, and fourth extension) ($F_{(7 \text{ and } 1092)} = 36.95$, p-value < 0.001, Residuals: −42.89 to 39.50; AIC = 5660.25; Table 3, Figure S6). This model explained 19% of variance in participants' state-anxiety according to r^2 and adjusted r^2. The RSE was 13.06, corresponding to a 41% error rate.

Regarding trait-anxiety, the minimum suitable model included the predictors: sex (woman), age (younger), economic income (when available, it has an inverse effect), presence of mental disorder history, and suicide attempt history (having an inverse effect

Table 3. Summary of the linear regression models better fitting[a] each mental health state (MHS) indicator (N = 1100).

						95% CI	
MHS indicator	Predictors	Estimate	Std. Error	*t* value	*p*-value[b]	2.5%	97.5%
Depression	Intercept	22.89	1.36	16.77	< 0.001	20.21	25.57
	Sex (woman)	3.93	0.72	5.43	< 0.001	2.51	5.35
	Age	−0.22	0.03	−8.39	< 0.001	−0.27	−0.17
	Economic income (yes)	−1.61	0.78	−2.06	0.04	−3.15	−0.08
	Mental disorder history (yes)	2.51	0.67	3.75	< 0.001	1.19	3.82
	Suicide attempt history (no)	−6.70	0.69	−9.77	< 0.001	−8.05	−5.36
	Suicide attempt history (yes)	4.87	1.25	3.90	< 0.001	2.42	7.32
	Quarantine sub-periods ($2^{nd}/3^{rd}$)	1.55	0.78	1.97	0.05	0.01	3.09
	Quarantine sub-periods (4^{th})	2.31	0.67	3.45	< 0.001	1.00	3.63
State-anxiety	Intercept	37.51	1.75	21.39	< 0.001	34.07	40.95
	Sex (woman)	3.57	1.00	3.55	< 0.001	1.60	5.54
	Age	−0.25	0.04	−6.91	< 0.001	−0.32	−0.18
	Mental disorder history (yes)	5.57	0.93	6.00	< 0.001	3.75	7.40
	Suicide attempt history (no)	−6.08	0.95	−6.38	< 0.001	−7.95	−4.21
	Suicide attempt history (yes)	4.59	1.73	2.65	0.01	1.19	7.99
	Quarantine sub-periods ($2^{nd}/3^{rd}$)	2.67	1.09	2.44	0.01	0.53	4.81
	Quarantine sub-periods (4^{th})	1.93	0.93	2.07	0.04	0.10	3.75
Trait-anxiety	Intercept	35.55	1.33	26.63	< 0.001	32.93	38.17
	Sex (woman)	4.03	0.78	5.15	< 0.001	2.49	5.56
	Age	−0.23	0.03	−8.39	< 0.001	−0.28	−0.18
	Economic income (yes)	−1.56	0.85	−1.83	0.07	−3.23	0.11
	Mental disorder history (yes)	5.54	0.73	7.61	< 0.001	4.11	6.97
	Suicide attempt history (no)	−7.53	0.75	−10.08	< 0.001	−8.99	−6.06
	Suicide attempt history (yes)	3.24	1.36	2.38	0.02	0.57	5.90
Suicidal risk	Intercept	45.57	1.75	26.08	< 0.001	42.14	49.00
	Sex (woman)	2.50	1.02	2.44	0.01	0.49	4.51
	Age	−0.25	0.04	−7.09	< 0.001	−0.32	−0.18
	Economic income (yes)	−2.66	1.11	−2.39	0.02	−4.85	−0.47
	Mental disorder history (yes)	6.17	0.95	6.48	< 0.001	4.30	8.05
	Suicide attempt history (no)	−13.47	0.98	−13.79	< 0.001	−15.39	−11.56
	Suicide attempt history (yes)	5.54	1.78	3.11	0.002	2.05	9.02

Note: Std. Error, Standard error; 95% CI, 95% Confidence Interval; Min, Minimum; Max, Maximum; Economic income (yes), available current economic income; Mental disorder history (yes), Presence of mental disorder history; Suicide attempt history (no), Absence of suicide attempt history; Suicide attempt history (yes), Presence of suicide attempt history; Quarantine sub-periods, Sub-period of quarantine extension (1^{st} extension, $2^{nd}/3^{rd}$ extensions, or 4^{th} extension).

[a]Best fitted model according to multiple linear regressions: stepwise selection (direction: both) by using exact Akaike's Information Criteria (AIC) to compare additive fitted models.

[b]Exact *p*-values are informed, except for *p*-values under 0.001, which are informed as < 0.001.

when it is absent and having a direct effect when it is present) ($F_{(6 \text{ and } 1093)} = 75.83$, p-value < 0.001, Residuals: −34.53 to 30.63; AIC = 5123.92; Table 3, Figure S7). This model explained 29% of variance in participants' trait-anxiety according to r^2 and adjusted r^2. The RSE was 10.24, corresponding to a 38% error rate.

Finally, for suicidal risk, the minimum suitable model included all the same predictors as for trait-anxiety ($F_{(6 \text{ and } 1093)} = 90.47$, p-value < 0.001, Residuals: −38.17 to 49.69; AIC = 5715.52; Table 3, Figure S8). This model explained 33% of variance in participants' suicidal risk according to r^2 and adjusted r^2. The RSE was 13.39, corresponding to a 44% error rate.

Based on the best fitting models, when two-predictor subset sizes were analyzed for each MHS indicator, the best model in all cases included the predictors age and suicide attempt history (absence). In contrast, the 2nd and 3rd best two-predictor subset size models were different for each MHS indicator (Table 4).

Discussion

Our findings revealed a worsening pattern for depression as quarantine sub-periods went by. This pattern consisted in mean scores increasing from the first to the second/third quarantine extensions, and they continue to increase thereon. On the one hand, these findings are opposite to what was reported by Qiu et al. (2020) in the Chinese population, with results indicating that as time passes, distress levels have been significantly descending. On the other hand, the findings presented in this research are consistent with a current study on psychological symptoms during two stages of lockdown in response to the COVID-19 outbreak in Spain, reporting that as the time spent in lockdown has progressed, psychological symptoms have risen (Ozamiz Etxebarria et al., 2020). Likewise, our current findings are consistent with our previous findings on MHS indicators in college students, which we analyzed during sub-periods of quarantine before the announcement of extension and after the first two quarantine extensions for COVID-19 pandemic (López Steinmetz et al., unpublished). Taken together, these findings suggest that the negative mental health impact of quarantine would follow a relatively similar pattern in students and in the general population.

Anxiety, just like suicidal risk, partially follows such a pattern, with mean scores increasing from the first to the second/third quarantine extensions, but then maintaining to the fourth extension. In non-quarantine situations, we have previously found that suicidal risk was more strongly correlated to trait-anxiety as compared to depression (López Steinmetz et al., 2020), and the current findings seem to support that such a correlation remains in a quarantine situation.

For measuring anxiety, we used an instrument based in the assumption that anxiety is a unidimensional construct. According to this, it is expected that high trait-anxiety scores are accompanied also by high state-anxiety scores (Spielberger et al., 1983). In general terms, our results supported this expectation. However, it is important to highlight that while depression continues to increase as quarantine duration went by – reaching scores of clinical depression in the 29.64% of the entire sample –, anxiety (both state and trait) cease to increase from the second/third quarantine extensions to the fourth extension. In a previous research, we have also observed this dissimilar tendency between depression and anxiety through quarantine duration and we have already discussed the reasons why

Table 4. Summary of the best three models with two-predictors subset size for each mental health state (MHS) indicator (N = 1100).

							95% CI		Residuals						
MHS indicator	Model	Predictors	Estimate	Std. Error	*t* value	*p*[a]	2.5%	97.5%	Min	Max	F (df)	*p*[a]	RSE (df)	r^2	Adj r^2
Depression	1st	Intercept	28.01	0.90	31.19	< 0.001	26.25	29.78	−26.92	33.90	121.4 (3 and 1096)	< 0.001	9.63 (1096)	0.25	0.25
		AGE	−0.24	0.02	−9.62	< 0.001	−0.29	−0.19							
		SUIC AT (no)	−7.52	0.68	−11.00	< 0.001	−8.86	−6.18							
		SUIC AT (yes)	5.70	1.27	4.48	< 0.001	3.20	8.19							
	2nd	Intercept	17.72	0.87	20.44	< 0.001	16.02	19.42	−26.84	36.81	96.44 (3 and 1096)	< 0.001	9.89 (1096)	0.21	0.21
		SEX (woman)	4.23	0.75	5.62	< 0.001	2.76	5.71							
		SUIC AT (no)	−8.53	0.69	−12.37	< 0.001	−9.88	−7.18							
		SUIC AT (yes)	4.88	1.30	3.74	< 0.001	2.32	7.44							
	3rd	Intercept	19.33	0.73	26.39	< 0.001	17.89	20.76	−26.48	33.46	70.04 (4 and 1095)	< 0.001	9.92 (1095)	0.20	0.20
		SUIC AT (no)	−8.78	0.69	−12.73	< 0.001	−10.14	−7.43							
		SUIC AT (yes)	5.27	1.31	4.02	< 0.001	2.70	7.84							
		SUB PER (2nd/3rd)	1.89	0.83	2.28	0.02	0.26	3.51							
		SUB PER (4th)	3.38	0.68	4.93	< 0.001	2.03	4.72							

(*Continued*)

Table 4. (Continued).

							95% CI		Residuals						
MHS indicator	Model	Predictors	Estimate	Std. Error	*t* value	p^a	2.5%	97.5%	Min	Max	F (df)	p^a	RSE (df)	r^2	Adj r^2
State-Anxiety	1st	Intercept	44.06	1.25	35.33	< 0.001	41.61	46.50	−42.27	37.11	63.92 (3 and 1096)	< 0.001	13.37 (1096)	0.15	0.15
		AGE	−0.24	0.03	−6.87	< 0.001	−0.31	−0.17							
		SUIC AT (no)	−7.58	0.95	−7.99	< 0.001	−9.44	−5.72							
		SUIC AT (yes)	5.94	1.76	3.37	< 0.001	2.48	9.40							
	2nd	Intercept	35.51	0.88	40.32	< 0.001	33.78	37.23	−39.37	37.42	55.96 (3 and 1096)	< 0.001	13.50 (1096)	0.13	0.13
		MENT DIS (yes)	4.86	0.95	5.10	< 0.001	2.99	6.73							
		SUIC AT (no)	−7.92	0.96	−8.27	< 0.001	−9.80	−6.04							
		SUIC AT (yes)	4.49	1.79	2.51	0.01	0.98	8.00							
	3rd	Intercept	39.85	1.18	33.76	< 0.001	37.54	42.17	−40.68	36.54	76.40 (2 and 1097)	< 0.001	13.57 (1097)	0.12	0.12
		AGE	−0.33	0.03	−9.35	< 0.001	−0.39	−0.26							
		MENT DIS (yes)	8.01	0.92	8.67	< 0.001	6.20	9.82							
Trait-Anxiety	1st	Intercept	39.66	0.99	39.97	< 0.001	37.72	41.61	−35.11	31.80	112.20 (3 and 1096)	< 0.001	10.64 (1096)	0.23	0.23
		AGE	−0.22	0.03	−7.93	< 0.001	−0.27	−0.17							
		SUIC AT (no)	−9.09	0.75	−12.04	< 0.001	−10.57	−7.61							
		SUIC AT (yes)	4.62	1.40	3.29	0.001	1.87	7.38							
	2nd	Intercept	31.63	0.70	45.16	< 0.001	30.26	33.01	−31.84	32.68	103.70 (3 and 1096)	< 0.001	10.74 (1096)	0.22	0.22
		MENT DIS (yes)	4.92	0.76	6.49	< 0.001	3.43	6.40							
		SUIC AT (no)	−9.32	0.76	−12.23	< 0.001	−10.81	−7.82							
		SUIC AT (yes)	3.20	1.42	2.25	0.02	0.41	5.99							
	3rd	Intercept	29.70	0.95	31.39	< 0.001	27.84	31.55	−35.09	32.26	98.95 (3 and 1096)	< 0.001	10.79 (1096)	0.21	0.21
		SEX (woman)	4.56	0.82	5.54	< 0.001	2.94	6.17							
		SUIC AT (no)	−9.96	0.75	−13.23	< 0.001	−11.44	−8.48							
		SUIC AT (yes)	3.83	1.42	2.69	0.007	1.04	6.63							

(*Continued*)

Table 4. (Continued).

MHS indicator	Model	Predictors	Estimate	Std. Error	*t* value	p^a	95% CI		Residuals		F (df)	p^a	RSE (df)	r^2	Adj r^2
							2.5%	97.5%	Min	Max					
Suicidal risk	1st	Intercept	47.73	1.28	37.32	< 0.001	45.22	50.24	−34.55	48.78	154.80 (3 and 1096)	< 0.001	13.71 (1096)	0.30	0.30
		AGE	−0.24	0.04	−6.81	< 0.001	−0.31	−0.17							
		SUIC AT (no)	−15.11	0.97	−15.52	< 0.001	−17.02	−13.20							
		SUIC AT (yes)	7.00	1.81	3.87	< 0.001	3.45	10.55							
	2nd	Intercept	38.83	0.90	43.12	< 0.001	37.07	40.60	−40.30	49.52	148.10 (3 and 1096)	< 0.001	13.80 (1096)	0.29	0.29
		MENT DIS (yes)	5.47	0.97	5.61	< 0.001	3.56	7.38							
		SUIC AT (no)	−15.35	0.98	−15.67	< 0.001	−17.28	−13.43							
		SUIC AT (yes)	5.42	1.83	2.96	0.003	1.83	9.01							
	3rd	Intercept	44.23	1.23	35.83	< 0.001	41.81	46.65	−40.44	53.04	139.40 (3 and 1096)	< 0.001	13.92 (1096)	0.28	0.27
		ECON (yes)	−4.03	1.14	−3.52	< 0.001	−6.28	−1.79							
		SUIC AT (no)	−16.24	0.97	−16.74	< 0.001	−18.14	−14.33							
		SUIC AT (yes)	6.24	1.84	3.40	0.001	2.63	9.84							

Note: Std. Error, Standard error; *p*, *p*-value; 95% CI, 95% Confidence Interval; Min, Minimum; Max, Maximum; F, F-statistic; df, degrees of freedom; RSE, Residual standard error; r^2, Coefficient of determination R-squared; Adj r^2, Adjusted R-squared; SUIC AT, suicide attempt history (yes or no); SUB PER, Sub-period of quarantine extension (1st extension, 2nd/3rd extensions, or 4th extension); MENT DIS, mental disorder history (yes or no); ECON, availability of current economic income (yes or no).

[a]Exact *p*-values are informed, except for *p*-values under 0.001, which are informed as < 0.001.

anxiety symptoms may stop to increase or even decrease during quarantine as time passes by (López Steinmetz et al., unpublished). It is important to be aware that the latter anxiety tendency is not likely to be an accustoming effect to quarantine, as it was suggested by some research (Urquijo as cited in Esteban, 2020). As we have previously proposed (López Steinmetz et al., unpublished), the learned helplessness paradigm (Seligman & Maier, 1967) – a long proven, valid and reliable depression-like behavior model in animals (Overmier & Seligman, 1967), which demonstrated to be reproducible in human subjects (Telner & Singhal, 1984) – may help to understand these patterns and tendencies observed through quarantine.

In the entire sample, 42.27% had levels of suicidal risk worthy of consideration. Unfortunately, there are insufficient peer-reviewed published studies screening for suicidal risk in the general population during quarantine, in order to compare our results. We found a study reporting a < 1% prevalence of moderate suicidal ideation in the Chinese workforce (Tan et al., 2020) and a case–control study carried-out on psychiatric patients reported that just one healthy control (0.90%) had severe suicidal ideation (Hao et al., 2020) during the COVID-19 pandemic. These results are strikingly low compared to ours but, notably, none of the cited studies was aimed to screen suicidal risk in the general population. The lack of studies addressing this noteworthy topic may be related to screening for suicidal risk is frequently avoided (see e.g., Urquijo as cited in Esteban, 2020), probably due to a commonly, but not evidence-based, held perception in psychology that enquiring about suicidality can increase suicidal tendencies (Dazzi et al., 2014). Our results highlight an increasing need for suicidal risk screening and for developing mental health interventions to address suicidal risk prevention and/or assistance during quarantine.

In brief, the negative mental health impacts of quarantine found in this research are consistent with what was reported in the literature regarding to the current (Cao et al., 2020; Ni et al., 2020; Özdin & Bayrak Özdin, 2020; Qiu et al., 2020; Wang et al., 2020; Zhang et al., 2020) as well as previous (Brooks et al., 2020; Rubin & Wessley, 2020) quarantine-related situations. Overall, our findings indicate that quarantine have negative mental health impacts and that the quarantine duration should be taken into account when measuring these effects, as quarantine extensions were shown to exacerbate negative mental health impacts. However, this does not mean that quarantine extensions should be avoided when COVID-19 spread-rates are increasing. Despite the negative psychological impacts caused (directly or indirectly) by the quarantine, while waiting for an effective vaccine, social distancing measures are the most reliable solution necessary to prevent the increasing burden of disease and increasing mortality rates for COVID-19 (Wilder Smith & Freedman, 2020; World Health Organization, 2020b).

When assessing the effects on each MHS indicator of potentially affecting factors, trait-anxiety and suicidal risk shared all the same predictors. These findings, along with what we have pointed-out when addressing the analyses of differences, add evidence to assert that suicidal risk and trait-anxiety would be strongly related. Thus, research and health policies addressing trait-anxiety should also consider suicidal risk. Similar to trait-anxiety and suicidal behavior, depression shared the same predictors with the addition of quarantine extension, which suggests that longer durations of quarantine have a significant impact on increasing depression. In general terms, the factors having protective effects on almost all the MHS indicators were the availability of current

economic income (except for state-anxiety, without significant effect) and absence of suicide attempt history. On the contrary, factors such as sex (woman), younger age, and mental disorder history had an increasing risk effect on all the MHS indicators. Our findings regarding all the latter factors were consistent with current research on mental health impact during the COVID-19 pandemic (Özdin & Bayrak Özdin, 2020; Qiu et al., 2020). However, contrary to expected, we did not find that factors such as level of education and living with somebody or being alone have a significant effect on mental health, as it was reported by other research (Banerjee & Rai, 2020; Qiu et al., 2020; Torales et al., 2020). Finally, the two most relevant predictors for all the MHS indicators analyzed were being a younger age and the absence of suicide attempt history, as risk and protective factors, respectively.

Findings of our study need to be considered within the context of several limitations. First, this study was cross-sectional. Second, our sample was one of convenience and it is unclear to what extent our results could be representative of the entire Argentinean population. However, we have used a sample as representative as possible, by including participants from different Argentinean provinces, each one representing different idiosyncratic features, exposed to different spread-rates of the COVID-19 (Ministry of Health, 2020), and living under different quarantine phases (Ministry of Health, n.d.). Third, our sample only includes people having access to the internet, which may have influenced the sample composition (e.g., less elderly people participating, less socioeconomic heterogeneity [see e.g., Bech & Kristensen, 2009]). Fourth, as it was the case in various current studies (e.g., Jungmann & Witthöft, 2020; Ozamiz Etxebarria et al., 2020; Qiu et al., 2020), our sample has a skewed distribution regarding to sex. Despite these limitations, we believe that our findings remain valuable and help shed light for further research on mental health impacts of the current quarantine, which is a pressing public health concern. In addition, overall, findings of our study suggest the following recommendations: 1) when the government announce quarantine extensions, it must anticipate complementary measures to cushion the negative mental health impacts that quarantine extensions have; 2) more attention needs to be paid to vulnerable groups such as the young, women, and people with a history of mental disorder; 3) nationwide mental health interventions for psychological first aid should be developed and promptly put into operation during (e.g., delivered through telemedicine) and after quarantine; 4) an epidemiological, preventive and intervention system on mental health should be created and promptly implemented in order to avoid mental health disorders as the following pandemic.

Disclosure statement

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Data availability statement

The data that support the findings of this study and reproducible R code for data analysis are openly available in Open Science Framework (OSF) at https://osf.io/gkcn7/.

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LCLS has elaborated the research project, designed the online protocol of this research, carried out the data collection, made data analyses, wrote the R code, and wrote the manuscript. MADF and CAL have participated in all phases of the data collection and have carried-out bibliography searches. SBF has made bibliography searches and has revised the manuscript for English grammar. AR has participated in the data collection and in the data analyses. JCG has participated in the data collection, made bibliography searches, and has revised the manuscript.

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