The role of social support and resilience in the mental health impact of the COVID-19 pandemic among healthcare workers in Spain

Esther Ortiz-Calvo [a,1], Gonzalo Martínez-Alés [b,c,1], Roberto Mediavilla [d,e,*], Elisabeth González-Gómez [a], Eduardo Fernández-Jiménez [c,f], María-Fe Bravo-Ortiz [c,d,f], Berta Moreno-Küstner [a,g,h], on behalf of The COVID-19 HEalth caRe wOrkErS – Spain (HEROES-SPA) Group[2]

[a] Department of Personality, Assessment and Psychological Treatment, Universidad de Málaga, Málaga, Spain
[b] Department of Epidemiology, Columbia University Mailman School of Public Health, New York, NY, United States
[c] Department of Psychiatry, Clinical Psychology and Mental Health, Hospital Universitario La Paz, Madrid, Spain
[d] Department of Psychiatry, Universidad Autónoma de Madrid (UAM), Madrid, Spain
[e] Centro de Investigación Biomédica en Red de Salud Mental (CIBERSAM), Instituto de Salud Carlos III, Madrid, Spain
[f] Instituto de Investigación Del Hospital Universitario La Paz (IdiPAZ), Madrid, Spain
[g] Andalusian Group of Psychosocial Research (GAP), Andalusia, Spain
[h] Instituto de Investigación Biomédica de Málaga (IBIMA), Málaga, Spain

A R T I C L E   I N F O

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A B S T R A C T

Background: Healthcare workers (HCWs) from COVID-19 pandemic hotspots across the globe have reported mental health problems, including anxiety, depression, or sleep problems. Many studies have focused on identifying modifiable risk factors, such as being afraid of getting infected or reporting shortage of personal protective equipment, but none have explored the role of protective factors.
Method: This cross-sectional study used an online survey to describe the association between three potentially protective factors (self-reported resilience, self-perceived social support from colleagues at work, and self-perceived social support from relatives and friends) and three mental health outcomes, namely psychological distress, depression symptoms, and death thoughts in a large sample of Spanish HCWs during the first wave of the COVID-19 pandemic.
Results: We recruited 2372 respondents between April 26th and June 22nd, 2020. Resilience and self-perceived social support were inversely associated with mental health problems (psychological distress, depression symptoms, and death thoughts), after adjusting for potential sources of confounding.
Conclusions: Resilience and self-perceived social support might protect HCWs against negative mental health outcomes. Public health strategies targeting these modifiable determinants might help to reduce the impact of the pandemic on HCWs' mental health.

The COVID-19 pandemic has forced health services around the world to perform major transformations, such as reorganizations of health care facilities - including deployment of field hospitals - or redistributions of healthcare workers (HCWs) (Armocida et al., 2020; Legido-Quigley et al., 2020). Accordingly, HCWs have experienced substantial exposure to risk factors for psychological distress since the initial pandemic outbreak, including elevated risk of contagion and inadequate access to protective equipment, increased workload and extension of working hours, requirements to prioritize patients due to limited hospital acute-care capacity, etc. (Cai et al., 2020). There is a large body of

evidence indicating that HCWs experienced a variety of mental health problems, such as hyperarousal, anger, sleep problems, anxiety, or depression, during the initial phases of the pandemic (Lai et al., 2020; Pappa et al., 2020; Santabárbara et al., 2021; Wu et al., 2021). In a study including a large sample of HCWs in Spain, nearly half of respondents screened positive for at least one of the following common mental disorders: panic attacks, generalized anxiety disorder, post-traumatic stress disorder, major depressive disorder, and substance use disorders (Alonso et al., 2021). Notwithstanding, the potential role of individual-level protective factors, such as resilience factors and different forms of social support, on HCWs' mental health outcomes during the pandemic remain relatively unexplored, despite important implications to guide mental health responses to the pandemic.

One particularly salient concern reported by HCWs during the initial peak of the pandemic was being afraid of infecting their families (Sampaio et al., 2021). Reports indicate that a substantial proportion of HCWs had to isolate themselves from their families to minimize their risk of contagion (Vimercati et al., 2020). This voluntary seclusion, added to other sources of social isolation experienced by the general population, such as generalized lockdown measures, may have put HCWs at increased risk of loss of social support – a key protective factor for mental health problems with a critical role during complex emergencies and humanitarian crises (Helgeson and López, 2010). Social support moderates the association between perceived stress (Ma et al., 2020) or traumatic experiences (Helgeson and López, 2010) and mental health outcomes, such as post-traumatic stress disorder (Brewin et al., 2000; Ozer et al., 2003), depression, anxiety, and sleep problems (Li, 2020), and it is associated with occupational stress among Italian frontline HCWs during the COVID-19 pandemic (Magnavita et al., 2021).

Resilience can be defined as "an empirically observable phenomenon, namely that someone does not develop lasting mental health problems although he or she is subject to adversity" (Kalisch et al., 2015, p. 5). During the COVID-19 pandemic, factors such as positive appraisal style (Veer et al., 2021) or the adoption of active coping strategies or engagement in forms of social support (Ye et al., 2020) explain why some people maintain mental health when facing adversities (i.e., resilience factors). Studies using samples of HCWs have identified positive correlations between resilience and other variables measuring positive domains, including life satisfaction, positive affect, and perception of social support; and negative associations between resilience and measures of risk of COVID-19 contagion and associated concerns (Bozdağ and Ergün, 2020; Schug et al., 2021).

Here, we studied the potential effect of self-perceived social support and a resilience factor, namely the self-reported ability to bounce back, on the mental health outcomes of a large sample of HCWs from Spain during the initial COVID-19 pandemic outbreak.

1. Methods

1.1. Study design

This study is part of the broader *COVID-19 HEalth caRe wOrkErSs (HEROES) Study*, a longitudinal cohort study currently being conducted in more than 30 countries across all continents of the world except Antarctica (Clinicaltrials.gov protocol ID: NCT04352634). Specifically, our study is a cross-sectional assessment, conducted in Spain between April 24th and June 22nd, 2020, as part of the baseline procedures. The study protocol is compliant with the declaration of Helsinki and was approved by the Ethics Review Board at La Paz University Hospital (Madrid, Spain) (ID: 4099).

1.2. Study setting

In Spain, a tax-funded public National Health System provides universal outpatient and inpatient healthcare to the population. In parallel,

people can choose to receive healthcare at private facilities: around 1 in 4 admissions in 2017 took place in private hospitals. Each of Spain's 17 regions or autonomous communities is responsible for healthcare planning and delivery and thus manages its own healthcare facilities. Most of the data comes from three autonomous communities, Madrid, Andalusia, and Murcia, where the 14-day cumulative incidence of COVID-19 during 2020 was, respectively, 985, 145 and 100 cases per 100,000 (CNE, 2019), when recruitment started.

Specifically, data from the region of Madrid, which has Spain's highest population density (830 per square kilometer) and gross domestic product (GDP) per capita (EUR 35,913 in 2019), come from the city of Madrid, a metropolitan area. Data from the region of Andalusia, which has the country's largest total population but a low population density (96 per square kilometer) and the second lowest GDP per capita (EUR 19,633 in 2019), come from Málaga, a metropolitan area; Granada, a medium-sized urban area; and Huelva, and Cádiz, two small urban areas. Data from the region of Murcia, which has intermediate population density (130 per square kilometer) and GDP per capita (EUR 21,642 in 2019), come from the city of Murcia, a metropolitan area, and Cartagena, a medium-sized urban area (INE, 2019; OECD, 2014). For perspective, in Spain, the average population density is 94 per square kilometer and the average GDP per capita was EUR 24,426 in 2019.

1.3. Participants

The sample of this study is a non-probabilistic sample composed of health and care professionals working at different healthcare facilities (e.g., outpatient primary care and mental health care centers, outpatient and inpatient emergency care units, hospital wards including critical patient units, etc.) and includes professionals directly involved in clinical work (physicians, nurses, pharmacists, psychologists, and physiotherapist) and professionals involved in non-clinical tasks (community mental health social workers, administration and service personnel, and auxiliary service workers such as maintenance, cleaning, and safety personnel).

1.3.1. Recruitment process

Participants were surveyed through an online interview distributed by email: we contacted the different heads of each collaborating centers, to whom a link was sent so that they could forward the survey to all their workers. This approach was augmented by allowing workers to forward the survey to their peers, to enhance the response rate. A list of the sampling strategies across facilities is provided in the **Appendix**. In addition to being over 18 years old and working at a health care facility, there were no additional eligibility criteria. All participants signed the informed consent form.

1.4. Variables

Our survey included four types of variables: sociodemographic characteristics, work-related stressors, resilience and self-perceived social support, and mental health outcomes.

Sociodemographic variables included age (18–35 years, 36–50 years, and >51 years), gender (male, female) and education (primary, secondary, and university studies). We also asked respondents whether they had a history of prior mental health problems (yes/no). Last, we calculated a dichotomous index of region-level cumulative incidence of COVID-19, which was "high" if cases per 100,000 were more than 750 and "low" if they were equal or under 750 (more details are provided in the **Appendix**).

Work-related variables included being in direct care of COVID-19 patients (yes/no) and type of job, collapsed into the following categories: physicians, nurses, health technicians (e.g., nurse, X-ray, and laboratory technicians), ancillary workers (e.g., security staff, drivers, porters, administrative staff, and cleaning staff), other HCWs (e.g., clinical psychologists, physiotherapists, and biologists), and workers

from residential treatment facilities (e.g., assisted living facilities, nursing homes).

To measure a resilience factor, namely the ability to bounce back, we used the Brief Resilience Scale (BRS) (Rodríguez-Rey et al., 2016; Smith et al., 2008). The instrument sees the self-reported abilitiy to overcome difficult situations –that is, the ability to get well during adversity or to "bounce back"- as an important predictor of resilient behavior, or resilience outcomes. It consists of 6 items scored from 1 ("completely disagree") to 5 ("completely agree"). According to Smith et al. (2008), scores between 1 and 2.9, 3 and 4.3, and 4.3 and 5, indicate low, normal, and high resilience, respectively. For our study, Cronbach's alpha was 0.80 (95 percent CI: 0.78, 0.81). The instrument was developed using a sample that included students, cardiac, and chronic pain patients. Recent studies conducted during the COVID-19 pandemic have used this instrument to explore resilience across countries and populations (Ben Salah et al., 2021; Kaur et al., 2021; Kim et al., 2021), and have explored its associations with depression, as measured by the PHQ-9. To measure self-perceived social support, we designed two 4-point Likert-type scales (from "strongly disagree" to "strongly agree"). Items read: "I have loved ones who support me when I need it" and "I have a reliable network of colleagues at work". To ease interpretability of stratified descriptive analyses, we created two dummy variables by collapsing the "strongly disagree" and "disagree" responses, and the "agree" and "strongly agree" responses.

We used three standardized self-reported questionnaires to assess mental health outcomes. To measure depressive symptoms, we used the Patient Health Questionnaire, 9-question version (PHQ-9) (Diez-Quevedo et al., 2001; Kroenke et al., 2001). Each item is scored from 0 to 3 and a final score between 0 and 27 is obtained (higher scores indicate more depressive symptoms). For our study, Cronbach's alpha was 0.88 (95 percent CI: 0.87, 0.89). To measure psychological distress, we used the General Health Questionnaire (GHQ-12) (Goldberg et al., 1997; Sánchez-López and Dresch, 2008), a 12-item instrument widely used for screening purposes. Each item is scored from 0 to 3 and a final score between 0 and 12 is obtained (higher scores indicate higher psychological distress). For our study, Cronbach's alpha was 0.86 (95 percent CI: 0.85, 0.87). To assess suicidality, we used the item on death thoughts (yes/no) of the Columbia Suicide Severity Rating Scale (C-SSRS), which reads "During the past month, have you wished you were dead or wished you could go to sleep and not wake up?" (Al-Halabí et al., 2016; Posner et al., 2008).

1.5. Statistical analyses

First, we removed respondents who provided informed consent but did not go on to initiate the survey (n = 95). Then, we reported categorical variables as frequencies and valid percentages and continuous variables as mean/median and standard deviations for the whole sample and stratified by the exposures, i.e., resilience, self-perceived social support from loved ones and self-perceived social support from colleagues at work, which was recoded into an ordinal variable with four levels (below first quartile, first quartile to second quartile, second quartile to third quartile, and over third quartile). Last, we explored the association between the three exposures, resilience, self-perceived social support from loved ones and self-perceived social support from colleagues at work, and three mental health outcomes: depressive symptoms, as measured by the PHQ-9 score, psychological distress, as measured by the GHQ-12 score, and death thoughts, as measured by the C-SSRS. To that end, we fitted nine multivariable regression models (the three exposure variables were entered as independent variables for each of the outcomes). Six of them were linear regression models (outcomes PHQ-9 total score and GHQ-12 score) and three of them were binary logistic regression models (presence of death thoughts). All models were adjusted for the following potential sources of confounding: age, gender, educational level, type of job, being involved in direct care of COVID-19 patients, having a personal history of a prior mental disorder, and

region-level COVID-19 incidence, which was introduced as a fixed factor. The approach to handling of missing data was decided after initial comparison of survey completers and non-completers across available correlates.

All analyses were conducted using the packages dplyr and summarytools of R Studio for Mac (Version February 1, 5042).

2. Results

We recruited 2372 respondents between April 24 and June 22, 2020. Three out of four respondents completed the survey. Median response time was 19 min. While there were roughly no missing data in the initial (i.e., sociodemographic) section of the survey, missing data increased progressively with subsequent sections – indicating that data missingness was largely determined by survey extension. Completers and non-completers were similar in average age (41.8 vs. 42.1 years, respectively) and gender distribution (77.3% vs. 81.3% female, respectively). Hence, we assumed missingness to be completely at random and did not impute missing data but rather report them in.

Table 1 represents the characteristics of the study sample. Most respondents (78%) were women, mainly with ages between 18 and 50 years (72%). Madrid, Andalusia, and Murcia were represented by, respectively, 41%, 34%, and 15% of respondents. Regarding job types, two thirds of the respondents were either physicians or nurses. Sixty-six percent reported working directly with COVID-19 patients (i.e., having a frontline job).

Table 1 also shows the distribution of resilience (measured as BRS score) and self-perceived social support (as provided by loved ones and colleagues) across characteristics of the study sample. Resilience scores were in the average range. Social support by loved ones was self-perceived by roughly 95% of the sample, across sociodemographic groups, with the only slight exception that 14% of HCWs with primary studies or less did not perceive support from their loved ones. Social support by colleagues was self-perceived by around 85% of the sample, without important differences across groups.

Table 2 represents the distribution of mental health outcome variables across sociodemographic groups. Psychological distress and depressive symptoms were more frequent among younger age groups, while death thoughts did not show a clear age pattern. Women reported depressive symptoms, psychological distress, and death thoughts, more frequently than men. Education attainment was directly associated with reported psychological distress. While physicians and nurses reported the highest scores overall in depressive symptoms, psychological distress was reportedly more common among health technicians. Frontline HCWs reported distinctly higher presence of depressive symptoms, psychological distress, and death thoughts.

Table 3 summarizes the results of the multivariable regression models. We found that resilience, self-perceived social support provided by loved ones, and self-perceived social support provided by colleagues, were all inversely associated with depressive symptoms, psychological distress, and death thoughts.

3. Discussion

This study explored the association between both the self-reported ability to bounce back (a resilience factor) and self-perceived social support (as provided by loved ones and as provided by colleagues) and mental health outcomes in a large sample of Spanish HCWs during the initial COVID-19 pandemic outbreak. Our results indicate that the ability to bounce back and self-perceived social support were inversely associated with depressive symptoms, psychological distress, and dead thoughts, in models adjusted by potential sources of confounding.

Numerous studies have focused on risk factors over the last months, but few have identified factors that protect against poor mental health outcomes (Schug et al., 2021). Our findings fill in an important gap in the literature and generate an evidence base that should help guide

Table 1
Characteristics of the participants.

	Total, n (%)	Resilience[a]	Social support (loved ones)			Social support (colleagues)		
			Yes	No	Missing	Yes	No	Missing
Total	2372	3.19 (0.72)	1766 (95%)	86 (5%)		1625 (88%)	227 (12%)	
Age group								
18–35	788 (35%)	3.14 (0.74)	598 (96%)	27 (4%)	163	543 (87%)	81 (13%)	164
36–50	844 (37%)	3.18 (0.71)	647 (96%)	28 (4%)	169	589 (87%)	86 (13%)	169
> 51	625 (28%)	3.26 (0.70)	472 (95%)	26 (5%)	127	444 (89%)	55 (11%)	126
Missing	113	3.18 (0.66)	49 (91%)	5 (9%)	59	49 (91%)	5 (9%)	59
Gender								
Female	1831 (78%)	3.12 (0.70)	1360 (95%)	70 (5%)	401	1247 (87%)	183 (13%)	401
Male	505 (22%)	3.42 (0.71)	405 (96%)	15 (4%)	85	376 (90%)	44 (10%)	85
Missing	34	3.41 (0.35)	1 (50%)	1 (50%)	32	2 (100%)	0	32
Educational level								
Primary or less	28 (1%)	3.03 (0.86)	19 (86%)	3 (14%)	6	19 (86%)	3 (14%)	6
Secondary	358 (15%)	3.05 (0.74)	250 (93%)	18 (7%)	90	233 (87%)	35 (13%)	90
University	1954 (84%)	3.21 (0.71)	1497 (96%)	65 (4%)	392	1373 (88%)	189 (12%)	392
Missing	0		0	0	30	0	0	30
History of prior mental health problems								
No	1677 (71%)	3.23 (0.70)	1604 (96%)	71 (4%)	2	1469 (88%)	206 (12%)	2
Yes	116 (5%)	2.60 (0.76)	106 (91%)	10 (9%)	0	101 (87%)	15 (13%)	0
Missing	577 (24%)	3.04 (0.65)	56 (92%)	5 (8%)	516	55 (90%)	6 (10%)	516
Type of job								
Physicians	751 (35%)	3.26 (0.73)	618 (97%)	18 (3%)	115	569 (90%)	67 (10%)	115
Nurses	727 (34%)	3.13 (0.69)	570 (94%)	34 (6%)	123	523 (86%)	82 (14%)	122
Health technicians	221 (10%)	3.09 (0.71)	151 (91%)	14 (9%)	56	146 (89%)	19 (11%)	56
Ancillary workers[b]	136 (6%)	3.09 (0.74)	116 (96%)	5 (4%)	15	103 (85%)	18 (15%)	15
Other HCWs[c]	218 (10%)	3.29 (0.67)	173 (96%)	8 (4%)	37	163 (91%)	17 (9%)	38
Residential facilities[d]	96 (5%)	3.23 (0.68)	65 (96%)	3 (4%)	28	55 (81%)	13 (19%)	28
Missing	221	3.16 (0.83)	73 (95%)	4 (5%)	144	66 (86%)	11 (14%)	144
Frontline position								
No	602 (34%)	3.24 (0.69)	473 (95%)	26 (5%)	103	431 (86%)	68 (14%)	103
Yes	1181 (66%)	3.18 (0.72)	978 (96%)	41 (4%)	162	907 (89%)	112 (11%)	162
Missing	587	3.13 (0.73)	315 (94%)	19 (6%)	253	287 (86%)	47 (14%)	253

Note. HCWs = healthcare workers.

[a] M (SD); Brief Resilience Scale (BRS) from 0 (lower) to 5 (higher) resilience; missing data: n = 544.

[b] Include porters, drivers, security staff, administrative staff, cleaning staff, etc.

[c] Include psychologists, physiotherapists, biologists, etc.

[d] Include people working at housing facilities, long-term care facilities, etc.

decision-making regarding mental health prevention and care for HCWs, as they clarify the relevance of access to informal networks of care, such as family and friends, and of resilience factors such as the ability to bounce back, a personality trait that is closely associated with optimism and with social support, in the maintenance of mental wellbeing among HCWs during peaks in COVID-19 transmission.

In keeping with a large body of evidence (Alonso et al., 2021; Azoulay et al., 2020; Pappa et al., 2020; Santabárbara et al., 2021), we found that HCWs reported a large burden of negative mental health outcomes – i.e., depressive symptoms and psychological distress. Our sample was similar to those from studies conducted in comparable settings in that depressive symptoms and psychological distress were particularly frequent among women, in comparison with men, and especially among nurses (Alonso et al., 2021; Pappa et al., 2020).

Self-perceived social support was inversely associated with all negative mental health outcomes under consideration. These data are consistent with previous research conducted in non-selected samples, indicating that low levels of social support worsen mental health in general (Barrón López De Roda and Sánchez Moreno, 2001) and may be associated with increased risk of post-traumatic stress (Brewin et al., 2000; Ozer et al., 2003). During the pandemic, social support has also been shown to decrease anxiety and depression in the general population (Li et al., 2020). Our results expand previous evidence, conducted on HCWs before the pandemic onset, suggesting that both the social support of family members and colleagues have a positive impact on mental health outcomes of HCWs (Ma et al., 2020).

As expected, we found a strong negative association between the self-reported ability to bounce back (resilience factor) and all negative mental health outcomes – which resulted particularly strong for depressive symptomatology. Pre-pandemic studies conducted among HCWs from Spain (Arrogante and Aparicio-Zaldivar, 2017) and Thailand (Songprakun and McCann, 2015), and a study conducted among HCWs from the United States during the pandemic (Barzilay et al., 2020), found similar results. The negative association between the resilience factor and death thoughts is also in line with previous evidence that resilience plays a moderating role against suicidal behaviors in clinical populations with depression and/or anxiety disorders (Li et al., 2020).

Notably, our findings regarding social support and the ability to bounce back should be considered altogether, as recent studies that have analyzed resilience in HCWs suggest that both factors are deeply interrelated – that is, self-perceived social support has a positive impact on resilience, among other factors (Bozdağ and Ergün, 2020).

Our study has important implications for the development of intervention plans aimed at preventing the psychological toll of the pandemic on this high-risk population. For instance, our results indicate that ensuring that HCWs remain in close contact with colleagues and loved ones, even in presence of strong social distancing measures (e.g., using digital tools based on electronic devices) is paramount for mental health prevention efforts. Also, these findings highlight the importance of promoting protective factors that enhance resilience such as social support, counseling, or brief psychological interventions. Further occupational health studies should explore whether these factors can also prevent burnout, which has become a rather common syndrome among HCWs during the COVID-19 pandemic (Miguel-Puga et al., 2021).

However, there are some limitations to our study. First, the cross-sectional nature of our design limits our ability to draw conclusions

Table 2
Description of mental health outcomes.

	Total	Depression PHQ-9 (n = 1851)[a]	Psychological distress GHQ-12 (n = 1918)[a]	Death thoughts C-SSRS (n = 1817)	
				Yes	No
Total[b]	2372	7.33 (5.37)	5.18 (3.38)	127 (7%)	1690 (93%)
Age					
18–35	788 (35%)	7.91 (5.11)	5.57 (3.41)	43 (7%)	573 (93%)
36–50	844 (37%)	7.45 (5.53)	5.20 (3.37)	52 (8%)	611 (92%)
> 51	625 (28%)	6.52 (5.44)	4.67 (3.36)	31 (6%)	451 (94%)
Gender					
Female	1831 (78%)	7.76 (5.36)	5.42 (3.36)	102 (7%)	1300 (93%)
Male	505 (22%)	5.86 (5.16)	4.38 (3.36)	25 (6%)	388 (94%)
Educational level					
Primary	28 (1%)	7.91 (6.63)	3.74 (3.40)	1 (5%)	20 (95%)
Secondary	358 (15%)	8.28 (6.12)	4.96 (3.31)	29 (11%)	230 (89%)
University	1.954 (84%)	7.15 (5.20)	5.24 (3.39)	97 (6%)	1440 (94%)
History of prior mental health problems					
No	1677 (94%)	7.05 (5.19)	5.08 (3.37)	99 (6%)	1574 (94%)
Yes	116 (6%)	11.09 (6.66)	6.70 (3.52)	24 (21%)	92 (79%)
Type of job					
Physicians	751 (35%)	6.91 (5.15)	5.36 (3.45)	40 (6%)	584 (94%)
Nurses	727 (34%)	7.90 (5.31)	5.47 (3.31)	40 (7%)	556 (93%)
Health technicians	221 (10%)	8.53 (5.59)	5.18 (3.25)	15 (9%)	144 (91%)
Ancillary workers[c]	136 (6%)	7.23 (6.102)	4.60 (3.41)	9 (8%)	110 (92%)
Other HCWs[d]	218 (10%)	6.21 (5.09)	4.57 (3.39)	11 (6%)	165 (94%)
Residential facilities[e]	96 (5%)	6.28 (4.92)	3.65 (3.10)	4 (6%)	62 (94%)
Frontline position					
No	602 (34%)	5.90 (4.92)	4.25 (3.48)	26 (5%)	462 (95%)
Yes	1181 (66%)	8.02 (5.39)	5.69 (3.26)	71 (7%)	928 (93%)

Note. HCWs = healthcare workers; PHQ-9 = Patients' Health Questionnaire – 9 items; GHQ-12 = General Health Questionnaire – 12 items; C-SSRS = Columbia Suicide Severity Rating Scale.
[a] M (SD); PHQ-9 score from 0 to 27; GHQ-12 total score from 0 to 12.
[b] Missing data varies depending on the instrument.
[c] Include porters, drivers, security staff, administrative staff, cleaning staff, etc.
[d] Include psychologists, physiotherapists, biologists, etc.
[e] Include people working at housing facilities, long-term care facilities, etc.

Table 3
Association between resilience and social support and mental health outcomes.

	Depression symptoms (PHQ-9)				Psychological distress (GHQ-12)				Death thoughts (C-SSRS)			
	Unadjusted		Adjusted[a]		Unadjusted		Adjusted[a]		Unadjusted		Adjusted[a]	
	B	95% CI	B	95% CI	B	95% CI	B	95% CI	Odds ratio	95% CI	Odds ratio	95% CI
Resilience (BRS)	−3.11	(-3.42, −2.79)	−2.36	(-2.73, −1.99)	−1.72	(-1.82, −1.51)	−1.42	(-1.65, −1.19)	0.34	(0.26, 0.43)	0.41	(0.29, 0.55)
SS (loved ones)	−1.10	(-1.48, −0.71)	−0.82	(-1.24, −0.39)	−0.64	(-0.88, −0.40)	−0.54	(-0.81, −0.28)	0.54	(0.43, 0.68)	0.53	(0.40, 0.70)
SS (colleagues)	−1.17	(-1.49, −0.84)	−1.06	(-1.41, −0.70)	−0.75	(-0.96, −0.55)	−0.76	(-0.98, −0.53)	0.60	(0.48, 0.74)	0.60	(0.46, 0.78)

Note: PHQ-9 = Patients' Health Questionnaire – 9 items; GHQ-12 = General Health Questionnaire – 12 items; C-SSRS = Columbia Suicide Severity Rating Scale; BRS = Brief Resilience Scale; SS = social support.
[a] Adjusted for age, gender, educational level, type of job, being involved in direct care of COVID-19 patients, having a personal history of a prior mental disorder, and region-level COVID-19 incidence (fixed factor).

about causal relationships between variables, as we cannot rule out the possibility of reverse causation, especially for people with major depressive disorders, who might give biased responses to the BRS score (i.e., underestimate their resilience factors). Notwithstanding, given that we measured resilience based on an instrument, the BRS scale, intended to capture resilience as a trait rather than a state – that is, that does not vary markedly over time –, it seems reasonable to conclude that our design emulates a longitudinal assessment to a large extent. Second, our non-probabilistic sampling method somewhat increases the risk of selection bias. This limitation is common to most studies exploring mental health outcomes of HCWs during the early phases of the pandemic (Romero et al., 2020; Rossi et al., 2020; Wanigasooriya et al., 2021). Of note, our study sample and findings are largely in line with those of studies that provide response rates of large samples in Europe (Alonso

et al., 2021; Azoulay et al., 2020; Lasalvia et al., 2021). Third, we used an ad-hoc instrument to measure self-perceived social support, somewhat hindering transportability of results to other settings. Fourth, while models were adjusted by known sources of confounding at the individual and the location levels, we cannot rule out the possibility of residual confounding. Last, we did not dichotomize negative mental health outcome scores because previously stablished thresholds for probable depression or psychological distress may not be valid in a highly selected population (i.e., HCWs) amidst an extremely extraordinary situation (i. e., the initial pandemic outbreak).

In conclusion, this study expands existing evidence on the protective role of resilience factors and self-perceived social support for mental health of HCWs to the current pandemic context. Our results provide preliminary evidence that mental health prevention efforts for HCWs

should favor contact maintenance with colleagues and loved ones and boost HCWs' access to other factors that enhance resilience, such as brief psychological interventions. Future research should confirm the associations depicted here using probabilistic samples of HCWs, including participants from other contexts, and implementing longitudinal designs that enhance causal inference.

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Declaration of competing interest

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Appendix A. Supplementary data

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