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Socioeconomic status, social support, coping, and fear predict mental health status during the first year of the COVID-19 pandemic: a 1-year longitudinal study

Margarida Jarego[1] · Alexandra Ferreira-Valente[1,2] · Elisabet Sánchez-Rodríguez[3] · Jordi Miró[3] · Patrício Costa[4,5,6] · José Pais-Ribeiro[1,6]

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Abstract

Research has shown that both the COVID-19 pandemic and the governmental measures implemented to tackle it severely impacted people's mental health worldwide. This study aimed at monitoring adults' mental health status during the first year of the COVID-19 pandemic and assessing demographic, socioeconomic, and psychosocial variables as mental health status development's potential predictors. A total of 105 adults (79% women; age: 18–72) completed a sociodemographic questionnaire and measures of mental health status, social support, coping, and fear of COVID-19 at T0 (Apr-May 2020), T1 (Nov 2020-Jan 2021) and T2 (May 2021). A Hierarchical Linear Model was used to assess the mental health status development trajectory and its predictors. Overall, no statistically significant differences in mental health status emerged. At the pandemic's beginning, social support, and positive/active coping predicted better mental health status. Higher socioeconomic status, supportive coping, and the use of substances predicted poorer mental health status. Individuals who were more afraid of COVID-19 continued to improve their self-reported mental health status over time, although at a slower rate than individuals who were less afraid of COVID-19. These findings suggest that, in the context of an epidemiological crisis, such as COVID-19, fear of infectious disease should be assessed as a routine care measure, while cognitive behavioral interventions discouraging the use of supportive coping and the use of substances should be implemented.

Keywords Mental health · Socioeconomic status · Coping · Fear · COVID-19 · Longitudinal study

Introduction

The COVID-19 pandemic represents a global health crisis that caused a profound impact on countries, societies, and individuals' lives (Cavazzoni et al., 2023). Previous findings suggest that both the COVID-19 pandemic itself and governmental measures undertaken to tackle it had an important negative effect on individuals' psychological functioning (Alsolais et al., 2021; Cavazzoni et al., 2023; Gullo et al., 2021; Miró et al., 2022). However, individuals' psychological functioning in response to the COVID-19 pandemic and the implemented measures varies from one individual to another. Previous studies performed in the context of public health crises, such as severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS), suggest that interindividual differences in psychological functioning might be partially attributed to

✉ Alexandra Ferreira-Valente
mafvalente@gmail.com

1 William James Center for Research, Ispa– University Institute, Lisbon, Portugal

2 Department of Social and Organizational Psychology, Centre for Social Research and Intervention (Cis-Iscte), University Institute of Lisbon (Iscte-IUL), Lisbon, Portugal

3 Research Center for Behavior Assessment (CRAMC), Department of Psychology, Universitat Rovira i Virgili, Unit for the Study and Treatment of Pain– ALGOS, Catalonia, Spain

4 Life and Health Sciences Research Institute (ICVS), School of Medicine, University of Minho, Braga, Portugal

5 ICVS/3B's - PT Government Associate Laboratory, Braga/Guimarães, Portugal

6 Faculty of Psychology and Education Sciences, University of Porto, Porto, Portugal

several demographic, socioeconomic, and psychosocial factors (Mak et al., 2009; Park et al., 2020; Sim et al., 2010).

Gender, age, and marital status are among the demographic variables that previous findings suggest might be predictors of the above-mentioned interindividual variability. Women, as well as unmarried younger individuals of both genders, tend to report worse psychological functioning (Alsolais et al., 2021; Gullo et al., 2021; Lawal et al., 2022; Miró et al., 2022; Pais-Ribeiro et al., 2022; Sánchez-Rodríguez et al., 2022). Gender differences have been attributed to gender inequalities related to greater financial instability, a greater need to engage in household chores, and a greater difficulty in managing work-life balance during lockdowns of women as compared to men (Cavazzoni et al., 2023). Age- and marital status-related differences, on the other hand, have been said to be associated either with: (a) a potentially lower vulnerability of older adults and married individuals to uncertainty (e.g., uncertainty related to losing their job, financial stability) in the case of older adults relative to their younger counterparts (AlHusseini et al., 2021; Satici et al., 2020); or with (b) a potentially lower social isolation and higher access to social support of married individuals, acting as a protection factor for mental health in these individuals (Lawal et al., 2022).

Socioeconomic predictors of interindividual differences in psychological functioning include socioeconomic status (SES) and monthly expenses, with individuals with lower SES and with higher monthly expenses frequently reporting worse psychological functioning (Claes et al., 2021; Zhi et al., 2020). Individuals with lower SES are thought to have been more vulnerable due to an associated financial insecurity to which these individuals might have been more prone to (Claes et al., 2021), while in individuals with greater financial resources that enable greater monthly expenses a reduction of residual sadness and increased sense of personal control was observed (Rick et al., 2014).

Finally, psychosocial factors that previous research suggests to predict said interindividual variability include, among others, social support, coping, and fear of COVID-19. Indeed, individuals with greater social support (i.e., the perception of instrumental and emotional support in social relationships; Cavazzoni et al., 2023) were found to be better off than those individuals with lower social support (Cavazzoni et al., 2023; Miró et al., 2022; Pais-Ribeiro et al., 2022). The role of social support has been previously attributed to a sense of connectedness and a lower sense of social isolation during health hazards, such as the COVID-19 pandemic (Cavazzoni et al., 2022; Miró et al., 2022; Pais-Ribeiro et al., 2022). Coping strategies such as active coping, instrumental support, emotional support, positive reframing, acceptance, and the use of humor to deal with stress were found to be associated with improved psychological functioning (e.g., lower levels of depression, anxiety, or stress) in the context of the COVID-19 pandemic (Alsolais et al., 2021; Budimir et al., 2021; Cavazzoni et al., 2023; Gurvich et al., 2021; Guszkowska & Dąbrowska-Zimakowska, 2022; Miró et al., 2022; Pais-Ribeiro et al., 2022). On the contrary, the use of religious coping, self-blame, venting, denial, self-distraction, behavioral disengagement, and substance use, as a way to deal with stress were frequently found to be associated with worse psychological functioning during this public health crisis (Budimir et al., 2021; Cavazzoni et al., 2023; Gurvich et al., 2021; Guszkowska & Dąbrowska-Zimakowska, 2022; Miró et al., 2022; Pais-Ribeiro et al., 2022). These last group of coping strategies were found to be maladaptive as there are cumulative findings that they are associated either with decreased quality of life and well-being, as well as increased perceived stress, depression, anxiety, and insomnia in the context of the COVID-19 pandemic (Budimir et al., 2021; Gurvich et al., 2021; Guszkowska & Dąbrowska-Zimakowska, 2022). Regarding fear of COVID-19, higher levels of fear of COVID-19 seem to be associated with lower levels of mental health (Alsolais et al., 2021), which may be explained by an exacerbation of psychological issues, such as insomnia or depression.

Understanding which factors are associated with psychological functioning during times of health crisis such as this is paramount. This knowledge helps to identify potential protective and risk factors that may enhance people's resources, or, on the contrary, exacerbate individuals' vulnerabilities, during future health crises. This knowledge might, then, be used to tailor existing interventions directed at the most vulnerable groups of individuals. The knowledge we have of the potential predictors of psychological functioning in the context of this health crisis so far derives, for the most part, from cross-sectional studies focusing on the beginning of the pandemic. These cross-sectional studies, while examining the psychological function of certain (sometimes large) samples of the general population and its association with demographic, socioeconomic, and psychosocial factors, did not capture the evolution of the mental health status over time, and were unable to confirm if factors found to be associated with psychological functioning in a given moment in time, were also predictors the psychological functioning development over time. These limitations can be overcome by longitudinal studies. Longitudinal research monitoring the development of psychological functioning during the COVID-19 pandemic, and its (demographic, socioeconomic, and psychosocial) correlates is scarcer and, for the most part, considered only short- to medium-term follow-ups (Lo Coco et al., 2023).

Nevertheless, recent longitudinal studies have found that, compared to pre-pandemic levels, depression, anxiety, and psychological distress have increased (Daly et al., 2021;

Gullo et al., 2021; Obiols et al., 2023). Despite the fact that mental health deteriorated after the onset of the COVID-19 pandemic, there are some inconsistencies in the literature regarding its development. For instance, during the period following the onset of the COVID-19 pandemic, depression and psychological distress decreased (Daly et al., 2021; Fernández-Theoduloz et al., 2024; Gullo et al., 2021; Robinson & Daly, 2021). The results of anxiety studies have been mixed. Some have reported decreases in anxiety levels (Daly et al., 2021; Fernández-Theoduloz et al., 2024; Robinson & Daly, 2021), while others have found anxiety to remain stable over time (Gullo et al., 2021).

A recent systematic review and meta-analysis summarized the evidence of available longitudinal studies focusing on these issues in adults during the COVID-19 pandemic (Cénat et al., 2022). This systematic review included 64 studies that assessed depression ($n = 40$), anxiety ($n = 37$), distress ($n = 18$), and other indicators of psychological (dis) functioning ($n = 24$). While the meta-analysis concluded that a decrease in depression and anxiety over time seems to have been observed, no significant changes in distress and other psychological (dis)functioning indicators over time occurred. However, the moderate to high heterogeneity reported suggests a somewhat limited reliability of these conclusions. For instance, 31 studies (out of 64) reported a significant decrease in depression, anxiety, distress, or other indicators of psychological (dis)functioning (e.g., Bendau et al., 2021; Yocum et al., 2021), while 14 studies reported a significant increase in these criterion variables over time (e.g. Czeisler et al., 2021; Vlake et al., 2021), and 19 studies reported mixed results (e.g., Dalkner et al., 2021; Iovino et al., 2021). Importantly, only four out of the 64 studies included in this systematic review and metanalysis considered a medium- (i.e., > 6 and < 12 months; $n = 3$) to long-term (i.e., $\geq$ 12 months; $n = 1$) follow-up, with only one study assessing at least one indicator of psychological functioning at 12-months after baseline, usually during the first lockdown associated with the COVID-19 pandemic in the respective countries where the studies were conducted.

In fact, that we are aware of, only three recent long-term longitudinal studies focusing on the development of psychological functioning in adults from the general population in the context of the COVID-19 pandemic have been published so far (Ausín et al., 2022; Du et al., 2023; Lo Coco et al., 2023). One of these studies was conducted in Spain (Ausín et al., 2022) and found symptoms of depression and anxiety, but not posttraumatic symptomatology, increased over a one-year period. The second study, performed in China, showed an increase in the reported anxiety and stress symptoms from the beginning of the pandemic until August 2021, while no changes were observed in depression (Du et al., 2023). Finally, the third study, conducted in Italy, assessed a large sample of 3931 adults over a period of 12 months (Lo Coco et al., 2023). The authors identified three groups of participants: (a) those who were worse off during the first mandatory lockdown associated with COVID-19 and for which no significant changes in depression, anxiety, and stress occurred over time (moderate-chronic class); (b) those who reported normal levels of psychological discomfort at the baseline (normal-increasing class), and (c) those reporting anxiety and stress symptoms in the normal range, but mild depression at the onset (mild-vulnerable class). For the latter two groups, a significant decrease in depression and anxiety from the baseline to the 3-month follow-up and a significant increase in these variables from the 3- to the 12-month follow-up was observed. Participants who were women, younger, unemployed, and had higher levels of expressive suppression, intolerance to uncertainty, and fear of COVID-19, were more likely to be in the moderate-chronic and mild-vulnerable classes. None of these three studies, however, examined if (and how) demographic, socioeconomic, and psychological factors predicted psychological functioning development over time. Long-term longitudinal studies, assessing the predictors of psychological functioning development trajectories over time would be useful to inform public policies and healthcare providers worldwide of both those individuals more at risk of long-term negative impact of COVID-19 on psychological functioning, and those psychological variables that should be targeted by psychological intervention programs since the beginning of health crisis similar to the COVID-19 pandemic.

Given the considerations above, this study aimed at monitoring the development of psychological functioning in adults living in Portugal during the first year of the COVID-19 pandemic, and its correlates. More specifically, we sought to: (a) examine the mental health status development trajectory over a one-year period since the first mandatory lockdown associated with the COVID-19 pandemic in Portugal (i.e., between March 2020 and May 2021); (b) study the association between demographic (i.e., gender, age, and marital status), socioeconomic (i.e., SES, and monthly expenses) and psychosocial (i.e., social support, coping, and fear of COVID-19) factors and mental health status at baseline; and (c) test if these demographic, socioeconomic and psychosocial factors predict the trajectory of mental health status over time. In light of the existing literature, we anticipated that: (a) mental health status would decrease during the first year of the COVID-19 pandemic; (b) being older, married, having higher monthly expenses, having social support, and using active coping, planning, instrumental support, emotional support, positive reframing, acceptance, and humor would predict better mental health status baseline scores; and (c) being a woman, having

a lower SES, using religious coping, self-blame, venting, denial, self-distraction, behavioral disengagement, and substance use, as well as being afraid of the COVID-19 would predict poorer mental health status baseline scores. Given the scarcity of previous research about the predictors of the trajectory of mental health status, no a priori expectations were formulated about this specific aim of the study.

Method

Participants

The study participants were adults from the general population living in Portugal. Prospective participants were eligible if they: (a) lived in Portugal between March 2020 and May 2021; (b) were 18 years old or over; (c) were able to read and understand Portuguese; (d) completed the online questionnaire in at least two of the three moments of assessment, including the first moment of assessment; and (e) volunteered to participate. A total of 106 individuals agreed to participate and met the inclusion criteria.

Measures

Participants filled out a sociodemographic questionnaire, along with measures of mental health status, social support, coping, and fear of COVID-19.

Sociodemographic questionnaire

The sociodemographic questionnaire asked participants about their gender (woman, man, or other), age, marital status (single, married, divorced, or widowed), educational level according to the 2011 International Standard Classification of Education, occupation (according to the 2008 International Standard Classification of Occupations), monthly household income, and monthly expenses (up to 635€, 636€-1270€, 1271€-2540€, 2541€-5080€, 5081€-9525€, more than 9525€). The variables gender and marital status were transformed into dummy variables, and the variable monthly expenses was transformed into a numerical variable using the midpoint of each category. A composite variable SES was computed considering education level, occupation, and monthly household income, as described in the Data Analysis section below. Lower scores on the composite variable SES represented individuals of higher SES (e.g., higher education level, higher monthly household income), whilst higher scores represented individuals of lower SES (e.g., lower education level, lower monthly household income).

Mental health inventory– 5-Item

The Portuguese version of the five-item Mental Health Inventory (MHI-5; (Pais-Ribeiro, 2001) was used. The MHI-5 is a self-report questionnaire measuring mental health status in terms of psychological distress and psychological well-being. Respondents were asked to respond to two favorably (e.g., feeling calm and peaceful) and three unfavorably (e.g., feeling downhearted and blue) worded items and rate their frequency either since the beginning of the COVID-19 pandemic (at the first assessment) or lately (at the following assessments), using a 6-point Likert-type scale (from 1 = "Always", to 6 = "Never"). Raw scores were computed according to the instructions of the scoring manual (Davies et al., 1988) and transformed into a 0–100-point scale. Both the original and Portuguese versions of the MHI-5 demonstrated to be valid and reliable mental health status measures (Pais-Ribeiro, 2001; Veit & Ware, 1983). The internal consistency of this measure in the study sample was 0.90 at the first two assessments and 0.93 at the last evaluation.

Social support satisfaction scale– intimacy subscale

The Intimacy subscale of the Social Support Satisfaction Scale (SSSS; (Pais-Ribeiro, 1999) was used to evaluate social support by assessing the participants' perception of intimate social support (i.e. the perception of having close friends and family on whom someone can rely on). Respondents were asked to answer four items (e.g., I feel alone in the world and without support) on a 5-point Likert scale (from 1 = "Totally disagree", to 5 = "Strongly agree"). The subscale score was computed by summing the four items, with scores ranging from 4 to 20. Previous research supports the reliability and validity of SSSS scores as a measure of satisfaction with social support (Pais-Ribeiro, 1999). This scale showed a good internal consistency ($\alpha = 0.81$) in this study sample.

Brief coping orientation to problems experienced inventory

The Brief Coping Orientation to Problems Experienced Inventory (Brief COPE; (Pais-Ribeiro & Rodrigues, 2004) was used to evaluate coping. Participants were asked to think of a particularly difficult situation experienced in the context of the current COVID-19 pandemic, in which they felt a high level of stress. This self-report measure consists 28 items (e.g., thinking hard about what steps to take) grouped in 14 subscales: (1) active coping (i.e., taking action to try to improve the situation), (2) planning (i.e., developing a strategy to handle the situation), (3) use of instrumental support (i.e., asking for help and guidance from other people),

(4) use of emotional support (i.e., attaining comfort and sympathetic from others), (5) religion (i.e., finding comfort in religious beliefs/practices), (6) positive reframing (i.e., changing the perspective of the situation into a more positive way), (7) self-blame (i.e., criticizing oneself for the situation), (8) acceptance (i.e., making peace that a situation has happened), (9) venting (i.e., expressing negative feelings to others), (10) denial (i.e., refusing to accept that the situation has happened), (11) self-distraction (i.e., engaging in activities to take their mind off things), (12) behavioral disengagement (i.e., ceasing attempts to try to manage the situation), (13) substance use (i.e., using drugs to feel better about the situation), and (14) humor (i.e., making jokes about the situation). Respondents were asked to rate the frequency of use of each coping strategy since the beginning of the pandemic in Portugal, on a 4-point Likert-type scale (from 0 = "I haven't been doing this at all", to 3 = "I've been doing this a lot"). Fourteen scores were computed (one per subscale) by summing the two items of each subscale. Scores range between 0 and 6. Previous research supports the validity and reliability of both the original and Portuguese versions of the Brief COPE (Carver, 1997; Pais-Ribeiro & Rodrigues, 2004). In the current sample, internal consistency for each subscale was: 0.61 for active coping and self-distraction; 0.52 for planning; 0.79 for use of instrumental support and religion; 0.78 for use of emotional support; 0.73 for positive reframing; 0.63 for self-blame; 0.60 for acceptance; 0.77 for venting; 0.34 for denial; 0.65 for behavioral disengagement; 0.91 for substance use; and 0.81 humor.

Fear of COVID-19 scale

The Portuguese version of the Fear of COVID-19 Scale (FCV-19S-P; (Jarego et al., 2023) was used to assess the fear of COVID-19. This self-report measure of seven items (e.g., I am afraid of losing my life because of coronavirus-19) responded on a 5-point Likert scale (from 1 = "Strongly disagree", to 5 = "Strongly agree"). One overall score was computed by summing all items ranging from 7 to 35. The original and Portuguese versions of the FCV-19S-P are valid and reliable measures of fear of COVID-19 (Ahorsu et al., 2022; Jarego et al., 2023). This measure showed a good internal consistency ($\alpha = 0.87$) in the study sample.

Procedure

Ethical approval was obtained from Ispa - University Institute's Ethical Committee for Research (reference I/033/04/2020). Prospective participants from the general population of adults living in Portugal between March 2020 and May 2021 were recruited through several means. The study was disclosed: (a) on the website and newsletter of the Order of Portuguese Psychologists– OPP; (b) via email sent to different organizations (e.g., universities) and individuals who could share the study with prospects; and (c) on social media (e.g., Facebook).

Prospective participants interested in this study were redirected to an online survey platform (Qualtrics), which fully described the study's aims and procedures. Those individuals providing informed consent to participate were then redirected to the online survey on the same web-based platform. Participants were informed of the longitudinal nature of the study, that their participation was voluntary and anonymous, and that they could drop out at any moment. Participants were sent a reminder email at the beginning of the second (6-month follow-up) and third (12-month follow-up) assessment moments. Data were collected during periods in which the Portuguese government declared a state of emergency due to the COVID-19 pandemic (i.e., T0 and T1), and at the end of this period (i.e., T2). Data were collected between (a) April 16 and May 2, 2020 (T0); (b) November 19, 2020, and January 30, 2021 (T1); and (c) May 3 and 30, 2021 (T2). The Portuguese government adopted different measures over time, depending on the development of the pandemic.

Data analysis

As a rule of thumb, the minimum sample size required to compute a hierarchical linear model (HLM) without leading to biased regression coefficients, variance components, and standard errors is 51 participants (Maas & Hox, 2005). Means, standard deviations, and frequencies of the study variables were computed. Skewness (*Sk*) and kurtosis (*Ku*) were also computed to assess items' normality, with absolute values lower than three and 10, respectively, indicating an absence of severe violation of the normality assumption. Data were screened for univariate outliers. Dichotomous variables with at least 90 – 10 splits between categories were retained, even though their association with other variables may be deflated (Tabachnick & Fidell, 2019). In the current study, only one dichotomous variable (i.e., marital status widow) showed a split of 97 – 3. Potential outliers in continuous variables were identified through standardized scores larger than 3.29 (Tabachnick & Fidell, 2019). In the current study, one case in the variable substance use showed a standardized score larger than 3.29 (z-score = 6.3), causing severe normality problems ($Sk = 3.6$; $Ku = 15.7$), and its value was disconnected from the other cases. For these reasons, this participant was eliminated from the subsequent statistical analysis (Tabachnick & Fidell, 2019). Missing values were analyzed in terms of the percentage of missing and the mechanism of missing data (Tabachnick & Fidell, 2019). Missing values ranged between 11 and 28% for the

study variables MHI-5 and FCV-19S-P, and missing data was considered missing completely at random by performing Little's Test of Missing Completely at Random. Hence, imputation of the missing values was executed through expectation maximization. The final sample consisted of 105 participants.

The categorical variables education level, occupation, and monthly household income were used to compute a single composite score of SES, using Categorial Principal Component Analysis. The three variables saturated in one dimension. To reduce the number of predictors in the analysis, principal component analysis (PCA) with an oblique rotation (direct oblimin) was applied to the 14 subscales of the Brief COPE. The component scores were then used as predictors in the regression analysis. The PCA originated a 5-component solution (first five eigenvalues: 3.5, 3.7, 1.4, 1.1, and 1), explaining 69% of the variance of the Brief COPE subscales. All factor loadings of each subscale on the corresponding component were at least 0.48. Similar component structure has been found in the literature (e.g., Hastings et al., 2005; Skapinakis et al., 2020; Voronin et al., 2020). We have labeled the five components based on the ones suggested in these previous studies: Positive/active coping (positive reframing, acceptance, active coping, planning, and humor), Supportive coping (use of instrumental support, use of emotional support, and venting), Active avoidance coping (behavioral disengagement, self-blame, and self-distraction), Denial/religious coping (denial and religion), and Substance use coping (substance use).

A HLM was used to assess the growth of study participants' self-reported mental health status development throughout the first year of the COVID-19 pandemic and to test if demographic, socioeconomic, and psychosocial predictors were significantly related to their trajectory. First, a null model, i.e., a model with no predictors, was specified. Based on this model, the intraclass correlation (ICC) was calculated. If deemed substantial, participants' mental health status would be considered different from each other (Heck et al., 2014). Additionally, a significant intercept variance between participants was tested based on Wald Z test. If ICC was deemed substantial and Wald Z test was considered significant, suggesting the adequation of the development of further complex models. Second, a Level 1 model was specified. Considering the number of time points (three), only the linear growth was tested (Heck et al., 2014). Several models were tested using different covariance structures, and the pair with the lowest Akaike's Information Criteria was chosen [Level 1: a first-order factor analytic (constant diagonal offset) and Level 2: identity]. Restricted maximum likelihood was the estimation method applied.

Finally, a Level 2 model was specified, which included the independent variables under study as predictors. All independent variables were centered on their grand mean, which allows advantages in multilevel modeling in interpreting intercepts, interaction terms, and variances (Heck et al., 2014). The main effects of time, gender, age, marital status, SES, monthly expenses, social support, positive/active coping, supportive coping, active avoidance coping, denial/religious coping, substance use coping, and fear of COVID-19, and the interactions terms of time × gender, time × age, time × marital status, time × SES, time × monthly expenses, time × social support, time × positive/active coping, time × supportive coping, time × active avoidance coping, time × denial/religious coping, time × substance use coping, and time × fear of COVID-19 were used as fixed factors. All independent variables were analyzed simultaneously in the multivariate analysis. Alpha was set at 0.05 for all analyses. All data analyses were performed with IBM SPSS Statistics (v. 25).

Results

Sample characteristics and descriptive statistics

The sociodemographic characteristics of the study sample are summarized in Table 1. As can be seen, most participants were women, unmarried, with ages ranging from 18 to 72 years old. Relative to SES-associated variables, most participants had a high education level, were professionals (e.g., science and engineering professionals, health professionals), and had a monthly household income higher than the national average monthly salary in the year 2020 (i.e., ~1042€).

Table 2 summarizes the descriptive statistics for the study variables in the study sample, at the different assessments. As can be seen, the average mental health status was 59.7 ($SD = 17.8$) at T0 and 60.6 ($SD = 19.1$) at T2.

Hierarchical linear model of mental health status development trajectory and its correlates

No within-subjects statistically significant mean differences were found in mental health status development trajectory along the three assessments, F (1, 102.294) = 0.621; $p = .432$. The ICC of the baseline model was 0.315, which indicates a variance in mental health status between participants of 31.5%. The intercepts also varied significantly across participants ($Wald\ Z = 4.009$, $p < .001$). Thus, a multilevel model was built to explain this intercept variability, as displayed in Table 3.

Individuals with higher social support ($B = 0.685$, $p = .009$) and using more frequently positive/active coping ($B = 4.594$, $p < .001$) reported better mental health status at

Table 1 Characteristics of the study sample ($n = 105$)

Sociodemographic and economic characteristics	*n*	%
Gender		
Woman	83	79
Man	22	21
Educational level		
ISCED level 2	1	1
ISCED levels 3	7	7
ISCED levels ≥ 6	97	92
Marital status		
Single	49	47
Married/Marital relationship	41	39
Divorced	12	11
Widow	3	3
Monthly household income [a]		
< 635€	2	2
636€-1270€	16	15
1271€-2540€	41	39
2541€-5080€	30	29
5081€-9525€	7	7
> 9525€	2	2
Monthly expenses		
317.5€	5	5
953€	48	46
1905.5€	38	36
3810.5€	13	12
7303€	1	1
Occupation [b]		
Managers	5	5
Professionals	56	53
Technicians and associate professionals	8	8
Clerical support workers	9	9
Services and sales workers	5	5
Elementary occupations	1	1
Students	16	15

[a] The variable monthly household income has 7 missing values (7%); [b] The variable occupation has 5 missing values (4%)

Table 2 Descriptive statistics of the study variables ($n = 105$)

Measures	M	SD	Sk	Ku	Min-Max
MHI-5					
T0	59.7	17.8	-0.4	0.2	4-100
T1	59.7	17.3	-0.1	-0.7	20–100
T2	60.6	19.1	-0.6	-0.6	14–89
Intimacy Subscale of SSSS [a]	13.8	4.3	-0.3	-0.8	4–20
Brief COPE subscales [a]					
Active coping	3.6	1.4	-0.1	-0.4	0–6
Planning	3.7	1.3	-0.3	0.4	0–6
Use of instrumental support	2.1	1.5	0.6	0.2	0–6
Use of emotional support	2.5	1.6	0.3	-0.3	0–6
Religion	1.7	1.8	1.1	0.2	0–6
Positive reframing	3.3	1.5	0.2	-0.5	0–6
Self-blame	1.5	1.3	1	0.4	0–5
Acceptance	3.8	1.4	-0.2	-0.2	0–6
Venting	2.6	1.5	0.5	-0.2	0–6
Denial	0.6	0.8	1.3	1	0–3
Self-distraction	2.8	1.6	0	-0.6	0–6
Behavioral disengagement	0.9	1.1	1.2	1.2	0–5
Substance use	0.3	0.7	2.7	6.1	0–3
Humor	2.3	1.6	0.3	-0.5	0–6
-19 S-P [b]	15.3	5.2	0.6	0	7–30

Note. MHI-5 = five-item Mental Health Inventory; Brief COPE = Short version of the Coping Orientation to Problems Experienced Inventory; SSSS = Social Support Satisfaction Scale; FCV-19 S-P = Portuguese version of the Fear of COVID-19 Scale

[a] The values presented on the table regarding Brief COPE and the Intimacy subscale of SSSS were measured at T0; [b] FCV-19S-P was measured for the first time at T1 and for this reason those are the values presented on the table

the onset of the pandemic, while individuals with higher SES ($B = 2.439$, $p = .019$), using more frequently supportive coping ($B = -2.372$, $p = .027$), and substance use coping ($B = -3.271$, $p < .001$) reported poorer mental health status at the beginning of the pandemic. Regarding predictors of the trajectory of mental health status over time between individuals, participants more afraid of COVID-19 ($B = -0.607$, $p < .001$) showed a slower linear increase in the mental health status development trajectory over the first year of the COVID-19 pandemic (an increase of only 0.039 mental health status over each assessment). Gender, age, marital status, monthly expenses, active avoidance coping, and denial/religious coping were not significant predictors of mental health status, at either baseline or throughout one year.

Discussion

This study aimed at monitoring the mental health status development trajectory over the first year of the COVID-19 pandemic and at exploring the predictive effect of a number of demographic, socioeconomic, and psychosocial variables on baseline mental health status and on its development trajectory. To the best of our knowledge, this is the first longitudinal study simultaneously monitoring the development of the mental health status of adults during the first year of the COVID-19 pandemic, whilst assessing the potential predictors of mental health status development trajectory. The findings provided only partial support to the study hypotheses. Self-reported mental health status remained unchanged over the first year of the COVID-19 pandemic. Social support and the endorsement of positive/active coping were significant predictors of better baseline mental health status, while being from an upper SES, and the use of substances and supportive coping predicted worse baseline mental health status. There was significant interindividual variability in the development trajectory of mental health status over a one year period, with slower increases in

Table 3 Linear mixed models testing the effect of the study variables on Mental Health Status ($n = 105$)

					95% CI	
Dependent variable	Parameters	Estimate (B)	SE	p^a	Lower bound	Upper bound
Mental health status	Intercept	59.42	0.918	**< 0.001**	57.610	61.237
	Time	0.646	0.883	0.465	-1.098	2.390
	Gender	4.114	2.482	0.100	-0.792	9.019
	Age	0.101	0.087	0.249	-0.071	0.272
	Single (1 = Yes)	-0.114	6.282	0.986	-12.527	12.299
	Married (1 = Yes)	6.921	6.072	0.256	-5.078	18.920
	Divorced (1 = Yes)	2.334	6.415	0.717	-10.343	15.010
	SES	2.439	1.028	**0.019**	0.407	4.471
	Monthly expenses	0.001	0.001	0.259	-0.001	0.003
	Intimate social support	0.685	0.257	**0.009**	0.176	1.193
	Positive/active coping	4.594	0.971	**< 0.001**	2.675	6.513
	Supportive coping	-2.372	1.059	**0.027**	-4.465	-0.279
	Active avoidance coping	-1.653	1.004	0.102	-3.638	0.332
	Denial/religious coping	-1.223	0.991	0.219	-3.181	0.736
	Substance use coping	-3.271	0.967	**< 0.001**	-5.183	-1.360
	Fear of COVID-19	-0.271	0.187	0.149	-0.641	0.098
	Time x Gender	-4.008	2.388	0.095	-8.726	0.710
	Time x Age	-0.069	0.084	0.410	-0.234	0.096
	Time x Single (1 = Yes)	4.617	6.043	0.446	-7.323	16.556
	Time x Married (1 = Yes)	3.572	5.841	0.542	-7.969	15.114
	Time x Divorced (1 = Yes)	2.362	6.171	0.702	-9.832	14.555
	Time x SES	-1.241	0.989	0.212	-3.195	0.714
	Time x Monthly expenses	-0.0003	0.001	0.673	-0.002	0.001
	Time x Intimate social support	-0.132	0.248	0.593	-0.621	0.357
	Time x Positive/active coping	-1.781	0.934	0.059	-3.626	0.065
	Time x Supportive coping	1.402	1.019	0.171	-0.611	3.415
	Time x Active avoidance coping	0.059	0.966	0.951	-1.850	1.969
	Time x Denial/religious coping	-0.392	0.953	0.682	-2.276	1.492
	Time x Substance use coping	-0.264	0.931	0.777	-2.103	1.575
	Time x Fear of COVID-19	-0.607	0.180	**< 0.001**	-0.963	-0.252

Note. CI = confidence interval; SE = standard error

[a] Statistically significant results ($p \leq .05$) are highlighted in bold

mental health status being observed in individuals reporting greater fear of COVID-19.

The stability of mental health status during the first year of the COVID-19 pandemic is inconsistent with previous findings (Ausín et al., 2022). We can speculate that this finding might be associated with governmental measures undertaken to tackle this health crisis, specific to the Portuguese case. For instance, Portugal evolved from a mandatory lockdown, during the first time of assessment, to the implementation of a curfew at night and at weekends during the second time of assessment (i.e., between November 19, 2020, and January 30, 2021). During this second period, Christmas gatherings (as opposed to the prohibition of gatherings during Easter that occurred in the first time of assessment) were allowed, representing an easing of restrictions allowed by the purchase of enough vaccines to inoculate Portugal's population. This may have buffered the negative impact of the continuation of the pandemic on individuals' mental health (Cavazzoni et al., 2023). While the resume of in-person exchanges may have contributed to an increase in perceived social support, it can also be hypothesized that the ease of the restrictions itself may have contributed to an increased sense of hope, control, and security, and a decrease in uncertainty (Satici et al., 2020). We can speculate that this buffering effect may have been continued six months later, nurtured by a high vaccination rate (56%) of the population in Portugal with (at least) one dose of the vaccine (Direção-Geral da Saúde, 2021).

Consistent with previous findings suggesting that social support (Cavazzoni et al., 2023; Miró et al., 2022; Pais-Ribeiro et al., 2022) and positive/active coping (Alsolais et al., 2021; Budimir et al., 2021; Gurvich et al., 2021; Guszkowska & Dąbrowska-Zimakowska, 2022) may have been protective of mental health in the context of the COVID-19 pandemic, these variables predicted better baseline mental health status in our sample. In fact, social support was found

to be beneficial in times of public health emergencies, presumably by buffering the negative impact of stress upon individuals (Cohen & Wills, 1985). Positive/active coping (i.e., positive reframing, acceptance, active coping, planning, and humor), on the other hand, may be associated with the ability to focus on the silver linings of a potentially stressful situation, such as at the beginning of this health crisis (e.g., more time to rest, an opportunity to seek new interests; (Lossio-Ventura et al., 2021), rather than in the severity of the stressful situation and its potential threat and associated fear (Bartzik et al., 2021), as suggested by other studies. By positively reframing the COVID-19 pandemic at its beginning, focusing on the behaviors they could endorse to control and deal with it, and being willing to navigate through it without trying to change the situation itself, we speculated that individuals using more frequently positive/active coping may have been more willing to handle the negative impact of the pandemic at the beginning (Nakamura & Orth, 2005) without losing a sense of control. Indeed, feeling in control during the COVID-19 pandemic has been found to be protective of mental well-being in recent empirical studies, as it may have given rise to a sense of being protected from the disease (Sigurvinsdottir et al., 2020).

In the opposite direction, and also congruent with previous findings (Budimir et al., 2021; Guszkowska & Dąbrowska-Zimakowska, 2022), substance use was negatively associated with mental health status at the beginning of the COVID-19 pandemic. The negative effect of substance use on individuals' mental health in this context, as in others, is well documented and has been attributed to its association with a deterioration of intimate relationships, ultimately aggravating the reduction of one's social support (Vosvick et al., 2003) in times of public health crisis–which, as discussed above, is a protective factor of adults' mental health. The negative association between mental health status and supportive coping (i.e., instrumental support, emotional support, and venting), on the one hand, and SES, on the other, is inconsistent with previous research (Cavazzoni et al., 2023; Claes et al., 2021; Miró et al., 2022; Pais-Ribeiro et al., 2022). We conjecture that it may be attributed to the unprecedented nature of the COVID-19 pandemic (Mendonça et al., 2022; Satici et al., 2020) for the current generations. Consequently, the population may not have developed the necessary skills and knowledge to handle the situation adaptively to mitigate the spread of the disease and its negative consequences. For instance, although there may have been a mutual demand for social support, the received social support may not have been efficient, as people responding to social support requests were facing the same stressors without prior experience, and were themselves stressed by it (Okafor et al., 2022). It can also be hypothesized that supportive coping may have exacerbated awareness regarding the lack of control and knowledge about the pandemic, possibly increasing levels of uncertainty and worsening mental health (Satici et al., 2020). Unexpectedly, individuals with higher SES reported worse mental health status at the beginning of the pandemic. This may be likely attributed to higher work-related stress during the first mandatory lockdown of these individuals compared to participants with lower SES. We presume that individuals with higher SES are more likely to have occupations with greater leadership and resources management responsibilities, on the one hand, and that are more likely to be compatible with telework, on the other. Indeed, leadership functions require persistent communication between the leader and their coworkers. During the lockdowns, there probably was a higher demand for communication given the novelty of the work conditions, mainly via online technologies, causing the leader to possibly feel more pressure to be constantly in touch with their coworkers, perhaps negatively affecting mental health, as demonstrated by recent literature (Mendonça et al., 2022). Moreover, managing resources at the beginning of the lockdown period may have increased the workload because adjustments were necessary (e.g., rearranging schedules, buying equipment to make telework possible). This may have caused a person to neglect their own physical needs (e.g., eating, sleeping) and, consequently, report poorer mental health. Concurrently, it can also be speculated that being in telework possibly disturbed work-life balance for several reasons, such as difficulty in distinguishing between work and personal time, increased number of tasks to manage simultaneously, especially for those with children (e.g., teleworking while helping children with school), and a flourishment in family frictions and interpersonal struggles.

Also inconsistent with previous findings (AlHusseini et al., 2021; Alsolais et al., 2021; Gullo et al., 2021; Miró et al., 2022; Pais-Ribeiro et al., 2022; Sánchez-Rodríguez et al., 2022; Zhi et al., 2020) was the absence of associations between mental health status and most demographic and socioeconomic variables under study, potentially indicating that the pandemic has been equality challenging for individuals of all ages, marital statuses, genders, and monthly expenses. For instance, we postulate that the COVID-19 pandemic might have been equally challenging for younger and older adults, though due to different reasons. The pandemic might have been associated with a higher perceived risk of hospitalization, severe illness, and even death, in the case of older adults (Evertsson et al., 2009). For younger adults, who seem to be more susceptible to uncertainty, the way the pandemic would unfold was somehow unpredictable in the long term, both in terms of the spread of the disease and in terms of its socioeconomic negative impacts at the global and individual levels (Pais-Ribeiro et al.,

2022), factors that were previously found to be associated with poorer mental health (AlHusseini et al., 2021; Satici et al., 2020). On the other hand, while being married (or in a domestic partnership) is most frequently beneficial for mental health, we hypothesized that a conflicted and low-quality marital relationship might not provide the necessary social support in times of crisis such as the COVID-19 pandemic. Indeed, individuals with lower relationship satisfaction or in a relationship with low commitment during the pandemic were found to report worse mental health than unmarried individuals (Till & Niederkrotenthaler, 2022). Despite being unmarried, individuals might have been living with other family members or friends, and thus potentially benefited from quality relationships that provided adequate social support and prevented social isolation (Lawal et al., 2022). The absence of associations between gender and monthly expenses may be potentially attributed, at least in part, to the characteristics of the study's sample. In fact, the study sample was somewhat unbalanced and composed mostly of individuals of higher SES (i.e., higher education level, monthly household income higher than the national average [i.e., 2841.8€ > 1969.58€, respectively], and monthly household income higher than monthly expenses [2841.8€ > 1681.7€, respectively]). Since mental health in the context of the COVID-19 pandemic was mainly poorer among unemployed individuals and those experiencing financial distress (Claes et al., 2021), and gender differences in mental health responses may be attributed to gender inequalities– more prevalent in lower socioeconomic individuals (Evertsson et al., 2009)–, our sample characteristics may have buffered these possible negative effects on mental health status throughout the COVID-19 pandemic.

The results regarding the association between mental health status, on one hand, and active avoidance coping (i.e., behavioral disengagement, self-blame, and self-distraction), denial/religious coping, and fear of COVID-19, on the other, is also inconsistent with previous evidence (Budimir et al., 2021; Gurvich et al., 2021; Guszkowska & Dąbrowska-Zimakowska, 2022). These results may potentially be explained by non-mutually exclusive reasons. Firstly, we speculated that active avoidance coping may not have predicted mental health status since different coping responses– behavioral disengagement, self-blame, and self-distraction–, with different patterns of associations with mental health status, were analyzed in aggregate. For instance, while behavioral disengagement and self-blame have been identified as harmful to psychological well-being in the current public health crisis (Alsolais et al., 2021; Gurvich et al., 2021; Guszkowska & Dąbrowska-Zimakowska, 2022), self-distraction has been identified in some studies as protective (Kavanagh et al., 2022). Using self-distraction to relieve stress due to the COVID-19 pandemic may have helped decrease feelings of tedium and vulnerability resulting from the cessation of social contacts, as found in other studies (Polizzi et al., 2020), thus contributing to better mental health. Thus, by analyzing the use of behavioral disengagement, self-blame, and self-distraction as one, the beneficial effect of self-distraction may have neutralized the effects of the other two coping responses, resulting in a non-significant association between active avoidance coping and mental health status.

Secondly, denial/religious coping can have both positive and negative effects on mental health status, depending on its usage (Alsolais et al., 2021; Guszkowska & Dąbrowska-Zimakowska, 2022), possibly hindering its effects on mental health status. For example, a temporary disconnection from a hard reality may bring a certain relief in the short term; nevertheless, it is ineffective in reducing distress or negative affect in the long run, as negative emotions associated with the stressful event are not processed, and remain unsolved (Hastings et al., 2005). Regarding religious coping, engaging in religious practices such as prayer– as measured by the religious coping subscale of the Brief COPE– can be done to cope with adversity, accept reality, obtain courage and a sense of purpose, confront one's limitations, and achieve growth, leading to lower levels of anxiety (Mattis, 2002). Despite this, studies found that praying frequently to handle stressful situations can lead to anxiety if the prayers are addressed to a God who is perceived as distant and cold, or if the prayers are directed to solve a problem that remains unsolved (Sigurvinsdottir et al., 2020). This may decrease the sense of security, as well as increase psychological suffering, leading people to question whether their prayers to God are in vain (Sigurvinsdottir et al., 2020). Finally, fear of COVID-19 may not have been a significant predictor of mental health status since the expected negative effect of fear may have been buffered by possible positive consequences of being afraid. That is, at the beginning of the pandemic, fear of COVID-19 may have motivated the adoption of preventive behaviors recommended by the government and health agencies (Harper et al., 2021). In turn, participants' sense of control would increase, which has been found to be protective of mental well-being, as mentioned previously (Sigurvinsdottir et al., 2020).

This study also sought to explore if the same demographic, socioeconomic, and psychosocial factors predicted mental health status development trajectory. Interestingly, only fear of COVID-19 showed a significant interaction with time, suggesting that adults who remained afraid of COVID-19 continued to improve their self-reported mental health status over time, although at a slower rate than individuals who were less afraid of COVID-19. This long-term negative effect of fear of COVID-19 on mental health status may be due to the possible greater use of maladaptive

coping responses by individuals with greater levels of fear (Alsolais et al., 2021). Moreover, long-term fear can interfere with behavior change, hindering individuals' ability to comply with the preventive measures recommended by governments and health entities (Fofana et al., 2020). In turn, individuals' sense of control may be reduced, thus hampering their mental health status improvement (Sigurvinsdottir et al., 2020).

Limitations

The findings of the present study should be interpreted considering some limitations. First, the study sample was non-probabilistic, predominantly women, highly educated individuals with a monthly household income above the national average. Consequently, the results of this study cannot be generalizable to other populations. Second, since there were missing values in the study variables, statistical power was reduced, the estimation of parameters could be biased, and the representativeness of the samples was reduced (Tabachnick & Fidell, 2019). To minimize these issues, missing data were imputed through EM imputation, in which the missing values were substituted by a predicted value based on available information. In this way, the relationship with other variables was preserved (Tabachnick & Fidell, 2019). Nonetheless, future studies with larger samples and a higher number of participants with complete datasets are needed to assess if the study findings would replicate. Third, it would have been important to collect information about the participants' family history, such as who participants live with (including school-age children) or genetic and predisposition factors, as these may have impacted the lockdown experience. Future research should include these variables as possible predictors of mental health status. Fourth, this study was guided by previous findings regarding other health crises, such as SARS and MERS, and not by a specific theoretical framework. Since there is sufficient information on COVID-19 to do so, future studies should be guided by theory. Finally, although online data collection may have caused the exclusion of individuals who do not have internet access, this was the only alternative to collect data during lockdowns. Future studies to validate the study findings are therefore warranted.

Implications for further research and clinical practice

First, it would be crucial to further examine the reasons why the mental health status of adults in Portugal did not change over time. By doing so, governments of countries whose populations have been negatively affected by the pandemic over time can understand its causes and implement new and effective measures to prevent further mental health deterioration and promote psychological well-being. A subgroup analysis of the population could enhance our knowledge regarding this occurrence and study the specific impact of governmental measures on the population's well-being. Second, it would be important to test if the hypothesized explanations or the association between the studied variables may be attributed to susceptibility to uncertainty, disruption of daily life routines, social function, sense of personal control, focus on the silver linings, disconnection from the stressful events, the content of prayers, hope, sense of security, work conditions, or to the characteristics of the study's sample, in the context of a longitudinal prospective study.

Third, interventions aiming at improving individuals' mental health in the context of public health crises, such as the one we faced during the COVID-19 pandemic, should target the increase of positive/active coping and social support at the onset of public health crises. Furthermore, the use of substances and supportive coping should be inhibited, as well as decrease the fear of a health crisis. Moreover, individuals of higher SES should also be targeted in these interventions, along with other individuals from lower SES, as they seem to be vulnerable to pandemic stress at the onset of events. Fourth, since the effectiveness of a certain coping in reducing stress depends on the circumstances, future studies are needed to explore and further understand the longitudinal effects of coping on mental health status. Only in that way, effective interventions can be accomplished. Fifth, these findings alert to the importance of psychosocial variables on mental health status, as no demographic or socioeconomic variables, except for SES, were found to significantly impact mental health status.

Conclusions

Regardless of the identified limitations, this study provides new data to help improve the understanding of the long-term effects of the COVID-19 pandemic on the mental health status of adults living in Portugal. Moreover, it also provides key information about the role of demographic, socioeconomic, and psychosocial variables as predictive factors of the mental health status of this sample of participants. This knowledge is paramount for developing health interventions to promote psychological functioning. The mental health status of our sample remained unchanged over the first year of the COVID-19 pandemic. On the one hand, the data suggest that individuals should engage in positive/active coping and resort to social support at the beginning of a public health crisis for better mental health. Coping such as supportive coping and substance use to deal with the COVID-19 pandemic should be discouraged to enable better mental

health and individuals of higher SES should also be targeted as they may be vulnerable at the onset of health hazards. The findings showed that psychosocial variables played a crucial part in mental health status– both at baseline and in its trajectory. For that reason, psychological resources for the population should be reinforced. Policymakers and healthcare agencies can now use this information to develop new interventional programs based on behavioral change models to promote the endorsement of the above-mentioned coping responses and discourage using the maladaptive coping identified in this study at the onset of pandemics.

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Data availability The data presented in this study are available on request from the corresponding author.

Declarations

Competing interests All authors certify that they have no financial or personal conflict of interest associated with this work to disclose.

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