Psychological impact of the quarantine during the COVID-19 pandemic on the general European adult population: a systematic review of the evidence

M. Bonati, R. Campi and G. Segre

Laboratory for Mother and Child Health, Department of Public Health, Istituto di Ricerche Farmacologiche Mario Negri IRCCS, 20156 Milan, Italy

Abstract

Aims. Due to the coronavirus disease 2019 (COVID-19) different countries implemented quarantine measures to limit the spread of the virus. Many studies analysed the mental health consequences of restrictive confinement, some of which focused their attention on specific populations. The general public’s mental health also requires significant attention, however. This study aimed to evaluate the effects of the COVID-19 quarantine on the general population’s mental health in different European countries. Risk and protective factors associated with the psychological symptoms were analysed.

Methods. A systematic search was conducted on four electronic databases (PubMed, PsycINFO, Scopus and Google Scholar). Studies published up until 20th April 2021, and following eligibility criteria were selected for this review. One thousand three hundred thirty-five (1335) studies were screened, 105 of which were included. Via network analysis, the current study investigated the pathways that underlie possible risk factors for mental health outcomes.

Results. Anxiety, depression, distress and post-traumatic symptoms are frequently experienced during the COVID-19 quarantine and are often associated with changes in sleeping and eating habits. Some socio-demographic and COVID-19-related variables were found to be risk factors for an individual’s wellbeing. In particular, being female, young, having a low income, being unemployed and having COVID-19-like symptoms or chronic disorders, were found to be the most common risk factors for mental health symptoms.

Conclusions. The COVID-19 pandemic represented an unprecedented threat to mental health globally. In order to prevent psychological morbidity and offer support tailored to short-, medium- and long-term negative outcomes, it is essential to identify the direct and indirect psychosocial effects of the lockdown and quarantine measures, especially in certain vulnerable groups. In addition to measures to reduce the curve of viral transmission, policy makers should urgently take into consideration provisions to alleviate hazards to mental health.

Introduction

From December 2019 severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection spread rapidly around the world, and in March 2020, the World Health Organization (WHO) declared a global pandemic (World Health Organization, 2020).

The impact of the coronavirus disease was dramatic also because appropriate tools for diagnosis and therapy were not available at the time.

Quarantine has been defined as the separation and restriction of movement of people who have potentially been exposed to a contagious disease to ascertain if they become unwell, so reducing the risk of them infecting others (Centers for Disease Control and Prevention, 2017). Quarantine was used mainly at the local level during historic outbreaks, e.g. during the 2014 Ebola outbreak in African villages.

For coronavirus disease 2019 (COVID-19), quarantine and social distancing measures were effective public health tools in limiting the dissemination and outcomes of the infection (Tognotti, 2013). Although the severity of these restrictions has varied between and within countries, they have had a significant impact on people’s daily life, influencing their job, leisure activities, livelihood and social relationships. Each country’s general population has experienced the emotional, social and economic impact of this emergency.

Previous studies have shown that widespread outbreaks of infectious diseases, such as SARS, Ebola and H1N1, are associated with psychological distress and mental health symptoms (Bao et al., 2020; Maalouf et al., 2021; Chaundri et al., 2021). The psychiatric implications continued far beyond the outbreaks: SARS survivors reported having persistent mental health issues years afterwards (Mak et al., 2009).
A review published at the beginning of the COVID-19 pandemic (Brooks et al., 2020) showed that quarantines could lead to deleterious psychological effects, including post-traumatic stress symptoms, confusion, anger, infection fears, frustration and boredom.

Several studies have investigated the mental consequences of COVID-19 on target populations such as children, students and healthcare professionals (Husky et al., 2020; Xie et al., 2020; Segre et al., 2021; Stocchetti et al., 2021).

While such a focus is understandable, it is also necessary to detect relevant changes in health behaviours that may be occurring at a community level in order to better understand the range of psychosocial consequences of the pandemic’s containment measures.

A systematic review and meta-analysis conducted at the beginning of the pandemic (Salari et al., 2020) showed that the prevalence of stress, anxiety and depression symptoms among the general population was 30% (95% confidence interval (CI) 24.3–35.4), 32% (95% CI 28–37) and 34% (95% CI 28–41), respectively.

Since lifestyle behaviours can affect mental wellbeing and health behaviours can change during the COVID-19 pandemic (Parletta et al., 2016; Arora and Grey, 2020), the potential benefits of mandatory mass quarantine need to be weighed against the possible costs, including psychological ones.

Although the first wave of the pandemic seems far away, two others have followed and others, albeit less intense, may occur. The use of quarantine to deal with epidemics or pandemics, however, may occur again.

Although many studies (Necho et al., 2021; Prati et al., 2021; Zhang et al., 2021) have evaluated the mental health consequences of the current pandemic on the general population, there has been no published systematic review focusing primarily on the broader psychological impact of COVID-19 quarantine on European general population samples.

The main objective of the present study was therefore to investigate the effects of the COVID-19 quarantine during the first wave (the most intense one) on mental health and lifestyle changes of the general population in European countries. Specifically, it aimed to analyse the socio-demographic and COVID-19-related variables in order to identify those individuals at elevated risk for adverse mental health outcomes. Specific focus was placed on pre-quarantine predictors of psychological impact and stressors during quarantine.

Methods

Search strategy and selection criteria

For the present review, the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines were followed. A computer-based literature search was conducted on the following databases: PubMed, PsycINFO and Scopus, including studies published from the inception of the pandemic (January 2020) until the 20th of April 2021. A manual search on Google Scholar was performed to identify additional relevant studies. The full list of search terms can be found in the Appendix (Table A1). In brief, we used a combination of terms relating to quarantine (e.g. ‘quarantine’, ‘isolation’, ‘confinement’ and ‘lockdown’), psychological outcomes (e.g. ‘psychological’, ‘mental health’, ‘depression’, ‘anxiety’, ‘insomnia’, ‘eating habits’ and ‘lifestyle changes’), survey (e.g. ‘online survey’ and ‘questionnaire’) and COVID-19 (e.g. ‘COVID’, ‘corona-virus’ and ‘pandemic’).

For studies to be included in this review they had to be journal articles, report on primary research, be published in peer-reviewed journals, be written in English, include participants asked to enter into quarantine outside of a hospital environment for at least 24 h and include data on the prevalence of mental health symptoms or psychological wellbeing, or on related factors. In particular, studies with a cross-sectional design and longitudinal studies with data collected only during the quarantine were included. Studies were excluded if they focused on particular subgroups of the population such as healthcare workers, students or people with chronic conditions, or if they did not have full-text availability. The present review followed the PRISMA checklist and reporting guidance (PRISMA-P Group et al., 2015).

The titles and abstracts were evaluated by the authors, independently, to decide whether to include or exclude the studies. Disagreements on the eligibility of a study were resolved by discussion until consensus was reached. Moreover, a review of the references of the included studies was performed. Complete references were downloaded and stored using Reference Manager 2011.0.1 software (Thompson Research Soft, Carlsbad, CA, USA).

After the first screening, only studies conducted during the first wave of the pandemic on European countries’ general adult population were included. In particular, those living in countries located in the European continent, extending from the island nation of Iceland, in the west, to the Ural Mountains of Russia, in the east, were considered.

Data analysis

The network analysis approach (Borsboom and Cramer, 2013) was used to investigate the relationship between the 20 variables considered as potential risk factors for mental health outcomes related to COVID-19 quarantine (gender, age, educational level, marital status, parental status, working situation, living conditions during confinement, financial situation, social support, levels of general health, being in a vulnerable group, pre-existing mental health disorder, working situation, changes in diet and nutrition, changes in sleep, physical activity during quarantine, living in specific areas during the pandemic, symptoms of COVID-19/ Physical symptoms, contact with COVID-19 cases, coping strategies/strategies to deal with stress). The Fruchterman–Reingold algorithm was used (Fruchterman and Reingold, 1991), in which a force-directed layout dissembles the graph as a system of a large quantity of nodes or vertices. Psychological distress is seen as a network of specific risk factors (termed nodes) that dynamically interact with, and impact, one another. The nodes represent the 20 variables considered and the edges represent the connections between the nodes. Nodes act as mass particles and edges behave as springs between the nodes. The degree of a node is its number of connections (how many neighbours the variable has with other variables). The figure generated shows the most consistent associations, where thicker edges show stronger relationships and thinner edges weaker relationships.

For each node, we calculated:

- betweenness centrality, which measures all the shortest paths between every pair of nodes of the network and then counts how many times a node is on a shortest path between two others,
• **closeness centrality**, which calculates the shortest paths between all nodes, then assigns each node a score based on its sum of shortest paths,

• **eigen centrality**, which measures a node’s influence based on the number of links it has to other nodes in the network and can identify nodes with an influence over the whole network, not just those directly connected to it.

A community detection analysis was carried out using the Louvain method (Blondel et al., 2008) to extract communities and calculate modularity. It is one of the most frequently used methods for clustering on large networks, it is very efficient and allows one to define communities in a hierarchical way to group together certain nodes, diminish the dimensionality of a dataset and facilitate interpretability. Network analysis was performed using Gephi version 0.9.2 (Bastian et al., 2009).

Methodological quality/bias risk were recorded using the Joanna Briggs Institute critical appraisal checklist for cross-sectional and cohort studies (see Appendix Tables A2 and A3).

### Results

Figure 1 presents the procedural steps adopted and the record count, duplicates and final studies obtained after screening. The initial search yielded 1335 studies, of which 105 included relevant data and were included in this review.

An overview with the characteristics of the studies is presented in online Supplementary Tables 1 and 2.

All eligible studies were included in the review, regardless of their quality assessment results. Of the 98 cross-sectional studies, 45 studies (46%) were of very good quality (maximum score on the JBI) and 8 (9%) were of poor quality (JBI score <5 points). All cohort studies were of good quality. Selected studies were conducted mainly in 17 different countries (Italy: n = 39, Spain: n = 25, UK: n = 9 and Greece: n = 4).

### The psychological impact of quarantine

Seventy-nine studies reported anxiety symptoms in the general population, with a prevalence ranging from 5.5 to 70.4%. The highest levels of anxiety were found in an Italian study (Di Renzo et al., 2020); these involved 70.4% of the enrolled population, 57.8% of whom with physical manifestations of anxiety (tachycardia, headache, sweating). On the contrary, three studies (Bonati et al., 2021; Budimir et al., 2021; Silva Moreira et al., 2021) found low percentages of anxiety symptoms (<10% of the sample).

A comparative investigation between Spanish and Greek participants (Papandreu et al., 2020) observed a similar prevalence of moderate and severe anxiety symptoms, with 12.3% in Spain and 13.2% in Greece. Similar rates were found also in a German study (Munk et al., 2020), in which 12% of the sample met the criteria for the general anxiety disorder (GAD) during the lockdown, compared with 2% before the pandemic.

Depressive symptomatology and mood variables were assessed in 74 studies and their clinical prevalence ranged from 3.2 to 82.6%. Sixteen studies classified the frequency and severity of symptoms in three categories: mild, moderate and severe. The lowest percentages of severe depressive symptoms were found in 3.2% of the Austrian sample (Budimir et al., 2021) and 9.3% of the Greek sample (Fountoulakis et al., 2021). Close rates were reported in the Portuguese population (Paulino et al., 2021) in which only 11.7% of the participants presented moderate to severe depressive symptoms on the ‘Depression, Anxiety and Stress Scale’ (DASS). On the contrary, the findings of a Polish study (Bodecka et al., 2021) showed that the majority of participants displayed at least mild depressive symptoms (82.6%). Nearly two-thirds of the Italian respondents (61.3%) experienced depressed mood (Di Renzo et al., 2020).

Psychological distress has been assessed with different tools: the majority of the included studies used the DASS stress scale. Four Italian studies (Costantini and Mazzotti, 2020; Landi et al., 2020; Pakenham et al., 2020; Bonati et al., 2021) used the ‘COVID-19 Peritraumatic Distress Index (CPDI)’ with positive responses ranging from 15 to 40%. Nearly one-third of people experienced symptoms of mild to moderate and severe peritraumatic distress in two studies (Costantini and Mazzotti, 2020; Pakenham et al., 2020), while lower rates (15.5% of the sample) were reported in another study (CPDI mean 17.95, s.d. 11.50) (Landi et al., 2020).

Eighteen studies focused their attention on post-traumatic stress disorder (PTSD) symptoms. In total, 54.4% of the Italian participants met criteria for a clinical level of stress related problems and 30% of the sample had probable diagnosis of PTSD (Panno et al., 2020). Lower scores of PTSD (5.1%) were reported in a study (Favieri et al., 2021) that specifically used the Post-Traumatic Stress Disorder Related to COVID-19 (COVID-19-PTSD). High levels of avoidance symptoms at the Impact of Events Scale Revisited (IES-R) were found in two studies (Fiorillo et al., 2020; Jiménez et al., 2020).

Seventeen studies focused specifically on resilience and/or coping strategies, i.e. the individual’s ability to cope with stress and adapt to changes. Resilience has been associated with a lower risk for any mental health symptoms; the same results were obtained regarding coping (Munk et al., 2020). A higher score on the positive coping strategy dimension was associated with a lower prevalence of depressive symptoms, while more supportive/distractive strategies were associated with an increased prevalence (Skapinakis et al., 2020).

### Pre-quarantine predictors of psychological impact

Several predictive factors were identified from the included studies.

Female gender is the most common risk factor associated with psychological symptoms during the COVID emergency. The risk of developing anxiety, depression, distress symptoms or PTSD was double in female compared to male participants (Casagrande et al., 2020; Fiorillo et al., 2020; Gualano et al., 2020; Landi et al., 2020; Mariani et al., 2020; Mazza et al., 2020; Piel et al., 2020; Rodriguez-Rey et al., 2020; Suso-Ribera and Martin-Brufau, 2020; Bonati et al., 2021; Rettie and Daniels, 2021). On the contrary, a Spanish study reported similar levels of anxiety, stress and depression (Ozmaz-Exitbarria et al., 2020). Women reported more frequent and severe sleeping problems (such as insomnia) than men (Bacaro et al., 2020; Casagrande et al., 2020; Margetić et al., 2021); they exhibited more PTSD or secondary traumatic stress and posttraumatic growth, were less resilient and used all kinds of coping strategies more often (Kalaitzaki, 2021).

An age-related variation was analysed in different studies: the psychological impact of COVID-19 confinement seems to ameliorate as people get older. The youngest participants (<35 years old) showed higher levels of depression, anxiety, stress, insomnia
and PTSD symptoms compared to the other age groups (Antunes et al., 2020; Bacaro et al., 2020; Bonsaksen et al., 2020; Rodriguez-Rey et al., 2020; Paulino et al., 2021; Rettie and Daniels, 2021; Rossi et al., 2021). The greater vulnerability to distress in young adulthood could be due to the precariousness of the working activities, with consequent interruption of income, and/or the interruption of the initial phase of development of one’s professional activity, and/or the presence of children, with resulting age-related concerns or the forced cohabitation in a phase in which young adults would normally leave the family of origin. Age remained positively associated with wellbeing and negatively associated with depression (Dawson and Golijani-Moghaddam, 2020): marked differences in prevalence of depression were found between 18 and 24 year (63.3%) olds and people over 65 years of age (11.5%) (Pieh et al., 2021). A similar pattern, even if slighter, was reported for sleep problems (Gualano et al., 2020; Beck et al., 2021). Results of a Spanish (Vicario-Merino, 2020) and a UK study (Neill et al., 2021) stated that symptoms of stress and depression tended to increase with an increase in age range.

Being more educated predicted greater wellbeing; lower educational status was significantly associated with higher depression, anxiety and PTSD symptoms (Benke et al., 2020; Di Crosta et al., 2020; Haesebaert et al., 2020; Skapinakis et al., 2020; Suso-Ribera and Martín-Brufau, 2020; Gutiérrez-Hernández et al., 2021; Silva Moreira et al., 2021). The trend of the association with education level, however, is likely also related also to the cultural context, as found in Italian results (Bonati et al., 2021) v. Portuguese ones (Paulino et al., 2021).

Moreover, having a partner also predicted greater wellbeing (Haesebaert et al., 2020): married participants and those cohabiting with their partner showed significantly lower psychological impact and felt less lonely than single participants (Balsamo and Carlucci, 2020; Cerbara et al., 2020; Saita et al., 2021). Although, an Italian study (Velotti et al., 2021) reported that having a partner was associated with overeating and social network use during the quarantine, sharing everyday life with someone during quarantine was a protective factor (Dawson and Golijani-Moghaddam, 2020; Gualano et al., 2020).

Additionally, living with children in the household was revealed as a protective factor against psychological distress, anxiety and depressive symptoms in five different studies (Gómez-Salgado et al., 2020; Mazza et al., 2020; Rodriguez-Rey et al., 2020; Ellen and De Vriendt Patricia, 2021; Saita et al., 2021). In particular, a low rate of psychological distress was observed among people living with older children or adolescents.
(Gómez-Salgado et al., 2020; Rodriguez-Rey et al., 2020), but those living with children under ten had poorer wellbeing (Haesebaert et al., 2020).

The impact of confinement was more damaging for people living in very poor cohabitation conditions. In particular, participants living in houses of more than 120 square meters showed lower psychological impact, stress, anxiety and depression symptoms than those living in less than 30 square meters (odds ratio (OR) 1.98, 95% CI 1.19–3.30) (Ramiz et al., 2021). Moreover, people with access to an outdoor space (e.g. garden, balcony) had higher wellbeing scores (OR 1.38, 95% CI 1.00–1.89) (Ramiz et al., 2021) and better mental health (Haesebaert et al., 2020; Ellen and De Vriendt Patricia, 2021). Both the number of cohabitants and the quality of the relationships must be taken into account, however, levels of psychological distress were higher and sleep quality was lower in people living alone (Pérez et al., 2021).

Being affected by a pre-existing mental disorder or having a pre-existing physical disease were found to be factors associated with worse levels of depressive and anxiety symptoms (Fiorillo et al., 2020; Mazza et al., 2020; Pérez et al., 2021; Rettie and Daniels, 2021). In particular, people in ‘vulnerable’ groups were significantly more anxious, and more anxious concerning their health, compared to individuals in nonvulnerable groups (Rettie and Daniels, 2021).

**Stressors during quarantine**

Unemployed participants, who were more vulnerable to the possible economic crisis in the pandemic’s aftermath, presented higher rates of depression, anxiety and stress symptoms compared to employed participants (Benke et al., 2020; Pieh et al., 2020; Bonati et al., 2021; Paulino et al., 2021). Unemployed participants were also at higher risk of developing sleep disorders (68%), often associated with some impairment of their daily daytime activities (OR 1.34; 95% 95% CI 1.02–1.70) (Casagrande et al., 2020; Beck et al., 2021). Working outside the home was associated with higher levels of psychological distress: people working in-presence showed significantly higher psychological impact compared to those working remotely (Di Giuseppe et al., 2020; Gómez-Salgado et al., 2020; Mazza et al., 2020; Paulino et al., 2021), although the type of job and professional role may affect the relationship (Fiorenzato et al., 2021). Economic stability, and socioeconomic status in general, are related to depression, anxiety and PTSD symptoms (Di Crosta et al., 2020; Prati, 2021); participants with high monthly family income showed lower psychological impact than those whose family income was lower (Nese et al., 2022; Pieh et al., 2020, 2021; Skapinakis et al., 2020; Pérez-Rodrigo et al., 2021).

Health became one of the primary concerns during the COVID-19 confinement. Symptomatic individuals expressed higher psychological impact and increased levels of depression, anxiety, stress symptoms and sleep disorders; these symptoms could be interpreted as potential symptoms of COVID-19 (Beck et al., 2021; Paulino et al., 2021; Vujčić et al., 2021). Patients with polymerase chain reaction-confirmed COVID-19 reported greater sleep problems (52% severe) and worse levels of depressive and anxiety symptoms (Fiorillo et al., 2020). Having had a contact with a positive case in the previous 14 days showed a statistically significant relationship with the presence of psychological distress (Gómez-Salgado et al., 2020).

Home confinement affected habits and lifestyle (in terms of sleep disorders, food consumption and physical activity), inducing common mental health problems (Balanzá-Martínez et al., 2021).

In total, 74% of the participants of a French study reported trouble sleeping, of whom females and the young had greater frequency and severity (Beck et al., 2021). Reduced sleep, poor sleep quality and changes in usual sleep patterns were associated with more negative mood and anxiety symptoms (Bacaro et al., 2020; Suso-Ribera and Martín-Brufau, 2020). Adhering to a routine, maintaining the same weight and moderate physical exercise were associated with fewer negative effects, indicating that they are important protective factors (Gismero-González et al., 2020). Age was inversely related to dietary control, and being female was associated with being more anxious and disposed to eating comfort food than males (Di Renzo et al., 2020).

Increased emotional eating was predicted by higher depressive and anxiety symptoms, quality of personal relationships and quality of life, while an increase in binging was predicted by higher stress (Cecchetto et al., 2021).

The respondents who maintained the same physical activity habits had higher levels of positive emotions (energy), lower levels of negative emotions (fear and anxiety) and lower levels of experienced symptoms (headache and fatigue) (Di Corrado et al., 2020). Increased duration and greater intensity of physical activity were both associated with further reduction in the prevalence of depression (Jacob et al., 2020; Pieh et al., 2020), in particular in females, suggesting that variations in physical activity habits may have more influence in women’s psychological status than in men’s (Maugeri et al., 2020).

**Network analysis**

The connections between the 20 prevalent variables analysed in the retrieved studies and the structure of the network are shown in Fig. 2a, where the diameter of the node refers to the degree centrality and the hue of the node refers to betweenness centrality (darker = higher value). The network had 330 non-zero edges out of 380 possible edges. The weights of the connections are presented in online Supplementary Table 3.

In agreement with the narrative analysis reported above, the strongest connection emerged between gender and age, meaning that these were found to be the most common risk factors for psychological distress during quarantine. A cluster was found between age, gender, living in specific areas and working situation during the pandemic. Other noteworthy associations were reported between gender and working situation, age and living area, and working situation and living area, during the quarantine.

Figure 2b shows the results of the community detection analysis, where the colour of the node refers to the partition of the network. All nodes related to socio-demographic characteristics (gender, age, working situation, living condition, financial situation and marital status) and variables related to health (symptoms of COVID-19/physical symptoms/being infected by COVID-19, pre-existing mental health disorder) formed one large module (node in violet). Two nodes were found outside this large module: the first comprised of changes in diet and nutrition, changes in sleep patterns and physical activity (node in orange); the second one (node in green) was related to coping strategies/responses/strategies to deal with stress and social support.
Fig. 2. Network analysis.
Figure 3 shows the resulting plot for centrality metrics, which highlights the differences in connectivity of the network. The three indices are significantly intercorrelated with each other: the correlation between eigen and closeness is 0.99 ($p < 0.01$), the correlation between eigen and betweenness is 0.91 ($p < 0.01$) and the correlation between closeness and betweenness is 0.95 ($p < 0.01$).

Gender, age, education, marital status, living conditions, financial situation, working situation and living in specific areas have the highest betweenness, closeness and eigen strengths, being the most central nodes, suggesting that they have the most connections in the network.

All the centrality measures indicate that the most central isolation variables in the network are physical activity, contact with COVID-19 case/quarantine and coping strategies/responses to deal with stress. Parental status, levels of general health, changes in sleep patterns and symptoms of COVID-19/physical symptoms/being infected by COVID-19 are the most central variables in the distribution of the three z-scored centrality metrics.

**Discussion**

This systematic review has analysed data from different studies that investigated the psychological impact of the quarantine on the general European population during the first wave of the SARS-CoV-2 pandemic.

Similar to those of other reviews (Luo et al., 2020; Salari et al., 2020), the findings of the present study highlight the fact that anxiety, depression, distress and post-traumatic symptoms were frequently experienced during the COVID-19 quarantine and were often associated with changes in sleeping and eating habits. In particular, the overall effect of the pandemic has been linked with worsening psychiatric symptoms. The long-term effect of direct COVID-19 infection has, however, been associated with no, or mild, symptoms (Bourdina et al., 2022).

These data should be interpreted with caution since different studies reported a considerable heterogeneity of mental health problems: the impact of the COVID-19 pandemic may have been different across different social groups and across different contexts and countries.
An increase in mental health problems was seen from pre-pandemic assessments through the first phase of lockdown; during lockdown, no uniform trend could be identified and after lockdown, mental health problems decreased slightly (Richter et al., 2021).

Similarly, another recent review (Robinson et al., 2022) observed an increase in mental health symptoms among most population sub-groups and symptom types soon after the outbreak of the COVID-19 pandemic, which then decreased and were comparable to pre-pandemic levels by mid-2020.

On the contrary, a relatively small effect of lockdowns on mental health was reported (Prati and Mancini, 2021) providing evidence of people’s robust capacity for resilience.

Several issues should be kept in mind when interpreting the findings of the current study.

Only studies written in English have been considered in the present review, and this may have led to some bias, although a study conducted in 2012 (Morrison et al., 2012) showed that little evidence of bias was introduced from the exclusion of non-English studies.

Some of the selected studies were conducted during the initial stages of the COVID-19 outbreak; it is therefore possible that they underestimated the actual occurrence of traumatic stress in the population, since delayed onset of symptoms, especially PTSD ones, is conceivable. Moreover, data collection time for cross-sectional studies (online Supplementary material, Fig. 4) differed also because decisions concerning time and type of quarantine differed between European countries.

The majority (98 out of 105) of the selected studies had a cross-sectional observational design, which does not allow one to establish cause and effect relationships and temporal association between variables, so these should be interpreted with caution. Time-limited, cross-sectional survey data shed little light on the enduring effects of quarantine, on how adaptations to quarantine changed or evolved over time, and on what happened during re-opening, when home-confinement restrictions began to ease. Only a few studies (Ozamiz-Etxebarria et al., 2020; Salfi et al., 2020; Ausin et al., 2021; Cheval et al., 2021; O’Connor et al., 2021; Velotti et al., 2021; Zavlis et al., 2021) analysed data at different timepoints during the restrictive measures, in order to investigate the psychological impact caused by the pandemic longitudinally.

Considering that previous research on the long-term effects of pandemics and quarantining (Brooks et al., 2020) has shown that not only acute mental health effects occur, but that psychological distress may persist long after the crisis, it is essential to prioritise studies with longitudinal designs.

It is thus imperative to prospectively document the synergistic effects of multiple co-occurring risk factors, such as economic precarity, unemployment, isolation, uncertainty, loss, and fear, which may increase the likelihood of mental health difficulties. It is also important to highlight the fact that the effects of stress exposure may not manifest themselves immediately, but, in some individuals, may unfold over time (Wade et al., 2020; Veldhuis et al., 2021).

Moreover, the processes that cultivate resilience change dynamically over time, and this supports the fact that the pandemic requires longitudinal analyses in order to monitor individual adaptation to uncertain conditions.

Only four studies (Szabó et al., 2020; Castellini et al., 2021; Lorant et al., 2021; Ramiz et al., 2021) compared data collected during the pandemic’s quarantine with the level of psychological status found in the general population under normal conditions.

Concerning the assessment tools, the majority of the studies used validated and reliable assessment instruments in order to investigate several domains of mental health and psychological wellbeing. Different assessment scales were used for population screening and different cut offs were employed by studies that used the same tests. The self-report questionnaires used in the majority of the studies were ‘the Patient Health Questionnaire’ (PHQ), used in 29 studies, and the GAD, used in 27 studies. Seven studies conducted ad hoc questionnaires (Cancelli et al., 2020; Cerbara et al., 2020; Di Corrado et al., 2020; Dogaş et al., 2020; Ferrucci et al., 2020; Nese et al., 2022; Izdebski and Mazur, 2021). It must be noted that data collected relied on self-report measures related to psychological symptoms, and thus cannot be considered sufficient to formulate diagnoses of specific disorders.

The degree to which self-reported prevalence rates effectively represent common distress is still unknown, as well as to what extent this distress will result in increased rates of mental disorders and need for subsequent health treatment (Richter et al., 2021).

Although the symptomatology was assessed with widely used screening tools, scores should not be confused with a diagnosis, which can be assessed only by mental health professionals with additional assessment methods such as structured clinical interviews. It is important to note that the increase in psychological distress during quarantine is related to subjective perception and that there is a lack of pre-post pandemic analyses.

Another relevant aspect that should be considered is the possibility of selection bias related to the use of online surveys. The use of online surveys, and the snowball method for increasing participation, limit the generalisability of the results, although surveys currently represent the best methodological choice for data collection in a short time and in a pandemic situation. The convenient non-probabilistic nature of the chosen sample may not represent the countries’ general populations: use of an online tool limits the participation of persons who do not use this type of technology, penalising, for example, elderly people or those living in socially disadvantaged contexts. Moreover, it was not possible to assess the participation rate since the number of subjects who received the link to the surveys was unknown.

A possible gender-related effect, which may not have been identified due to the small number of men who responded, should also be taken into consideration. More women than men participated in the studies, coherently with previous research, reaffirming that it is more difficult to recruit male participants (Korkeila et al., 2001; Dunn et al., 2004). Furthermore, variable distribution might differ between a sample and the population of reference for residence, age, sex, education and other characteristics, and this requires that study findings be generalised with caution.

Lastly, more than half of the studies enrolled Italian and Spanish populations: 40 studies collected data from Italy and 26 from Spain. This represents an unbalanced interest compared with other European countries, although the severity of COVID-19 in the two Mediterranean countries from the beginning of the pandemic can, in part, justify such a huge production. All the questionnaires were launched nation-wide but, at the time of data collection, the COVID-19 outbreak was more severe in some countries and in specific regions. This may have motivated more people living in those areas to fill in the questionnaires compared to residents from other regions. Moreover, COVID-19 has had different mortality rates worldwide, and the severity and
### Timing of data collection for each European country.

| MARCH | APRIL | MAY | JUNE |
|-------|-------|-----|------|
| Kavouni et al., 2020 | Albania | | |
| Rukavina et al., 2020 | Austria | | |
| Pich et al., 2020 | Austria | | |
| Celli et al., 2021 | Belgium | | |
| Ellen et al., 2021 | Belgium | | |
| Lentini et al., 2021 | Belgium | | |
| Donges et al., 2020 | Croatia | | |
| Manzouli et al., 2021 | Croatia | | |
| Deck et al., 2020 | France | | |
| Hassanpour et al., 2020 | France | | |
| Doshi et al., 2020 | Germany | | |
| Jung et al., 2021 | Germany | | |
| Munk et al., 2020 | Germany | | |
| Fontenla et al., 2021 | Greece | | |
| Karatzas, 2021 | Greece | | |
| Karanoupi et al., 2021 | Greece | | |
| Giokionis et al., 2020 | Greece | | |
| Papadopoulou et al., 2020 | Spain | | |
| Sakhij et al., 2020 | Hungary | | |
| Stowers et al., 2020 | Italy | | |
| Blichmeier et al., 2020 | Italy | | |
| Bertelli et al., 2020 | Italy | | |
| Carinci et al., 2020 | Italy | | |
| Cappuccion et al., 2020 | Italy | | |
| Cimino et al., 2020 | Italy | | |
| Castroviejo-Silvera et al., 2021 | Italy | | |
| Carusi et al., 2020 | Italy | | |
| Czarnowska et al., 2020 | Italy | | |
| Conforti et al., 2021 | Italy | | |
| Costantini et al., 2020 | Italy | | |
| Costantini and Masin, 2020 | Italy | | |
| Di Carlo et al., 2020 | Italy | | |
| Di Giuseppe et al., 2020 | Italy | | |
| Di Giuseppe et al., 2020 | Italy | | |
| Farina et al., 2021 | Italy | | |
| Francisci et al., 2020 | Italy | | |
| Fornaciari et al., 2021 | Italy | | |
| Fornaciari et al., 2020 | Italy | | |
| Franceschi et al., 2020 | Italy | | |
| Franchini et al., 2020 | Italy | | |
| Orlandini et al., 2020 | Italy | | |
| Landi et al., 2020 | Italy | | |
| Lanza et al., 2020 | Italy | | |
| Minnocci et al., 2020 | Italy | | |
| Miserez et al., 2020 | Italy | | |
| Mozzi et al., 2020 | Italy | | |
| Neve et al., 2020 | Italy | | |
| Orlimo et al., 2021 | Italy | | |
| Paleari et al., 2020 | Italy | | |
| Ponce et al., 2020 | Italy | | |
| Prata, 2020 | Italy | | |
| Penta et al., 2020 | Italy | | |
| Rinas and Caputoa, 2021 | Italy | | |
| Rossi et al., 2021 | Italy | | |
| Sera et al., 2021 | Italy | | |
| Cellini et al., 2021 | Italy | | |
| Berntsen et al., 2020 | Norway | | |
| Stokbro et al., 2020 | Poland | | |
| Bernsmyth et al., 2020 | Poland | | |
| Cholewinski et al., 2020 | Poland | | |
| Godda et al., 2020 | Poland | | |
| Ingham and Muir, 2021 | Poland | | |
| Kukling et al., 2020 | Portugal | | |
| Antunes et al., 2020 | Portugal | | |
| Paulino et al., 2020 | Portugal | | |
| Silva and Melo, 2020 | Portugal | | |
| Blomqvist et al., 2020 | Romania | | |
| Isacsson et al., 2020 | Scotland | | |
| Vacca et al., 2021 | Serbia | | |
| Bliccmeier et al., 2020 | Spain | | |
| Cordero et al., 2020 | Spain | | |
| Garcia-Ortiz et al., 2020 | Spain | | |
| Girón-Arias et al., 2020 | Spain | | |
| Grüber et al., 2020 | Spain | | |
| Guadalón-Blázquez et al., 2021 | Spain | | |
| Jacques-Ashipping | Spain | | |
| Jaro-López et al., 2021 | Spain | | |
| Jimenez et al., 2020 | Spain | | |
| Justo-Atienza et al., 2020 | Spain | | |
| Lepeñ Zeidler et al., 2020 | Spain | | |
| Lepeñ Zeidler et al., 2020 | Spain | | |
| Lepeñ Zeidler et al., 2020 | Spain | | |
| Miranda-Gómez et al., 2021 | Spain | | |
| Odriozola-García et al., 2020 | Spain | | |
| Ponce et al., 2020 | Spain | | |
| Pons-Bellogín | Spain | | |
| Rodríguez-González et al., 2020 | Spain | | |
| Musco et al. and Martín-Rodríguez, 2020 | Spain | | |
| Valentin et al., 2021 | Spain | | |
| Vicente et al., 2021 | Spain | | |
| Vicente et al. and Martin-Aguirre, 2020 | Spain | | |
| Zago et al., 2021 | Spain | | |
| Zago and Galduff, 2020 | Spain | | |
| Pich et al., 2020 | Spain | | |
| Pich et al., 2020 | Spain | | |
| Collin et al., 2020 | United Kingdom | | |
| Dovey et al. and Colgate, 2020 | United Kingdom | | |
| Gough et al., 2020 | United Kingdom | | |
| Jacob et al., 2021 | United Kingdom | | |
| Neil et al., 2021 | United Kingdom | | |
| Pich et al., 2020 | United Kingdom | | |
| Rica et al., 2021 | United Kingdom | | |
| The British Isles et al., 2021 | United Kingdom | | |
frequency of mental health outcomes could be related to the intensity of the viral spread.

**What can be done to mitigate the consequences of quarantine?**

The current COVID-19 health emergency has completely changed the daily life of the population. Both the confinement scenario and the spread of the virus, as well as associated consequences, could alter people’s cognitive and emotional state through perceived threat from the virus and through development of negative affective balance and feelings. Several individual, economic and psychological factors have also been found to play a role in the development of higher levels of symptomatology.

The pandemic has highlighted the need to pay greater attention to gender and to the private sphere to prevent, and alleviate, the psychological consequences of pandemic on more vulnerable groups.

Despite the limitations of the retrieved studies, justified in part by the need to rapidly to assess the situation as a whole, our results highlight the importance of identifying which groups may face more difficulties in adopting healthy behaviours (e.g. physical activity, healthy food choices and sleep routines) and maintaining physical and psychological wellbeing. By identifying vulnerable groups, intervention strategies may be more targeted, and the effectiveness of health strategies may be improved.

Maintaining regular habits during restrictive measures could be considered a protective factor for mental health outcomes. Encouraging healthy food choices, regular mealtimes and the carrying out of physical activity at home could therefore be a useful strategy to make the population aware of the need to remain healthy. The promotion of correct lifestyles is important for the protection of health, but it becomes even more important during periods of forced home confinement in reducing long-term negative effects of quarantine. Suggestions on how to maintain a correct lifestyle could be provided through video or app-based supports, but also through non-digital channels (such as TV, newspapers, journals, posters or leaflets) in order to reach less technology-oriented people.

Given that the most effective healthcare measure for reducing the incidence of the coronavirus pandemic was quarantine, and the fact that globalisation and travel increase the likelihood that a similar situation may occur in the future, knowledge of the emotional and cognitive effects of quarantine on the population could lead to the implementation of more effective measures aimed at facilitating coping strategies.

It is essential to implement psychoeducational programmes to manage the emotional and affective alterations caused by restrictive measures, especially if they are taken on a mass level and are repeated in time.

**Conclusions**

The implementation of forced restrictive measures to prevent the spread of the COVID-19 infection, in particular the more limiting ones such as quarantine, has influenced individual mental health. Depression, anxiety, psychological distress and post-traumatic symptoms have been the predominant, new-onset psychological health problems in European general populations during the pandemic. Several risk factors have been identified, such as being female, young, having a low income, being unemployed and having COVID-19-like symptoms.

Overall, despite the limitation of the studies, due also to the emergency pandemic situation, the results of this review suggest that there is an immediate psychological impact of the quarantine. Concerning the long-lasting effects, this impact may depend on each country’s strategies and duration of restrictive measures taken. To mitigate the significant negative effects on emotional wellbeing, the adoption of appropriate strategies by health services is fundamental, as is preparing the general population for possible future waves of the pandemic. When applying quarantine measures, policy makers should attempt to find the right balance between reducing the risk of infection and minimising the risk of negative mental consequences, while also empowering wellbeing, especially in vulnerable groups.

Future research, based on longitudinal analyses, should attempt to monitor the increase in mental health symptoms over time, in particular their course after the end of the restrictive measures. It would also be important to investigate the social context-related factors that are likely to influence their relationship with quarantine.

Moreover, in addition to providing a focus on the most vulnerable populations, research should investigate between-country variations that result from the confluence of specific environmental stressors and time and type of quarantine in that given area.

**Supplementary material.** The supplementary material for this article can be found at https://doi.org/10.1017/S2045796022000051

**Availability of data and materials.** The data are available from the authors upon request.

**Acknowledgements.** The authors would like to acknowledge Chiara Pandolfini for language editing and Daniela Miglio for editing.

**Author contributions.** G. S. wrote the first draft of the manuscript with input from M.B. R.C. did the network analysis. M.B. critically reviewed the article and reviewed the final draft of the article. All authors had full access to all the data in the study and had final responsibility for the decision to submit for publication. The authors read and approved the final manuscript. M.B. is the guarantor.

**Conflict of interest.** All authors declare that they have no competing interests.

**References**

Antunes R, Frontini R, Amaro N, Salvador R, Matos R, Moroco P and Rebelo-Goncalves R (2020) Exploring lifestyle habits, physical activity, anxiety and basic psychological needs in a sample of Portuguese adults during COVID-19. *International Journal of Environmental Research and Public Health* 17, 4360.

Arora T and Grey I (2020) Health behaviour changes during COVID-19 and the potential consequences: a mini-review. *Journal of Health Psychology* 25, 1155–1163.

Ausín B, Chiabudini M, Buonanno C, De Bartolo P, Riemann D, Mancini P and Baglioni C (2020) Insomnia in the Italian population during COVID-19 outbreak: a snapshot on one major risk factor for depression and anxiety. *Frontiers in Psychiatry* 11, 579107.

Balanzá-Martínez V, Kapczinski F, de Azevedo Cardoso T, Atienza-Carbonell B, Rosa AR, Mota JC and De Boni RB (2021) Gender-related differences in the psychological impact of confinement as a consequence of COVID-19 in Spain. *Journal of Gender Studies* 30, 29–38.

Bacaro V, Chiabudini M, Buonanno C, De Bartolo P, Riemann D, Mancini P and Baglioni C (2020) Insomnia in the Italian population during COVID-19 outbreak: a snapshot on one major risk factor for depression and anxiety. *Frontiers in Psychiatry* 11, 579107.

Balanzá-Martínez V, Kapczinski F, de Azevedo Cardoso T, Atienza-Carbonell B, Rosa AR, Mota JC and De Boni RB (2021) The assessment of lifestyle changes during the COVID-19 pandemic using a multidimensional scale. *Revista de Psiquiatria y Salud Mental* 14, 16–26.

Balsamo M and Carlucci L (2020) Italians on the age of COVID-19: the self-reported depressive symptoms through web-based survey. *Frontiers in Psychology* 11, 569276.
Bao Y, Sun Y, Meng S, Shi J and Lu L (2020) 2019-nCoV epidemic: address mental health care to empower society. The Lancet 395, e37–e38.

Bartoszek A, Walkowiak D, Bartoszek A and Kardas G (2020) Mental well-being (depression, loneliness, insomnia, daily life fatigue) during COVID-19 related home-confinement – a study from Poland. International Journal of Environmental Research and Public Health 17, 7417.

Bastian M, Heymann S and Jacomy M (2009) Gephi: an open source software for exploring and manipulating networks. International AAAI Conference on Weblogs and Social Media.

Beck F, Léger D, Fressard L, Peretti-Watel P and Verger P and The Coconel Group (2021) COVID-19 health crisis and lockdown associated with high level of sleep complaints and hypnic upsets at the population level. Journal of Sleep Research 30, e13119.

Benke C, Autenrieth LK, Asselmann E and Pané-Farré CA (2021) Relationships between depression, anxiety and distress at the beginning of the COVID-19 pandemic among adults from Germany. Psychiatry Research 293, 113462.

Blondel VD, Guillaume J-L, Lambiotte R and Lefebvre E (2008) Fast unfolding of communities in large networks. Journal of Statistical Mechanics: Theory and Experiment 2008, P0008.

Bodecka M, Nowakowska I, Zajenkowska A, Rajchert J, Klabon VD, Guillaume J-L, Lambiotte R and Lefebvre E (2020) Multimodal psychopathology before the COVID-19 outbreak and during lockdown during COVID-19 lockdown. European Review for Medical and Pharmacological Sciences 24, 7155–7163.

Chaudhry AW, Kazmi B, Sharjeel S, Akhtar Z and Shahid S (2021) Learning from the past: a systematic review on risk and protective factors for psychological distress in past infectious epidemics and COVID-19. Journal of Research in Psychology 3, 1–54.

Cheval B, Sivaramakrishnan H, Maltagliati S, Fessler L, Forestier C, Sarrazin P, Orsholits D, Chalabaev A, Sander D, Ntoumanis N and Boisgontier MP (2021) Relationships between changes in self-reported physical activity, sedentary behaviour and health during the coronavirus (COVID-19) pandemic in France and Switzerland. Journal of Sports Research and Public Health 12, 626944.

Costantini A and Mazzotti E (2020) Italian validation of COVID-19 peritraumatic distress index and preliminary data in a sample of general population. Rivista di Psichiatria 55, 7.

Coulthard H, Sharps M, Culiffe L and van den Tol A (2021) Eating in the lockdown during the COVID-19 pandemic: self-reported changes in eating behaviour, and associations with BMI, eating style, coping and health anxiety. Appetite 161, 105082.

Dawson DL and Golijani-Moghaddam N (2020) COVID-19: psychological flexibility, coping, mental health, and wellbeing in the UK during the pandemic. Journal of Contextual Behavioral Science 17, 126–134.

di Corrado D, Magnano P, Muzzi B, Coco M, Guarnera M, De Lucia S and Maldonato NM (2020) Effects of social distancing on psychological state and physical activity routines during the COVID-19 pandemic. Sport Sciences for Health 16, 619–624.

di Crosta A, Palumbo R, Marchetti D, Cecatto I, La Malva P, Maiella R, Cipì M, Roma P, Mammarella N, Verrocchio MC and Di Domenico A (2020) Individual differences, economic stability, and fear of contagion as risk factors for PTSD symptoms in the COVID-19 emergency. Frontiers in Psychology 11, 567367.

Di Giuseppe M, Zilcha-Mano S, Prout TA, Perry JC, Ortuş G and Conversano C (2020) Psychological impact of coronavirus disease 2019 among Italians during the first week of lockdown. Frontiers in Psychiatry 11, 576597.

Di Renzo L, Guattieri P, Cinelli G, Bigioni G, Soldati L, Attinà A, Bianco FF, Caparella G, Camodeca V, Carrano E, Ferrari S, Giannattasio S, Leggeri C, Rampello T, Lo Presti L, Tarisitano MG and De Lorenzo A (2020) Psychological and eating habits during COVID-19 home confinement: results of EHLC-COVID-19 Italian online survey. Nutrients 12, 2152.

Dogaş Z, Lüsiç Kalcina L, Pavlinac Dodig I, Demirović S, Madirazza K, Valić M and Pecotić R (2020) The effect of COVID-19 lockdown on lifestyle and mood in Croatian general population: a cross-sectional study. Croatian Medical Journal 61, 309–318.
Dunn KM, Jordan K, Lacey RJ, Shapley M and Jinks C (2004) Patterns of consent in epidemiologic research: evidence from over 25,000 respondents. *American Journal of Epidemiology* 159, 1087–1094.

Ellen C and De Vriendt Patricia (2021) Meaningful activities during COVID-19 lockdown and association with mental health in Belgian adults. *BMC Public Health* 21, 622.

Favieri F, Forte G, Tambelli R and Casagrande M (2021) The Italians in the time of coronavirus: psychosocial aspects of the unexpected COVID-19 pandemic. *Frontiers in Psychiatry* 12, 551924.

Ferrucci R, Averna A, Marino D, Raitano MR, Ruggiero F, Mameli F, Dini M, Poletti B, Barbieri S, Priori A and Pravettoni G (2020) Psychological impact during the first outbreak of COVID-19 in Italy. *Frontiers in Psychiatry* 11, 59266.

Fiorenzato E, Zabberoni S, Costa A and CONA G (2021) Cognitive and mental health changes and their vulnerability factors related to COVID-19 lockdown in Italy. *PLoS ONE* 16, e0246204.

Fiorillo A, Sampogna G, Giallonardo V, Del Vecchio V, Luciano M, Albert U, Carmassi C, Carrà G, Cirulli F, Dell’Ossio B, Nanni MG, Pompili M, Sani G, Tortorella A and Volpe U (2020) Effects of the lockdown on the mental health of the general population during the COVID-19 pandemic in Italy: results from the COMET collaborative network. *European Psychiatry* 63, e87.

Fountoulakis KN, Apostolidou MK, Vilaregut A, Carratalà E, Torras-Garat S and Pérez-Testor (2021) The Italians in the country and abroad – implications for mental care. *Frontiers in Psychology* 67, 6642.

Fruchtman TMJ and Reingold EM (1991) Graph drawing by force-directed placement. *Software: Practice and Experience* 21, 11.

Gambin M, Sękowski M, Woźniak-Prus M, Wnuk A, Oleksy T, Cudo A, Hansen K, Hulej-Lukasik M, Kubicka K, Łysi AE, Gorgol J, Holas P, Kmita G, Lojek E and Maison D (2021) Generalized anxiety and depressive symptoms in various age groups during the COVID-19 lockdown in Poland specific predictors and differences in symptoms severity. *Comprehensive Psychiatry* 105, 152222.

García-Álvarez L, de la Fuente-Tomás L, García-Portilla MP, Sáiz PA, Fiorillo A, Sampogna G, Giallonardo V, Del Vecchio V, Luciano M, Albert U, Carmassi C, Carrà G, Cirulli F, Dell’Ossio B, Nanni MG, Pompili M, Sani G, Tortorella A and Volpe U (2020) Effects of the lockdown on the mental health of the general population during the COVID-19 pandemic in Italy: results from the COMET collaborative network. *European Psychiatry* 63, e87.

Gonçalves AQ, Duarte-Salles T and Berenguera A (2020) Mental health, sense of well-being and daily physical activity and remote work. *Journal of Affective Disorders* 279, 624–629.

Franceschini C, Musetti A, Zenesini C, Palagini L, Scarpetti MC, Lenzo V, Freda L, Lemmo D, Vegni E, Borghi L, Saita E, Cattivelli M, Poletti B, Barbieri S, Priori A and Pravettoni G (2020) Poor sleep quality and its consequences on mental health during the COVID-19 lockdown in Italy. *Frontiers in Psychology* 11, 574475.

Groarke JM, Berry E, Graham-Wisener L, McKenna-Plumley PE, Gómez-Salgado J, Andrés-Villas M, Domínguez-Salas S, Díaz-Milanés D and Herring N. Bonati M. (2021) Poor mental health and sleep disturbances in Italy: results from the COMET collaborative network. *Comprehensive Psychiatry* 105, 152222.

Gutierrez-Hernandez ME, Fanjul LF, Diaz-Megolla A, Reyes-Hurtado P, Herrera-Rodriguez JF, Enjuato-Castellanos MDP and Peñate W (2021) COVID-19 lockdown and mental health in a sample population in Spain: the role of self-compassion. *International Journal of Environmental Research and Public Health* 18, 2103.

Hasebaert F, Hasebaert J, Zante E and Franck N (2020) Who maintains good mental health in a locked-down country? A French nationwide online survey of 11,391 participants. *Health & Place* 66, 102440.

Husky MM, Koves-Masfety V and Swendsen JD (2020) Stress and anxiety among university students in France during COVID-19 mandatory confinement. *Comprehensive Psychiatry* 102, 152191.

Izdebski Z and Mazur J (2021) Changes in mental well-being of adult Poles in the early period of the COVID-19 pandemic with reference to their occupational activity and remote work. *International Journal of Occupational Medicine and Environmental Health* 34, 251–262.

Jacob L, Tully MA, Barnett Y, Lopez-Sanchez GF, Butler L, Schuch F, López-Bueno R, McDermott D, Firth J, Grabovac I, Yakkundi A, Armstrong N, Young T and Smith L (2020) The relationship between physical activity and mental health in a sample of the UK public: a cross-sectional study during the implementation of COVID-19 social distancing measures. *Medical and Physical Activity* 19, 100345.

Jacques-Aviñó C, López-Jiménez T, Medina-Perucha L, del Bont J, Gonzales Alcaves, Duarte-Salles T and Berenguera A (2020) Gender-based approach on the social impact and mental health in Spain during COVID-19 lockdown: a cross-sectional study. *BMJ Open* 10, e044617.

Jané-Llopis E, Anderson P, Segura I, Zabaleta E, Muñoz R, Ruiz G, Rehm J, Cabezás C and Colom J (2021) Mental ill-health during COVID-19 confinement. *BMC Psychiatry* 21, 194.

Jiménez Ó, Sánchez-Sánchez LC and García-Montes JM (2020) Psychological impact of COVID-19 confinement and its relationship with meditation. *International Journal of Environmental Research and Public Health* 17, 6642.

Jung S, Kneer J and Krüger THC (2020) Mental health, sense of COHERENCE, and interpersonal violence during the COVID-19 pandemic lockdown in Germany. *Journal of Clinical Medicine* 9, E3708.

Justo-Alonso A, García-Dantas A, González-Vázquez AI, Sánchez-Martín M and del Río-Casanova L (2020) How did different generations cope with the COVID-19 pandemic? Early stages of the pandemic in Spain. *Psicothema* 32, 490–500.

Kalinizaki A (2021) Posttraumatic symptoms, posttraumatic growth, and internal resources among the general population in Greece: a nation-wide survey amid the first COVID-19 lockdown. *International Journal of Psychology: Journal International De Psychologie* 56, 766–771.

Kamberi F, Jaho J, Mechili EA, Sinaj E and Skendho H (2020) Effect of COVID-19 pandemic on mental health among Albanian people residing in the country and abroad – implications for mental care. *Archives of Psychiatric Nursing* 34, 307–512.

Karavazoglou K, Konstantopoulou G, Kalogeropoulou M, Iliou T, Vorvolakos T, Assimakopoulos K, Gourris P and Alexopoulos P (2021) Psychological distress in the Greek general population during the first COVID-19 lockdown. *B/Pysch Open* 7, e59.

Korkelia K, Suominen S, Alhvenainen J, Ojantlaiva A, Rautava P, Helenius H and Koskenux M (2001) Non-response and related factors in a nationwide health survey. *European Journal of Epidemiology* 17, 991–999.

Landi G, Pakenham KI, Boccolini G, Grandi S and Tossani E (2020) Health anxiety and mental health outcome during COVID-19 lockdown in Italy: the mediating and moderating roles of psychological flexibility. *Frontiers in Psychology* 11, 2195.

Lengo V, Quattropani MC, Musetti A, Zenesini C, Freda MF, Lemmo D, Vegni E, Borghi L, Plazzi G, Castelnuovo G, Cattivelli M, Poletti B, Barbieri S, Priori A and Pravettoni G (2020) Resilience contributes to low emotional impact of COVID-19 pandemic lockdown. *Comprehensive Psychiatry* 105, 152222.

León-Zarceño E, Moreno-Tenas A, Boix Villela S, García-Naveira A and Serrano-Rosa MA (2021) Habits and psychological factors associated with changes in physical activity due to COVID-19 confinement. *Frontiers in Psychology* 12, 620745.
Salari N, Hosseinian-Far A, Jalali R, Vaisi-Raygani A, Rasoulpoor S, Salfi F, Lauriola M, Amicucci G, Corigliano D, Viselli L, Tempesta D and Robinson E, Sutin AR, Daly M and Jones A (2020) Psychological impact and associated factors during the COVID-19 pandemic among the general population in Spain. Frontiers in Psychiatry 12, 567470.

Rettie H and Daniels J (2021) Coping and tolerance of uncertainty: predictors and mediators of mental health during the COVID-19 pandemic. American Psychologist 76, 427–437.

Richter D, Riedel-Heller S and Zuercher S (2021) Mental health problems in the general population during and after the first lockdown phase due to the SARS-CoV-2 pandemic: rapid review of multi-wave studies. Epidemiology and Psychiatric Sciences 30, E27. doi: 10.1017/S2045796021000160

Robinson E, Sutin AR, Daly M and Jones A (2022) A systematic review and meta-analysis of longitudinal cohort studies comparing mental health before versus during the COVID-19 pandemic in 2020. Journal of affective disorders 296, 567–576.

Rodríguez-Rey R, Garrido-Hernansaiz H and Collado S (2020) Psychological impact and associated factors during the initial stage of the coronavirus (COVID-19) pandemic among the general population in Spain. Frontiers in Psychology 11, 1540.

Rossi R, Jannini TB, Soci C, Pacitti F and Lorenzo GD (2021) Stressful life events and resilience during the COVID-19 lockdown measures in Italy: association with mental health outcomes and age. Frontiers in Psychiatry 12, 653832.

Rotărescu VS, Matei DB, Mircia IA, Mirescu AM, Nedelescu BG, Nedelea DG, Calina AN, Necula G, Oteșanu G and Tudor LC (2021) How anxious did you feel during lockdown? The roles resilience, living environment, and gender play on the level of anxiety state during pandemic isolation. Research in Psychotherapy: Psychopathology, Process and Outcome 23, 496.

Saita E, Faccini F, Pagnini F and Molgora S (2021) In the eye of the COVID-19 storm: a web-based survey of psychological distress among people living in Lombardy. Frontiers in Psychology 12, 566753.

Salari N, Hosseini-For A, Jalali R, Vaisi-Raygani A, Rasoulopoor S, Mohammadi M, Rasoulopoor S and Khaledi-Paveh B (2020) Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: a systematic review and meta-analysis. Globalization and health 16, 1–1.

Salti F, Lauriola M, Amicucci G, Corigliano D, Viselli L, Tempesta D and Ferrara M (2020) Gender-related time course of sleep disturbances and psychological symptoms during the COVID-19 lockdown: a longitudinal study on the Italian population. Neurobiology of Stress 13, 100259.

Segre G, Campi R, Scarpellini F, Clavenna A, Zanetti M, Cartabia M and Bonati M (2021) Interviewing children: the impact of the COVID-19 quarantine on children’s perceived psychological distress and changes in routine. BMC Pediatrics 21, 231.

Silva Moreira P, Ferreira S, Couto B, Machado-Sousa M, Fernández M, Raposo-Lima C, Sousa N, Picó-Pérez M and Morgado P (2021) Protective factors of mental health status during the COVID-19 outbreak in the Portuguese population. International Journal of Environmental Research and Public Health 18, 1910.

Skapinakis P, Bellos S, Oikonomou A, Dimitriadis G, Gikas P, Perdikari E and Mavreas V (2020) Depression and its relationship with coping strategies and illness perceptions during the COVID-19 lockdown in Greece: a cross-sectional survey of the population. Depression Research and Treatment 2020, 1–11.

Stocchetto N, Segre G, Zanier ER, Zanetti M, Campi R, Scarpellini F, Clavenna A and Bonati M (2021) Burnout in intensive care unit workers during the second wave of the COVID-19 pandemic: a single center cross-sectional Italian study. International Journal of Environmental Research and Public Health 18, 6102.

Suso-Ribera C and Martín-Brufau R (2020) How much support is there for the recommendations made to the general population during confinement? A study during the first three days of the COVID-19 quarantine in Spain. International Journal of Environmental Research and Public Health 17, 4382.

Szabó C, Pukánszky L and Kemény L (2020) Psychological effects of the COVID-19 pandemic on Hungarian adults. International Journal of Environmental Research and Public Health 17, 9565.

Tognotti E (2013) Lessons from the history of quarantine, from plague to influenza A. Emerging Infectious Diseases 19, 254–259.

Valiente C, Conteras A, Peinado V, Trucharte A, Martínez AP and Vázquez C (2021) Psychological adjustment in Spain during the COVID-19 pandemic: positive and negative mental health outcomes in the general population. The Spanish Journal of Psychology 24, e8.

Velhuis CB, Nesoff ED, McKown AL, Rice DR, Ghoneima H, Wootton AR, Papautsky EL, Arigo D, Goldberg S and Anderson JC (2021) Addressing the critical need for long-term mental health data during the COVID-19 pandemic: changes in mental health from April to September 2020. Preventive Medicine 110, 106465.

Verloti P, Rogier G, Beomonte Zobel S, Castellano R and Tambelli R (2021) Loneliness, emotion dysregulation, and internalizing symptoms during coronavirus disease 2019: a structural equation modeling approach. Frontiers in Psychiatry 11, 581494.

Vicario-Merino A (2020) Analysis of the stress, anxiety and healthy habits in the Spanish COVID-19 confinement. Health Science Journal 14, 6.

Vujčić I, Safije T, Milikić B, Popović E, Dubljanić D, Dubljanić E, Dubljanić J and Čabarkapa M (2021) Coronavirus disease 2019 (COVID-19) epidemic and mental health Status in the general adult population of Serbia: a cross-sectional study. International Journal of Environmental Research Public Health 18, 15.

Wade M, Prime H and Browne DT (2020) Why we need longitudinal mental health research with children and youth during (and after) the COVID-19 pandemic. Psychiatry Research 290, 113143.

World Health Organization (2020) Mental Health and Psychosocial Considerations during COVID-19 Outbreak. Geneva, Switzerland: World Health Organization.

Xie X, Xue Q, Zhou Y, Zhu K, Liu Q, Zhang J and Song R (2020) Mental health status among children in home confinement during the coronavirus disease 2019 outbreak in Hubei province, China. JAMA Pediatrics 174, 898.

Zavlis O, Butter S, Bennett K, Hartman TK, Hyland P, Mason L, McBride O, Murphy J, Gibson-Miller J, Levita L, Martínez AP, Shelvin M, Stocks TVA, Vallieres F and Bentall RP (2021) How does the COVID-19 pandemic impact on population mental health? A network analysis of COVID influences on depression, anxiety and traumatic stress in the UK population. Psychological Medicine, 1–9.

Zhang L, Pan R, Cai Y and Pan J (2021) The prevalence of post-traumatic stress disorder in the general population during the COVID-19 pandemic: a systematic review and single-arm meta-analysis. Psychiatry investigation 18, 426.

Appendix

Table A1. Keywords used for searching databases

| Search query | Keywords (searched within titles, abstracts and general keywords) |
|--------------|------------------------------------------------------------------|
| 1            | ‘quarantine’ OR ‘isolation’ OR ‘isolate’ OR ‘confinement’ OR ‘Lockdown’ OR ‘home quarantine’ OR ‘quarantined’ |
| 2            | ‘COVID’ OR ‘COVID-19’ OR ‘nCoV’ OR ‘corona-virus’ OR ‘outbreak’ OR ‘epidemic’ OR ‘pandemic’ OR ‘coronavirus’ OR ‘Sars-cov-2’ |
| 3            | ‘mental health’ OR ‘mental disorders’ OR ‘mental illness’ OR ‘psychiatric’ OR ‘psychological’ OR ‘psychosocial’ OR ‘mental wellbeing’ OR ‘depression’ OR ‘depressive’ OR ‘sleep disorder’ OR ‘insomnia’ OR ‘anxiety’ OR ‘PTSD’ OR ‘distress’ OR ‘affective’ OR ‘fear’ OR ‘phobia’ |
| 4            | ‘Survey’ OR ‘questionnaire’ OR ‘online survey’ OR ‘self-report questionnaire’ |

Final search query 1 AND 2 AND 3 AND 4 AND 4
| Study                   | Johanna Briggs Institute Score (Moola et al., 2020) | Were the criteria for inclusion in the sample clearly defined? | Were the study subjects and the setting described in detail? | Exposure measured in a valid and reliable way? | Objective, standard criteria used for measurement of the condition? | Confounding factors identified? | Strategies to deal with confounding factors stated? | Outcomes measured in a valid and reliable way? | Appropriate statistical analysis used? |
|------------------------|---------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------|--------------------------------|-----------------------------------------------|-----------------------------------------------|---------------------------------------------|
| Antunes et al. (2020)  | 6                                                 | Y                                                             | Y                                                             | Y                                                             | N                                                             | N                             | N                             | Y                                                             | Y                                           |
| Bacaro et al. (2020)   | 8                                                 | Y                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Balanzà-Martínez et al. (2021) | 8                                         | Y                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Balsamo and Carlucci (2020) | 7                                         | N                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Bartoszek et al. (2020) | 8                                                 | Y                                                             | Y                                                             | Y                                                             | N                                                             | N                             | N                             | Y                                                             | Y                                           |
| Beck et al. (2021)     | 3                                                 | N                                                             | Y                                                             | N                                                             | N                                                             | N                             | N                             | Y                                                             | Y                                           |
| Benke et al. (2020)    | 5                                                 | N                                                             | Y                                                             | N                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Bodecka et al. (2021)  | 4                                                 | N                                                             | Y                                                             | Y                                                             | N                                                             | N                             | N                             | N                                                             | N                                           |
| Bonati et al. (2021)   | 7                                                 | N                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Bonsaksen et al. (2020) | 8                                            | Y                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Budimir et al. (2021)  | 6                                                 | N                                                             | Y                                                             | Y                                                             | N                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Cancello et al. (2020) | 5                                                 | N                                                             | Y                                                             | N                                                             | N                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Carriedo et al. (2020) | 7                                                 | N                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Casagrande et al. (2020) | 8                                           | Y                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Casali et al. (2021)   | 8                                                 | Y                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Castellini et al. (2021) | 8                                          | Y                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Cecchetto et al. (2021) | 7                                            | N                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Cellini et al. (2021)  | 7                                                 | N                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Cerami et al. (2020)   | 8                                                 | Y                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Cerbara et al. (2020)  | 5                                                 | N                                                             | Y                                                             | N                                                             | N                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Chodkiewicz et al. (2020) | 4                                          | N                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Conversano et al. (2020) | 7                                            | N                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Coppola et al. (2021)  | 8                                                 | Y                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Costantini and Mazzotti (2020) | 7                               | N                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Coulthard et al. (2020) | 8                                                | Y                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Dawson and Goljani-Moghaddam (2020) | 8                           | Y                                                             | Y                                                             | Y                                                             | Y                                                             | Y                             | Y                             | Y                                                             | Y                                           |
| Study                      | Johanna Briggs Institute Score (Moola et al., 2020) | Were the criteria for inclusion in the sample clearly defined? | Were the study subjects and the setting described in detail? | Exposure measured in a valid and reliable way? | Objective, standard criteria used for measurement of the condition? | Confounding factors identified? | Strategies to deal with confounding factors stated? | Outcomes measured in a valid and reliable way? | Appropriate statistical analysis used? |
|---------------------------|--------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------|----------------------------------|----------------------------------------------|----------------------------------------------|---------------------------------------|
| Di Corrado et al. (2020)  | 2                                                | Y                                                             | Y                                                             | N                                               | N                                                                | N                                               | N                                            | N                                           | Y                                     |
| Di Crosta et al. (2020)   | 7                                                | N                                                             | Y                                                             | Y                                               | Y                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Di Giuseppe et al. (2020) | 8                                                | Y                                                             | Y                                                             | Y                                               | Y                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Di Renzo et al. (2020)    | 8                                                | Y                                                             | Y                                                             | Y                                               | Y                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Dogli et al. (2020)       | 6                                                | Y                                                             | Y                                                             | Y                                               | N                                                                | N                                               | N                                            | Y                                           | Y                                     |
| Ellen et al. (2021)       | 8                                                | Y                                                             | Y                                                             | Y                                               | Y                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Favieri et al., 2021      | 6                                                | Y                                                             | Y                                                             | Y                                               | N                                                                | N                                               | N                                            | Y                                           | Y                                     |
| Ferrucci et al. (2020)    | 5                                                | N                                                             | Y                                                             | N                                               | N                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Fiorenzano et al. (2021)  | 8                                                | Y                                                             | Y                                                             | Y                                               | Y                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Fiorillo et al. (2020)    | 7                                                | N                                                             | Y                                                             | Y                                               | Y                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Fountoulakis et al. (2021)| 7                                                | N                                                             | Y                                                             | Y                                               | Y                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Franceschini et al. (2020)| 8                                                | Y                                                             | Y                                                             | Y                                               | Y                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Gambin et al. (2021)      | 7                                                | N                                                             | Y                                                             | Y                                               | Y                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| García-Alvarez et al. (2020)|                                       | Y                                                             | Y                                                             | Y                                               | Y                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Gismero-González et al. (2021)|                                       | 6                                                | Y                                                             | Y                                                             | Y                                                            | N                                               | N                                            | Y                                           | Y                                     |
| Gomez-Salgado et al. (2020)|                                       | 8                                                | Y                                                             | Y                                                             | Y                                                            | Y                                               | Y                                            | Y                                           | Y                                     |
| Groarke et al. (2020)     | 8                                                | Y                                                             | Y                                                             | Y                                               | Y                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Gualano et al. (2020)     | 7                                                | N                                                             | Y                                                             | Y                                               | Y                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Gutiérrez-Hernández et al. (2021)|                                       | 8                                                | Y                                                             | Y                                                             | Y                                                            | Y                                               | Y                                            | Y                                           | Y                                     |
| Gunther Bel et al. (2020) | 8                                                | Y                                                             | Y                                                             | Y                                               | Y                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Haesebaert et al. (2020)  | 8                                                | Y                                                             | Y                                                             | Y                                               | Y                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Izdebski and Mazur (2021) | 5                                                | N                                                             | Y                                                             | N                                               | N                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Jacob et al. (2020)       | 8                                                | Y                                                             | Y                                                             | Y                                               | Y                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Jacques-Avino et al. (2020)|                                       | 8                                                | Y                                                             | Y                                                             | Y                                                            | Y                                               | Y                                            | Y                                           | Y                                     |
| Jané-Llopis et al. (2021) | 8                                                | Y                                                             | Y                                                             | Y                                               | Y                                                                | Y                                               | Y                                            | Y                                           | Y                                     |
| Jiménez et al. (2020)     | 5                                                | N                                                             | Y                                                             | Y                                               | N                                                                | N                                               | N                                            | Y                                           | Y                                     |
| Study                        | Year | N | Y | Y | Y | N | N | Y | N |
|-----------------------------|------|---|---|---|---|---|---|---|---|
| Jung et al. (2020)          | 4    | N | Y | Y | Y | N | N | Y | N |
| Justo-Alonso et al. (2020)  | 8    | Y | Y | Y | Y | Y | Y | Y | Y |
| Kalaitzaki (2021)           | 6    | Y | Y | Y | Y | N | N | Y | Y |
| Kamberi et al. (2020)       | 4    | N | Y | Y | Y | N | N | Y | N |
| Karaivazoglou et al. (2021) | 7    | N | Y | Y | Y | Y | Y | Y | Y |
| Landi et al. (2020)         | 8    | Y | Y | Y | Y | Y | Y | Y | Y |
| Lenzo et al. (2020)         | 7    | N | Y | Y | Y | Y | Y | Y | Y |
| López-Moreno et al. (2020)  | 5    | Y | Y | Y | Y | N | N | Y | N |
| Lopez Bueno et al. (2020a)  | 7    | Y | Y | Y | Y | Y | Y | N | Y |
| Lopez Bueno et al. (2020b)  | 6    | N | Y | Y | Y | Y | Y | Y | N |
| Lorant et al. (2021)        | 7    | N | Y | Y | Y | Y | Y | Y | Y |
| Margetic et al. (2021)      | 7    | N | Y | Y | Y | Y | Y | Y | Y |
| Mariani et al. (2020)       | 6    | Y | Y | Y | Y | N | N | Y | Y |
| Maugeri et al. (2020)       | 5    | N | Y | Y | Y | N | N | Y | Y |
| Mazza et al. (2020)         | 8    | Y | Y | Y | Y | Y | Y | Y | Y |
| Méndez-Giménez et al. (2021)| 7    | N | Y | Y | Y | Y | Y | Y | Y |
| Silva Moreira et al. (2021) | 8    | Y | Y | Y | Y | Y | Y | Y | Y |
| Munk et al. (2020)          | 5    | N | Y | Y | Y | N | N | Y | Y |
| Neill et al. (2021)         | 8    | Y | Y | Y | Y | Y | Y | Y | Y |
| Nese et al. (2022)          | 3    | N | Y | N | N | N | N | Y | Y |
| Odriozola-Gonzalez et al. (2022)| 8    | Y | Y | Y | Y | Y | Y | Y | Y |
| Orlandi et al. (2021)       | 8    | Y | Y | Y | Y | Y | Y | Y | Y |
| Pakenham et al. (2020)      | 8    | Y | Y | Y | Y | Y | Y | Y | Y |
| Panno et al. (2020)         | 8    | Y | Y | Y | Y | Y | Y | Y | Y |
| Papandreou et al. (2020)    | 8    | Y | Y | Y | Y | Y | Y | Y | Y |
| Paulino et al. (2021)       | 8    | Y | Y | Y | Y | Y | Y | Y | Y |
| Perez et al. (2021)         | 8    | Y | Y | Y | Y | Y | Y | Y | Y |
| Pérez-Rodrigo et al. (2021) | 7    | N | Y | Y | Y | Y | Y | Y | Y |
| Pieh et al. (2021)          | 6    | N | Y | Y | Y | N | Y | Y | Y |
| Study                     | Johanna Briggs Institute Score (Moola et al., 2020) | Were the criteria for inclusion in the sample clearly defined? | Were the study subjects and the setting described in detail? | Exposure measured in a valid and reliable way? | Objective, standard criteria used for measurement of the condition? | Confounding factors identified? | Strategies to deal with confounding factors stated? | Outcomes measured in a valid and reliable way? | Appropriate statistical analysis used? |
|--------------------------|-----------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------------|---------------------------------|-------------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| Pieh et al. (2020)       | 7                                                   | N                                                              | Y                                                           | Y                                             | Y                                                           | Y                                              | Y                                              | Y                                             | Y                                             |
| Prati (2021)             | 7                                                   | N                                                              | Y                                                           | Y                                             | Y                                                           | Y                                              | Y                                              | Y                                             | Y                                             |
| Prete et al. (2020)      | 8                                                   | Y                                                              | Y                                                           | Y                                             | Y                                                           | Y                                              | Y                                              | Y                                             | Y                                             |
| Ramiz et al. (2021)      | 6                                                   | Y                                                              | Y                                                           | Y                                             | Y                                                           | N                                              | N                                              | Y                                             | Y                                             |
| Rania and Coppola (2021) | 7                                                   | N                                                              | Y                                                           | Y                                             | Y                                                           | Y                                              | Y                                              | Y                                             | Y                                             |
| Rettie and Daniels (2021)| 8                                                   | Y                                                              | Y                                                           | Y                                             | Y                                                           | Y                                              | Y                                              | Y                                             | Y                                             |
| Rodriguez Rey et al. (2020)| 8                                       | Y                                                              | Y                                                           | Y                                             | Y                                                           | Y                                              | Y                                              | Y                                             | Y                                             |
| Rossi et al. (2021)      | 8                                                   | Y                                                              | Y                                                           | Y                                             | Y                                                           | Y                                              | Y                                              | Y                                             | Y                                             |
| Rotârescu et al. (2021)  | 6                                                   | Y                                                              | Y                                                           | Y                                             | N                                                           | N                                              | N                                              | Y                                             | Y                                             |
| Saita et al. (2021)      | 5                                                   | Y                                                              | Y                                                           | Y                                             | Y                                                           | N                                              | N                                              | Y                                             | N                                             |
| Skapinakis et al. (2020) | 5                                                   | N                                                              | Y                                                           | Y                                             | Y                                                           | N                                              | N                                              | Y                                             | Y                                             |
| Suso Ribeira and Martin-Burfau (2020) | 8                                           | Y                                                              | Y                                                           | Y                                             | Y                                                           | Y                                              | Y                                              | Y                                             | Y                                             |
| Szabó et al. (2020)      | 6                                                   | Y                                                              | Y                                                           | Y                                             | N                                                           | N                                              | N                                              | Y                                             | Y                                             |
| Valiente et al. (2021)   | 7                                                   | N                                                              | Y                                                           | Y                                             | Y                                                           | Y                                              | Y                                              | Y                                             | Y                                             |
| Vicario-Merino (2020)    | 4                                                   | N                                                              | Y                                                           | Y                                             | Y                                                           | Y                                              | Y                                              | Y                                             | N/A                                           |
| Vujčić et al. (2021)     | 8                                                   | Y                                                              | Y                                                           | Y                                             | Y                                                           | Y                                              | Y                                              | Y                                             | Y                                             |
| León-Zarceño et al. (2021)| 5                                           | N                                                              | Y                                                           | Y                                             | N                                                           | N                                              | N                                              | Y                                             | Y                                             |
Table A3. Critical appraisal of cohort studies

| Study                  | Johanna Briggs Institute Score (Moola et al., 2020) | Were the criteria for inclusion in the sample clearly defined? | Were the study subjects and the setting described in detail? | Exposure measured in a valid and reliable way? | Objective, standard criteria used for measurement of the condition? | Confounding factors identified? | Strategies to deal with confounding factors stated? | Outcomes measured in a valid and reliable way? | Appropriate statistical analysis used? | Was the follow-up time reported and sufficient to be long enough for outcomes to occur? | Was follow-up complete, and if not, were the reasons to loss to follow up described and explored? | Were strategies to address incomplete follow up utilised? |
|-----------------------|-----------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|------------------------------------------------|-----------------------------------------------------------------|--------------------------------|------------------------------------------------|------------------------------------------------|--------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------|
| Ausin et al. (2021)   | 11                                                  | Y                                                             | Y                                                             | Y                                                             | Y                                                               | Y                                                             | Y                                                             | Y                                                             | Y                                                             | Y                                                               | Y                                                               | Y                                                             |
| Cheval et al. (2021)  | 11                                                  | Y                                                             | Y                                                             | Y                                                             | Y                                                               | Y                                                             | Y                                                             | Y                                                             | Y                                                             | Y                                                               | Y                                                               | Y                                                             |
| O’Connor et al. (2021)| 10                                                  | N                                                             | Y                                                             | Y                                                             | Y                                                               | Y                                                             | Y                                                             | Y                                                             | Y                                                             | Y                                                               | Y                                                               | Y                                                             |
| Ozamiz-Extebarria et al. (2020) | 8                                                   | N                                                             | Y                                                             | Y                                                             | Y                                                               | N                                                             | N                                                             | Y                                                             | Y                                                             | Y                                                               | Y                                                               | Y                                                             |
| Salfi et al. (2020)   | 10                                                  | N                                                             | Y                                                             | Y                                                             | Y                                                               | Y                                                             | Y                                                             | Y                                                             | Y                                                             | Y                                                               | Y                                                               | Y                                                             |
| Velotti et al. (2021) | 10                                                  | N                                                             | Y                                                             | Y                                                             | Y                                                               | Y                                                             | Y                                                             | Y                                                             | Y                                                             | Y                                                               | Y                                                               | Y                                                             |
| Zavlis et al. (2021)  | 11                                                  | Y                                                             | Y                                                             | Y                                                             | Y                                                               | Y                                                             | Y                                                             | Y                                                             | Y                                                             | Y                                                               | Y                                                               | Y                                                             |