periscope

Pan-European Response to the ImpactS of COVID-19
and future Pandemics and Epidemics

Analytical report on mental health impacts

Deliverable 2.1

PERISCOPE

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Analytical report on mental health impacts

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REPORT SUMMARY

This report comprises of a systematic review of the effects of COVID-29, previous pandemics/epidemics and economic crises on mental health, which has been conducted through the lead of Karolinska Institutet and in collaboration with PERISCOPE partners Federation of European Academies of Medicine, and Mental Health Europe. The review draft was also presented and discussed at an online workshop on June 16th, 2021, which was open to all PERISCOPE partners and their relevant professional networks. This report presents first the findings form the systematic review, and then, of the workshop.

Background

A rise in mental illness is expected to follow the COVID-19 pandemic-related circumstances, and the pandemic has been projected to lead to a deep global economic recession, further adding to risk-factors. The aim of this review was to assess the early impact of the COVID-19 pandemic on mental health, and of possible impacts of an economic crisis.

Methods

For the systematic review, searches were conducted in PubMed, Web of Science, PsycInfo and Sociological abstracts, restricted to 2000 – 2021 and English. We included studies of all populations exposed to the COVID-19 pandemic, other similar previous pandemics /epidemics, or economic crises, compared to pre-exposure measures or measures from unaffected areas. The outcome was mental health and study designs were longitudinal cohort or repeated cross-sectional. The study team appraised and extracted the data in pairs. PROSPERO registration: 2021 CRD42021252774.

At the workshop, three keynote presentations were given and the invitation to the workshop was disseminated to all PERISCOPE partners.

Findings

We screened 6686 studies, the full-texts of 559 studies were thereafter assessed, and 174 studies were finally included. They examined mental health impacts of the COVID-19 pandemic (87 studies), 2008 economic crisis (84 studies) and the SARS epidemic (3 studies). Outcomes were divided into affective disorders; suicides; mental health care utilization and other mental health outcomes. The studies with COVID-19 exposure were of lesser quality than those of economic crisis or SARS. Most studies for all exposures showed increases in affective disorders and other mental health problems. For economic crisis exposure, increases in mental health care utilization and suicides were also found, but for COVID-19 these findings were mixed. This is probably due

to quarantine measures impacting health care seeking, and due to shorter follow-ups of studies with COVID-19 exposure.

At the workshop, altogether 35 participants from seven countries registered and three keynotes were held and discussed. Also, the workshop participants received a draft version of the systematic review prior to the workshop, which was therefore also available as a basis of discussions.

Conclusions

Our findings from the review and workshop drawn together highlight the importance of available, accessible, and sustainable mental health services, and socio-economically disadvantaged populations should be particular targets of policy interventions in the pandemic. Also, the reflections form the workshop complement the findings form the review, emphasizing the need of combining good-quality studies of health care use with more fine-grained studies of self-reported mental health and ethnographic study of informal social networks, in order to guide future best practices and holistic policy guidance.

INTRODUCTION

INTRODUCTION

The COVID-19 pandemic has carried profound effects on population health, both due to actual COVID-19 infection, and to collateral impacts.[1] Already early on, a rise in mental illness was expected to follow the pandemic-related extraordinary circumstances.[2] Widespread concerns were voiced about the effects of bereavement, fear and social isolation on mental health, and concerns were expressed about socioeconomic impacts of the pandemic response.[2] Also, many people were projected to face increased levels of alcohol and drug use, insomnia, and anxiety.[3] Furthermore, the COVID-19 pandemic has contributed to the largest economic shock in the world in decades, and has been projected to lead to a deep global economic recession.[4] Therefore, the add-on effects of economic recessions on mental health and well-being[5] may further contribute to negative impacts of the pandemic.

Collecting high-quality data on the mental health effects of the COVID-19 pandemic has therefore been identified as an immediate research priority, and international comparisons will be especially helpful in this regard.[2] The aim of this report is thus to systematically assess the early impact that the COVID-19 pandemic has had on mental health, and to provide information about possible impacts that may add on to this, as a result of an eventual economic crisis following the pandemic. Therefore, we intend to map information on the impact of previous pandemics/epidemics similar to COVID-19, and on the impact of earlier economic crises, in order to guide the prevention and management of negative mental health impacts.

METHODS

METHODS

Search strategy and study selection

For this systematic review, searches were conducted in four databases: PubMed, Web of Science, PsycInfo and Sociological abstracts. The search strategy was developed in consultation with a librarian at the Karolinska Institutet - the search strings can be found in Appendix 1. The searches were restricted to the time period 2000 – 2021 and to English. Reference lists of systematic reviews were scanned to identify further studies. The searches were conducted on January 5th and 6th 2021.

Inclusion criteria:

Population: General population and/or any specific populations.

Exposure: COVID-19 or pandemics and epidemics similar to COVID-19 such as MERS, SARS, the swine flu, or economic crises.

Comparator: Pre-pandemic/epidemic or pre-economic crisis measures or measures from unaffected geographical areas.

Outcome: Mental health outcomes (see search strings in Appendix 1 for details).

Types of study: Longitudinal cohort and repeated cross-sectional studies that allowed for direct comparison between exposed and unexposed populations.

The titles and abstracts of all records were independently screened by two researchers in pairs (MA, EP, WO, OS, PF, MN, RC, LM, FA). Disagreement was resolved through discussion among the pair or by consulting a third researcher within the team. Articles included for full-text screening were assessed against the inclusion criteria by two researchers. This review followed the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines,[6] and the review protocol has been pre-registered in PROSPERO (PROSPERO 2021 CRD42021252774 available from: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42021252774)

Data extraction

The data was recorded in an excel spreadsheet and collected by one researcher (MA, EP, OS, PF, MN, RC, LM, FA, CD). The extracted data was checked by another researcher (MA or MN). The data that was extracted included: Study design, country, funding, exposure,

inclusion/exclusion criteria, mental health outcomes, population characteristics, follow-up period length, main findings, author conclusions and other key findings.

Quality assessment

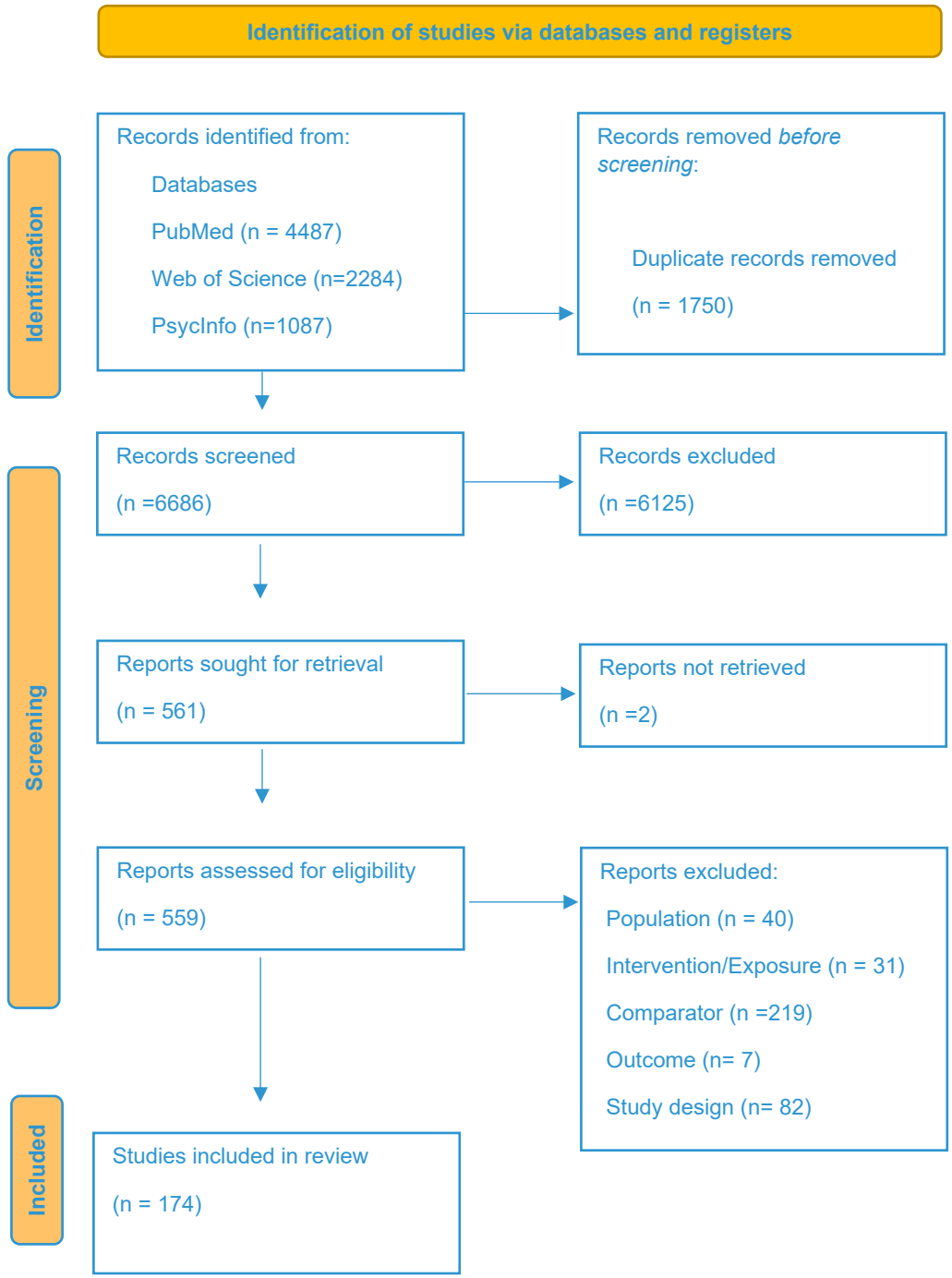
The quality of the included studies was assessed using the Newcastle-Ottawa scale for quality assessment of observational studies.[7] The assessment was done independently by two researchers (MA and MN); disagreement was resolved by discussion between them.

RESULTS

Results

Figure 1 shows the results of the selection process. We screened 6686 studies by title and abstract. The full-texts of 559 studies were assessed for eligibility, and 174 studies met our selection criteria and were included. Articles excluded at the full-text stage are listed in Appendix 2, with reasons for exclusion.

Figure 1: PRISMA 2020 flow diagram for new systematic reviews including searches of databases and registers



Details about the included studies are given in tables 1, 2 and 3 and a qualitative summary of the findings is provided below, divided by exposure and outcome.

COVID-19 exposure

Altogether 87 studies were included where the exposure was the COVID-19 pandemic, where 43 focused on affective disorders, ten examined mental health care utilization, four assessed suicides, and 30 assessed other mental health outcomes.

Affective disorders

Among the studies with affective disorders as outcome, 31 found increases during the pandemic.[8-38] These studies were conducted among population-based samples of 151 to 336 52 individuals;[11, 12, 16, 23, 27, 33, 34, 37] among more specific healthy populations of various ages, life stages or occupations, ranging from 93 to 7527 individuals;[8, 9, 15, 17-21, 28, 30-33, 35, 36] as well as among patients/populations with various somatic or psychiatric diagnoses including 46 to 1 854 742 participants.[10, 13, 14, 22, 24-26, 29] The studies were conducted in Hong Kong,[20, 27] the USA,[9, 11-13, 16, 18, 24, 28, 34, 36] the UK,[15, 23, 24, 28, 33] Germany,[25, 37] China,[30, 31] Italy,[8, 14, 19] Australia,[26, 32]Bangladesh,[17] India,[21] Switzerland,[38] South Sudan,[35] Canada,[24] France,[24] Singapore,[29] Serbia,[22] and the Netherlands.[10] Among these studies, 18 were of good quality,[8, 9, 11, 12, 15, 17, 21-23, 25, 26, 28-30, 33, 35] while 13 were of fair quality.[10, 13, 14, 16, 18, 20, 24, 27, 31, 32, 34, 37, 38]

Altogether five studies with 25 to 3 983 participants found no change in affective disorders. They included residents in long-term care homes in Canada,[39] patients with affective and psychotic disorders in the USA,[40] adults from the Netherlands,[41] college students and their families in the USA[42] and university students from Italy.[43] Four of these studies were of fair quality, while one was of good quality.[43]

A fair quality study among adolescents and parents from the Netherlands only found the negative affect of parents to increase, but not that of adolescents.[44] A good quality study among people with cancer from the UK found increased rates of depression only among those with certain cancer types.[45]

Some studies found unchanged or lower rates of affective disorders[46-49] and lower incidence of common mental disorders and medication prescriptions.[50] These were conducted among populations of 164 to 241 458 participants, including post-partum women in Israel,[46] patients in general practice in the UK,[50] medical students from the Republic of Kazakhstan,[48] patients from a sleep out-patient clinic from Japan,[47] and university students in China.[49] Four of these studies were of good quality, while one was of fair quality.[47]

Health care utilization

Altogether six studies that assessed admissions for mental health problems to hospitals and other health-care services found decreased rates: Emergency department presentations decreased at three health services in Australia,[51] two hospitals in Italy,[52, 53] psychiatric emergency services in Paris and its suburbs, in France,[54] and a pediatric emergency department in the USA.[55] Also, acute care referrals and admissions for mental health diagnoses in the UK decreased, while a higher percentage of the patients admitted had nonaffective psychotic disorders or bipolar disorder.[56] All of these six studies were of good quality.

However, admissions for mental health problems increased at an acute medical unit in the UK,[57] and, another study in the UK found an acceleration in urgent referrals to secondary mental health services.[58] In Italy, psychological morbidity worsened among 145 palliative care professionals from 11 regions.[59] Finally, the emergency department at a hospital in New Zealand experienced overall decreases in mental health presentations, but relative increases in presentations of overdoses and self-harm.[60] Three of these studies were of good quality while one was of fair quality.[59]

Suicides

The four studies that assessed pandemic-period suicide rates in the whole populations from Connecticut, USA,[61] Queensland, Australia,[62] Japan,[63] and Peru [64] found these had either decreased [61, 64] or remained unaltered.[62, 63] All four studies were of good quality.

Other mental health outcomes

Most of the 30 studies assessing other well-being or mental health outcomes were conducted among population-based samples and found decreases in mental health.[65-76] These studies were conducted among populations ranging from 1003 to 17 452 individuals in the USA,[65, 71, 72] the UK,[66-69, 73] New Zealand,[70] Denmark,[74] Canada,[75] and China.[76] Seven of these studies were of good quality,[66, 69-71, 73, 75, 76] while two were of fair quality[65, 67] and three were of poor quality.[68, 72, 74]

Other studies in more defined samples ranging from 21 to 3505 individuals also found deteriorations in mental health.[77-86] These included healthy populations of different ages and occupations, [77-80, 82, 83, 86] and patients with various somatic or psychiatric diagnoses.[81, 84-86] These studies were conducted in the USA,[81, 82, 86] Spain,[78] Switzerland,[79] Croatia,[83] the UK,[77, 80] and Italy.[84, 85] Of these studies, seven were of good quality[78, 79, 81-85] while three were of fair quality.[77, 80, 86]

However, eight of the studies did not find changes in mental health among study populations ranging from 46 to 1870 participants, and consisting of a population-based sample from the

USA,[87] undergraduates in the USA [88] older adults in Sweden,[89] online adult participants from Germany,[90] older adults in the Netherlands,[91] children aged 10-14 years in the USA,[92] caregivers of children diagnosed with cancer in the Netherlands,[93] and adults with PTSD and 30 trauma-exposed controls in the USA.[94] Of these studies, five were of good quality[78, 79, 81-85] while three were of fair quality.[77, 80, 86]

Economic crisis exposure

Altogether 84 studies were included, where the exposure was the 2008 economic crisis, where 15 focused on affective disorders, seven assessed mental health care utilization, 37 assessed suicides, and 25 assessed other mental health outcomes.

Affective disorders

All 15 studies reporting affective disorders as an outcome were population-based surveys. The findings from 12 of these studies, with populations ranging from 2 011 to 81 313 participants were that there was a significant increase in affective disorders[95-106] These studies were conducted in Canada,[95] Hong Kong,[96] USA,[97-99, 102-105] Europe,[97] Spain,[100] and Australia .[101, 106] Eight of these studies were of good quality,[96-98, 100-102, 105, 106] while four were of fair quality.[95, 99, 103, 104]

In contrast, a study among 815 adults aged over 50 years found no increase in depression among those who were most affected by the stock market crash, despite an increase in antidepressant medication use.[107] Also, a study among 25-75-year-olds in the USA found that mental health improved after the crisis onset.[108] Among 106 158 participants aged over 15 years from 21 European countries no effect of the crisis was found on depressive feelings.[109] Two[108, 109] of these three studies were of good quality while one[107] was of fair quality.

Health care utilization

Five of the seven studies assessing changes in health care utilization for mental health problems found increases in rates after crisis onset. The settings or populations of the studies included in-patient admissions for affective disorders in Italy,[110] hospitalization due to depression in Taiwan,[111] primary care patients in Spain,[112] general practice patients in the UK,[113] and the Spanish Hospital morbidity data.[114] All five studies were of good quality.

Two studies did not find overall increases in mental health care utilization: A study in the UK found that rates of self-harm among patients increased in Derby and among males in Manchester, but not in in Oxford.[115] In the USA, physician visits due to mental health disorders decreased after the onset of the crisis, though the use of antidepressants and psychotropic medications increased.[116] Both these studies were of good quality.

Suicides

Altogether, 37 studies assessed suicide in relation to the 2008 economic crisis, and all these studies were of good quality.

Altogether 17 studies found increased suicide rates after the start of the crisis and reported these changes at the level of the total population studied. These were conducted among the populations of Italy (Milan),[117] Greece,[118-123] Spain,[124] the EU,[125-127] Canada,[125] England,[127-129] the USA,[130-132] and South Korea.[133] A study in Spain assessing suicide attempts found increased rates,[134] and a study in Italy assessing suicides as a result of mental and behavioral disorders also found increased rates.[135]

Some studies reported only changes in suicide rates in specific population sub-groups or attributable to specific factors: Working age adults were at increased risk in Greece,[136] while studies in Italy,[137] Australia,[138] Spain,[139, 140] Barcelona (Spain)[141] and the USA[142] attributed suicide rates or attempts to unemployment. In Greece, suicide mortality rates differed by occupation categories,[143] and a study from 29 EU countries found a general relationship between the economic environment and suicide rates.[144]

A study among the male population in 20 EU countries found job losses to be a critical determinant of male suicide risks, and greater spending on active labour market policies and social capital mitigated risks.[145] Among people aged 15 or above from 27 European countries, 18 American countries, eight Asian countries, and one African country found that suicide rates increased in the European and American countries, particularly in men and in countries with higher levels of job loss.[146] Studies in England, Wales, Ireland and Spain found increased rates among men after the start of the crisis.[147-149] In Italy, periods of economic fluctuations were associated with male suicides, while severe economic downturns were associated with increased rates among both males and females,[150] and GDP was associated to suicides due to financial problems.[151]

Finally, one study in the Piraeus greater area in Greece found a slight decrease in the trend of suicide rates,[152] and a study including all EU countries found decreased rates in Austria.[126] Also, a study in Crete found no overall increase in suicide rates.[153]

Other mental health outcomes

Most of the 25 studies assessing other mental health outcomes were conducted among nationally or regionally representative samples, and the clear majority found evidence for increased mental distress.[154-163] The studies that presented results at the population level included populations from 3 479 to 306 664 participants and were conducted in Stockholm, Sweden,[154] the UK,[156] Italy,[157] Spain,[158] England,[155, 160] Australia,[161] Iceland,[163] the Valencian Community in Spain,[159] and 36 mainly European countries.[162] Nine of these studies were of good quality, while one[157] was of

poor quality. Also, two studies among more defined populations of 2050 medical researchers in Greece,[164] and 13 000 children aged 4-17 in the USA[165] found decreases in mental health. Both studies were of good quality.

Some of the population-based studies showed decreases in mental health only among particular population groups or under specific conditions. The study populations ranged in sizes form 3 755 to 11 743 participants, and found deteriorations in conditions of higher rates of precarious employment and lower health spending in Spain,[166] among civil servants in Ireland,[167] women in Iceland,[168] men in Spain,[169] women working in the public sector in France,[170] and among those with less educated mothers in Catalonia, Spain.[171] A study with 11 743 participants in the UK found that those with lower general trust levels were at risk of worse psychological wellbeing.[172] In the USA retail sales for ACE inhibitors and SSRIs/SNRIs were not associated with unemployment, but for opioids and PDE inhibitors, there were positive associations.[173] All of these eight studies were of good quality.

Also, one study among a cohort of 3321 mothers and 4089 children in Australia found that girls experienced an increase in mental health problems, but not boys or mothers.[174] This study was of fair quality.

Four studies found no changes in mental health outcomes. They were conducted among a population-based sample in the UK,[175] and a nationally representative sample of adults over 50 years in Ireland,[176] a study among 21 European countries,[177] and a study among children aged 11-15 years from 31 countries in Europe, from Israel and the USA.[178] Two[175, 177] of these studies were of good quality, while two[176, 178] were of poor quality.

SARS exposure

Our review also yielded three studies addressing changes in mental health before and after the on-set of the SARS epidemic in Hong Kong. All of these studies were conducted among adults of older age.[179-181] One study based on a stratified random sample showed no changes in depression among men, but an increase among women.[179] Another study found an excess in suicide rates among older adults.[180] Finally, a study among women based on a random sample, showed increases in depression and perceived stress.[181] Two[180, 181] of these studies were of good quality, while one was of poor quality.[179]

DISCUSSION

Discussion

This systematic review resulted in 174 studies assessing the mental health impacts of the COVID-19 pandemic (87 studies), 2008 economic crisis (84 studies) and the SARS epidemic (3 studies). The findings allow us to synthesize initial evidence of impacts of the pandemic on mental health and to make projections for the future, based on previous events.

Most studies reported the effects of the exposures on affective disorders. Mostly, these studies found increased rates, as might be expected due to increased prevalence of risk factors for affective disorders. For the COVID-19 pandemic, these include unpredictability and uncertainty, loss of income, inactivity, limited access to basic services, increased access to food, alcohol, and online gambling, and decreased family and social support.[182] However, some populations experienced improvements in mental health outcomes. Future studies may thus further delineate the ways in which these populations differed in terms of risk- and protective factors, perhaps in part due to various pandemic response strategies that were undertaken.

Our findings showed that mental health care utilization as a result of the pandemic did not increase in the same manner as it did in result of the economic crisis: Others have already voiced concerns around regulations on travel and quarantine having resulted in mental health care visits becoming more difficult and impractical.[183] Further, we did find two studies that showed worsening of mental ill-health severity among those using services during the pandemic, thus indicating a shift away from seeking mental health care for milder problems with a parallel increase in severity. Indeed, retaining existing mental health services and promoting new practices that expand access and provide cost-effective delivery have been brought forth as priorities in the pandemic.[182] Additional recommendations include the scaling up of effective practices and resorting to peer support and remote health delivery.[182]

Overall, we found that socioeconomic factors and unemployment resulting from the economic crisis carried negative impacts. Previous reviews have also reported on the deleterious consequences of economic crises on mental health, and that the main risk factors mediating these effects include unemployment, indebtedness, precarious working conditions, inequalities, lack of social connectedness, and housing instability.[184] Also, in line with our findings, this previous work has suggested that men at working age are at particular risk.[184] It may thus be expected that these population groups will also be negatively impacted by the COVID-19 pandemic and associated economic downturn.

Contrary to the large number of studies assessing suicide rates in relation to the economic crisis, our review did not find many studies on these outcomes in relation to the pandemic. The few

studies we did identify showed either that rates decreased or remained unaltered – in contradiction to studies on the economic crisis. Follow-ups of included studies on the pandemic are considerably shorter than the ones assessing the impact of economic crisis. In the longer term, we might expect an increase in suicide rates as a result of the pandemic, as many of the known risk-factors for suicides have been clearly aggravated.

A limitation of our study was the necessity to narrow the scope of our search strategies to search terms found in titles and abstracts, which was done due to the large number of published studies on the topic. We are aware that this may have resulted in us missing some relevant studies. Also, we were not able to conduct searches in other sources, such as grey literature, which is also a limitation. Indeed, our findings reflect what others have noted – that toward the end of 2020, mental health was top of the charts in terms of research being conducted on the effects of COVID-19, while the quantity of papers was not being matched by quality[185] – our included studies on the economic crisis were overall of better quality than those on COVID-19. A strength of our study was the systematic nature and the broad scope, which allows us both to see emerging early evidence of the impacts of the COVID-19 pandemic on mental health, and possible longer-term impacts.

Report from workshop on June 16th, 2021

This report was presented at on on-line workshop on June 16th, 2021 titled “Impacts of COVID-19 on mental health and well-being: From understanding risks to building resilience”. The workshop was three hours long and participants included collaborators form the PERISCOPE project as well as from their respective professional networks. Altogether, 35 participants registered at the workshop, and they were from the following organizations and countries: University of Pavia (Italy), the European Hospital and Healthcare Federation (Belgium), Dokuz Eylul University (Turkey), Ghent University (Belgium), the Federation of European Academies of Medicine (Belgium), Politecnico di Milano (Italy), London School of Economics (the UK), the San Martino Hospital (Italy), ProMIS (PROgramma Mattone Internazionale Salute, Italy), European Regional and local Health Authorities (Italy/Belgium), Sari Agricultural and Natural Resources University (Iran), Mental Health Europe (Belgium), Stefan S. Nicolau Institute of Virology (Romania), Make Mothers Matter (Switzerland) and Karolinska Institutet (Sweden).

All participants were provided with a draft of this review report a week prior to the workshop, and asked to read the review with three questions in mind:

- Do any of the report findings surprise you?

- Which aspects of the report do you find particularly interesting or worth investigating more deeply?

- Are any important aspects/perspectives missing from the report, that should be added? Can something be added from the perspective of your organisation?

The workshop itself included three keynote presentations as well as focus group discussions among all participants, which focused on the questions above. The keynote presenters and topics were as follow:

1. Findings from WP2 so far and the planned work, including status of data gathering – *Christina Dalman, Professor, Karolinska Institutet, Department of Global Public Health*

2. How will the data from WP2 contribute to the Data Atlas and the bigger PERISCOPE picture? - *Enea Parimbelli, Ph.D., Assistant professor, University of Pavia, Department of Electrical, Computer and Biomedical Engineering*

3. Social infrastructures to address inequality and mental ill health – *Nikita Simpson, London School of Economics, Department of Anthropology*

Also, all registered participants were sent a post-workshop survey, with the following questions, allowing for open answers:

After reading the report and/or attending the workshop:

- Do any of the findings presented/discussed surprise you?

- Which aspects of the report and workshop discussions do you find particularly interesting or worth investigating more deeply?

- Were any important aspects/perspectives missing from the report, that should be added? Can something be added from the perspective of your organization?

Altogether five persons responded to the post-workshop survey. Some key reflections from the workshop as well as the survey included the following:

The overarching aim of the PERISCOPE project it to gather data on a large variety of outcomes, including health, well-being, social and economic impacts of the pandemic, and to draw recommendations from all of this data, drawn together in the “COVID atlas”, to make holistic policy guidance for best practices for the future. Data for the atlas is in part being drawn from big data sources such as the CoronaNet research project, ECDE and OECD, but also form more fine-grained data sources such as those represented in the present report.

While it was surprising, that the impact of the COVID-19 pandemic on mental health was not reflected in increases in health care utilization or suicide rates, this is understandable, due to the impacts of the pandemic and healthcare seeking. Therefore, for the purposes of the PERISCOPE project, it would be recommendable to not only rely on data on health care utilization even though this data is usually of better quality. Self-report surveys will probably be a necessary complementary data source, in order to provide a more comprehensive picture of the pandemic's impacts on mental health. Also, in the longer term, suicide rates and use of psychotropic medication will be important complements to this data. Furthermore, it would be useful to look at data from various populations, in order to detect unmet need for mental health care among vulnerable groups. Also, it would be of interest to look more closely at the timings of the mental health trends in relation to exposures of lockdowns, other policies, COVID-19 load and economical hardships.

Mapping the behavior of people in collective networks of care, social infrastructures, i.e. informal networks that individuals find themselves in, including family members and friends etc. and how these are impacted by policies and what relevance they have for social support and well-being. Socioeconomically disadvantaged and minority groups often depend more on these networks than the mainstream. Ethnographic work, studying such social infrastructures and taking a life-course and life-stage perspective, that is being performed in the PERISCOPE work package on multi-level governance (WP 9) is an important complement to the quantitative data addressed in this report.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions and recommendations

The findings from the review as well as the workshop discussions allow us to synthesize initial evidence of negative impacts of the pandemic on mental health and to make possible projections for the future, based on previous events. Some clear policy implications from our findings may already be drawn. For example, they highlight the importance of making mental health services available, accessible, and sustainable for those in need. Also, seeing as the socio-economically disadvantaged are at increased risk of adverse mental health outcomes, these populations should be particular targets of policy interventions in the pandemic. Finally, we expect future research to be able to elucidate the specific impacts of the pandemic on mental health, including more long-term follow-ups, and that international comparisons of mental health outcomes may allow detailed analyses on the differential mental health impacts form the pandemic and economic mitigation measures taken by different countries

Table 1: COVID-19 exposure

First Author	Quality	Year	Study design	Country	Main mental health outcome measure	Follow up period
Meda N[8]	***	2020	Repeated cross-Sectional	Italy	BDI-2*, BAI*	8 months 2 years October 2019-June 2020
Krendl A C[9]	***	2020	Longitudinal cohort	USA	PHQ-8*	1 year summer/fall 2019 and April/May 2020
Pan K-Y[10]	**	2020	Longitudinal cohort	Netherlands	QUIDS*, BAI*	4-14 years 2006-2016 and April- May 2020
Ettman C K[11]	***	2020	Longitudinal cohort	USA	Depression symptoms	2-3 years 2017-2018 and March- April 2020
Daly M[12]	***	2020	Longitudinal cohort	UK	GHQ-12*	3 years 2017-2020
Puhl R M[13]	**	2020	Longitudinal cohort	USA	Depression scale, 6 items	2- 10 years 2010-2018 and 2020

Villani E R[14]	**	2020	Longitudinal cohort	Italy	DRS*	1-5 years 2015-2019
Gallagher S[15]	***	2020	Longitudinal cohort	UK	GHQ-12*	2017–2019 and May 2020
Wanberg C R[16]	**	2020	Longitudinal cohort	USA	PHQ*-8	1 year April-June 2019 and April 2020
Hamadani J D[17]	***	2020	Longitudinal cohort	Bangladesh	CES-D*	3 months- 3 years 2017-Feb 2020, May -June 2020. Median days 708 (baseline) and 347 (RCT endline) days before covid lockdown period
Lee C M[18]	**	2020	Longitudinal cohort	USA	Three-item Loneliness Scale, PHQ-4*	3-4 months Jan 2020 and April/May 2020
Zanardo V[19]	***	2020	Repeated cross sectional	Italy	Postpartum depression EPDS* total score	1 year 2019-2020

Wong S Y S[20]	**	2020	Longitudinal cohort	Hong Kong	PHQ-9*, GAD-7*	4 years 2016-2020
Saraswathi I[21]	***	2020	Longitudinal cohort	India	DASS21*	6 months Dec 2019 to June 2020
Stojanov A[22]	***	2020	Longitudinal cohort	Serbia	HARS*, HRSD*	1 year 2019-2020
Kwong A S F[23]	***	2021	Longitudinal cohort	UK	PHQ-9*, GAD-7*, Short Mood and Feelings Questionnaire, Short Warwick Edinburgh Mental Wellbeing Scale	9- 29 years ALSPAC:1991-1992 to 9 April and 14 May 2020.Generation Scotland: 2006 -2011 to 7 April and 17 May 2020.
Thombs B D[24]	**	2020	Longitudinal cohort	Canada, France, UK, USA	PROMIS anxiety scale, PHQ-8*	4-9 months July -Dec 2019 and April 9 to April 27 2020
Jacob L[25]	***	2020	Repeated cross-sectional	Germany	ICD-10 anxiety disorders	1 year Jan-June 2019 and Jan-June 2020

Titov N[26]	***	2020	Repeated cross sectional	Australia	GAD-7*, PHQ-9*	1 year 2019 and 2020
Zhao S Z[27]	**	2020	Repeated cross-sectional	China	GAD-2*, PHQ-2*	3-4 years 2016, 2017 and April 2020
Huckins J F[28]	***	2020	Longitudinal cohort	USA	PHQ-4*	2-3 years 2017/2018 and 2020
Lim S L[29]	***	2020	Longitudinal cohort	Singapore	EQ-5D	2 years 2018-2020
Li H Y[30]	***	2020	Longitudinal cohort	China	Positive Affect	3 months 20 Dec 2019 and Feb 2020
Chen I H[31]	**	2020	Longitudinal cohort	China	DASS-21*	1 year 2019-2020
Magson N R[32]	**	2021	Longitudinal cohort	Australia	SCAS-C*, SMFQ-C *	1 years 2019-2020
Creese B[33]	***	2020	Longitudinal cohort	UK	PHQ-9*, GAD-7*	5 years 2015-2020

Twenge J M[34]	**	2020	Repeated cross sectional	USA	PHQ -2*, GAD-2*	approx. 9 months Jan-Jun 2019 and April-May 2020
Zhang Y[35]	***	2020	Longitudinal cohort	South Sudan	PSS-10*, GAD-7*, PHQ-9*	3-9 months Nov 2019, Feb, May and August 2020
Zhang B[36]	***	2020	Longitudinal cohort	USA	GAD-7*, PHQ-9*	1 month Jan - Feb and March – May 2020
Peters A[37]	**	2020	Longitudinal cohort	Germany	PHQ-9*, GAD-7	3-6 years 2014- 2019 and 30 April- 29 May 2020
Elmer T[38]	**	2020	Longitudinal cohort	Switzerland	CES-D*, GAD-7*	2 years 2018-2020
McArthur C[39]	**	2021	Longitudinal cohort	Canada	Depression DRS*	3.5 years Jan 2017-June 2020 and March 2020

Pinkham A E[40]	**	2020	Longitudinal cohort	USA	Self-rated mood and wellness	1-2 years 2018, 2019 and 2020
van der Velden P[41]	**	2020	Longitudinal cohort	Netherlands	MHI-5*	2 years 2018-2020
Sturman E D[42]	**	2020	Repeated cross-sectional	USA	CESD*	5 months Nov-Dec 2019 and April 2020
Baiano C[43]	***	2020	Longitudinal cohort	Italy	Anxiety Sensitivity Index-3	2 -5 months 4 Nov 2019–17 Feb 2020 and 26-30 April 2020
Janssen L H C[44]	**	2020	Longitudinal cohort	Netherlands	PHQ-9*	1-2 years 2018–2019 and 14–28 April 2020
Gallagher S[45]	***	2020	Longitudinal cohort	UK	GHQ-12*	1-3 years 2017–19 and 2020

Pariente G[46]	***	2020	Repeated cross-sectional	Israel	EPDS*	3-4 years Nov 2016- April 2017 and March -April 2020.
Ubara A[47]	**	2020	Longitudinal cohort	Japan	PHQ-9*	1 year 2019 and 2020
Bolatov A K[48]	***	2021	Repeated cross-sectional	the Republic of Kazakhstan	CBI-S*, PHQ-9*, GAD-7*	4 months Oct- Nov 2019 and April 2020
Li W W[49]	***	2020	Longitudinal cohort	China	DASS-21*	6-7 months Nov 2019 to May - June, 2020
Williams R[50]	***	2020	Repeated cross-sectional	UK	Common mental health problem diagnoses and medication prescriptions	Predicted expected and observed numbers of first diagnoses and first prescriptions between March 1 and May 31, 2020,
Dragovic M[51]	***	2020	Repeated cross sectional	Australia	ICD-10 principal psychiatric diagnoses	1 year 2019 and 2020

Stein H C[52]	***	2020	Repeated cross-sectional	Italy	ER visits for mental-health-related conditions	1 year 2019-2020
Capuzzi E[53]	***	2020	Repeated cross-sectional	Italy	Emergency psychiatric consultations	1 year Feb - May 2019 and Feb - May 2020
Pignon B[54]	***	2020	Repeated cross-sectional	France	Psychiatric emergency consultations	1 year 2019-2020
Leff R A[55]	***	2021	Repeated cross-sectional	USA	Mental health-related diagnoses at Paediatric emergency department	1 year March 2019 and March 2020
Abbas M J[56]	***	2021	Repeated cross-sectional	UK	Referrals to crisis resolution and home treatment team and acute care mental health admissions	1 year 2019 and 2020 March-April
Grimshaw B[57]	***	2021	Repeated cross-sectional	UK	Mental health admissions, ICD-10*	1 year 2019 and 2020

Chen S[58]	***	2020	Repeated cross-sectional	UK	Referrals per day to secondary care mental health services. Routine, urgent/emergency	1-year 2019 and 2020
Varani S[59]	**	2020	Longitudinal cohort	Italy	GHQ-12*	4 years 2016 and 2020
Joyce L R[60]	***	2021	Repeated cross-sectional	New Zealand	Emergency department mental health presentations (medical records)	2019 and 2020. Baseline at pre-lockdown, 33 days prior to lock-down period
Mitchell T O[61]	***	2020	Repeated cross-sectional	USA	Suicide rates	2 months March 10th to May 20th, 2020, compared with 5 year average
Leske S[62]	***	2020	Repeated cross-sectional	Australia	Probable and beyond reasonable doubt suicides	2015-2020
Isumi A[63]	***	2020	Repeated cross-sectional	Japan	Suicide rates	1-2 years 2018 - 2019 and 2020

Calderon-Anyosa R[64]	***	2020	Repeated cross-sectional	Peru	Suicide	3 years Jan 2017 -Sep 2020
Sutin A R[65]	**	2020	Longitudinal cohort	USA	PHQ-2*	1-3 months Jan 31- Feb 10, March 18 -29, and April 23-29 2020
Pierce M[66]	***	2020	Longitudinal cohort	UK	GHQ-12*	1 year 2019 - April 2020
Banks J[67]	**	2020	Longitudinal cohort	UK	GHQ*-12	11 months Jan 2017-Nov 2019 and April 2020
Gray N[68]	*	2020	Repeated cross-sectional	UK	WEMWBS* and K10*	1 year, & 2 months April 2018-March 2019 and 9 June -13 July, 2020
Daly M[69]	***	2021	Repeated cross-sectional	USA	PHQ-2 *	2-3 years 2017-2018 and 2020

Sibley C G[70]	***	2020	Longitudinal cohort	New Zealand	K6*	6-3 months Oct-Dec 2019 and 2020
Twenge J M[71]	***	2020	Repeated cross-sectional	USA	K-6*	2 years 2018- and April 2020
McGinty E E[72]	*	2020	Longitudinal cohort	USA	Psychological distress	2 years 2018 - April 2020
Niedzwiedz C L[73]	***	2020	Longitudinal cohort	UK	GHQ-12*	1 year 2019 and April 2020
Søndersko v K M[74]	*	2020	Repeated cross- sectional	Denmark	Wellbeing	4 years 2016-2020
Bierman A[75]	***	2020	Repeated cross-sectional	Canada	Distress	6 months Sep 2019 -March 2020
Ran M S[76]	***	2020	Repeated cross-sectional	China	GHQ-12*, SAS*, SDS*	8 months Jan -May 2019 and Feb 2020

Shen J[77]	**	2020	Longitudinal cohort	UK	GHQ-12*	1-3 years 2017-2019 follow-up 2020
Reverté-Villarroya S[78]	***	2021	Repeated cross-sectional	Spain	GHQ*	3 years 2017 and 2020
Macdonald B[79]	***	2020	Longitudinal cohort	Switzerland	Positive and negative affect and loneliness	1 year 2019 (for 21 days) & 2020 (4-weeks)
Savage M J[80]	**	2020	Longitudinal cohort	UK	WEMWBS* and PSS*	6 months Oct 2019 - April 2020
Ohliger E[81]	***	2020	Repeated cross-sectional	USA	ICD-10 classification of mental disorders	9 months- 1 year Feb-April 2019 and Feb-April 2020
Copeland W E[82]	***	2021	Longitudinal cohort	USA	2 mood scale items	2-4 months Early 2020 and May-Jun 2020

Dragun R[83]	***	2021	Repeated cross-sectional	Croatia	PSS-10*	1-2 years 2018 and 2019 vs 2020
Castellini G[84]	***	2020	Longitudinal cohort	Italy	BSI* and EDE-Q*	5 months Nov 2019 - Jan 2020 and April- May 2020
Giordano A[85]	***	2021	Longitudinal cohort	Italy	Epileptic seizure frequency	1-3 Months Jan- Feb and March-April 2020
Gomez S[86]	**	2020	Longitudinal cohort	USA	Stanford Professional Fulfillment Index	1-4 1-2 years Dec 2018-Jan 2019 and July 2019 - May 2020
Breslau J[87]	***	2020	Longitudinal cohort	USA	Psychological distress K-6*	1-year 2019 and 2020
Benham G[88]	***	2020	Repeated cross-sectional	USA	PSS-10*	1 year Spring 2019 - Summer 2020

Kivi M[89]	**	2021	Longitudinal	Sweden	Levels of Worry, Risk Perception, and Social Distancing in Relation to COVID-19	5 years Yearly from 2015 to 2020
Schäfer S K[90]	**	2020	Longitudinal cohort	Germany	SOC (9-item Antonovsky scale), Mini-Symptom Checklist	1 month Feb 2020 and March 2020
van Tilburg T G[91]	***	2020	Longitudinal cohort	Netherlands	Social and emotional loneliness (three items), mental health inventory (five items)	1 year 2019-2020
Penner F[92]	***	2021	Longitudinal cohort	USA	BPM*	Jan 2020 and 3 time-points beginning 1 month after COVID-19 stay-at-home measures
van Gorp M[93]	***	2021	Longitudinal cohort	Netherlands	PedsQL generic and PedsQL fatigue of children (caregiver about child)	5 months 1 Jan - 1 June 2020

Rutherford B R[94]	**	2020	Longitudinal cohort	USA	PCL-5*, HARS*, HRSD*	3 years	2017 April-May 2020	

*** CES-D Center for Epidemiological Studies Depression Scale, EPDS Edinburgh Postnatal Depression, DASS21 Depression and Anxiety Scale 21, WEMWBS Warwick-Edinburgh Mental Well- being Scale, PCL-5 Post-traumatic Stress Disorder Checklist, BSI Brief Symptom Inventory, PHQ-2 PHQ-10 Patient Health Questionnaire, K-10, K-6 Kessler Psychological Distress Scale, GHQ-12 General Health Questionnaire -12, PSS Perceived Stress Scale, DRS Depression Rating Scale, MHI-5 Mental Health Inventory, 5 items, BPM Brief Problem Monitor, HARS Hamilton Anxiety Rating Scale, HRSD Hamilton rating Scale for Depression, EDE-Q Eating Disorder Examination Questionnaire, GAD-7, GAD-2 General Anxiety Disorder, CBI-S Copenhagen Burnout Inventory, SAS Self-rating Anxiety Scale, SDS Self-Rating Depression Scale, BAI Beck Anxiety Inventory, QIDS Quick Inventory of Depressive Symptoms, SCAS-C Spence Children's Anxiety Scale, SMFQ-C Short Mood and Feelings Questionnaire—Child Version, BDI Beck Depression Inventory, EQ-5D Euroqol 5 dimensions. Quality assessment according to Newcastle-Ottawa criteria7: Good quality = *** Fair quality =** Poor quality =***

Table 2: Economic crisis exposure

First Author	Quality	Year	Study design	Country	Main mental health outcome measure	Follow up period length
Wang J[95]	**	2010	Repeated Cross-sectional	Canada	WHO's CIDI-Auto 2.1*	1 year 2008-2009

Lee S[96]	***	2010	Repeated cross-sectional	Hong Kong	Major Depressive Episode according to DSM-IV	2 years and 3 months Jan-Feb 2007 and April-May 2009)
Riumallo-Herl C[97]	***	2014	Longitudinal Cohort	USA	EURO-D*, CES-D*	6 years 2004-2010
Tapia Granados J A[98]	***	2018	Longitudinal cohort	USA	CES-D*	Up to 24 years 1987–1988, 1990–1991, 1992–1993, 1995–1996, 2000–2001, 2005–2006 and 2010–2011
Cagney K A[99]	**	2014	Longitudinal cohort	USA	CES-D*	5 – 6 years 2005-2006 and 2010-2011
Chaves C[100]	***	2018	Repeated cross-sectional	Spain	CESD8*	7 years 2006-2013
Sargent-Cox K[101]	***	2011	Longitudinal cohort	Australia	Goldberg depression scale	3-5 years 2005-2006 to 2009-2010

Mehta K[102]	***	2015	Repeated cross-sectional	USA	PHQ-9*	7 years 2005-2012
Pruchno R[103]	**	2017	Longitudinal cohort	USA	CES-D*	5 years Nov 2006, April 2008 and Jan 2011- May 2012
Wang H[104]	**	2018	Longitudinal cohort	USA	K6*	Up to 10 years 2003-2005, 2007-2009,2011-2013
Dagher R K[105]	***	2015	Repeated cross sectional	USA	SF-12 MCS*, K6	4-6 years 2005-2006, 2010-2011
Shi Z[106]	***	2010	Repeated cross-sectional	Australia	K-10*, GHQ*-28	7 years 2002-2009
McInerney M[107]	**	2013	Longitudinal cohort	USA	CES-D*	2 years 2006 and 2008
Forbes M K[108]	***	2019	Longitudinal cohort	USA	CIDI-SF*	10-11 years 2003/2004-2012/2013

Reibling N[109]	***	2017	Repeated cross-sectional	21 European nations	CES-D*	8 years 2006-2014
Wang Y[110]	***	2020	Longitudinal cohort	Italy	Inpatient admissions for affective disorders (ICD-9: 296.0-296.9)	8 years 2007-2015
Bonnie Lee C[111]	***	2017	Repeated cross-sectional	Taiwan	Hospitalization due to depressive illnesses	5 Years 2007-2012
Gili M[112]	***	2012	Repeated cross-sectional	Spain	PRIME-MD*	3-4 years 2006/2007 and 2010/2011
Kendrick T[113]	***	2015	Repeated cross-sectional	UK	GP recording of Depression	10 years 2003-2013
Medel-Herrero A[114]	***	2017	Repeated cross-sectional	Spain	Psychiatric hospital admissions	5-11 yearsJuly 2002-March 2008 and April 2008 to Dec 2013
Hawton K[115]	***	2016	Repeated cross-sectional	UK	Rates of self-harm	9 years 2001-2010

Chen J[116]	***	2014	Repeated cross- sectional	USA	Physician visits, Prescription drug utilization	9 years 2000-2009
Merzagora I[117]	***	2016	Repeated cross-sectional	Italy	Suicide	11 years 2002-2013
Zilidis C[118]	***	2020	Repeated cross-sectional	Greece	Suicide	15 years 2001-2016
Madianos M G[119]	***	2014	Repeated cross-sectional	Greece	Suicide	21 years 1990-2011
Vlachadis N[120]	***	2014	Repeated cross sectional	Greece	Suicide	2 years 2010-2012 and time series of suicide rates over several years
Branas C C[121]	***	2014	Repeated cross-sectional	Greece	Suicide	29 years 1983-2012
Papaslanis T[122]	***	2016	Repeated cross-sectional	Greece	Suicide	20 years 1992 to 2012 (only extracting data from 2006 to 2012

Kontaxakis V[123]	***	2013	Repeated cross-sectional	Greece	Suicide	10 years 2001-2011
Lopez Bernal J A[124]	***	2013	Repeated cross-sectional	Spain	Suicide	5 years 2005-2010
Reeves A[125]	***	2014	Repeated cross-sectional	Europe, Canada, USA	Suicide	3 years 2007-2010
Stuckler D[126]	***	2011	Repeated cross-sectional	Austria, Finland, Greece, Ireland, the Netherlands, and the UK, Czech Republic, Hungary, Lithuania, and Romania	Suicide	2 years 2007-2009
Laanani M[127]	***	2014	Longitudinal cohort	Western EU countries (Austria, Finland, France,Germany, the	Relative risks of increase in suicide rates for a 10% increase in unemployment rate	10 years 2000–2010

				Netherlands, Spain, Sweden and the UK)		
Saurina C[128]	***	2013	Repeated cross-sectional	England	Suicide	17 years 1993-2010
Barr B[129]	***	2012	Repeated cross-sectional	England	Number of excess suicides	10 years 2000-2010
Agrrawal P[130]	***	2017	Repeated cross-sectional	USA	Suicide	8 years 2005-2013
Kerr W C[131]	***	2017	Repeated cross-sectional	USA	Suicide	6 years 2005-2011
Carriere D E[132]	***	2019	Repeated cross-sectional	USA	Suicide	14 years 2002-2016
Chan C H[133]	***	2013	Repeated cross-sectional	South Korea	Suicide	2003-2011
Córdoba-Doña J A[134]	***	2014	Repeated cross sectional	Spain	Suicide attempts	1-9 years 2003–2007, 2008–2012
De Vogli R[135]	***	2014	Repeated cross-sectional	Italy	Mortality due to mental and behavioural disorders	10 years 2000-2010

Rachiotis G[136]	***	2015	Repeated cross-sectional	Greece	Suicide	9 years 2003-2012
Mattei G[137]	***	2019	Repeated cross-sectional	Italy	Suicide	29-38 years 1977–2015, 1983–2012
Milner A[138]	***	2014	Repeated cross-sectional	Australia	Suicide	2 years 2007–2009
Iglesias-García C[139]	***	2017	Repeated cross-sectional	Spain	Suicide	14 years 1999-2013
Rivera B[140]	***	2016	Repeated cross-sectional	Spain	Suicide	9 years 2004 and 2013
López-Contreras N[141]	***	2019	Repeated cross-sectional	Spain	Suicide	10 years 2006-2016
Cylus J[142]	***	2014	Repeated cross sectional	USA	Suicide	40 years 1968-2008
Alexopoulos E C[143]	***	2019	Repeated cross-sectional	Greece	Suicide	13 years 2000–2013

Fountoulakis K N[144]	***	2014	Repeated cross-sectional	Austria, Belgium, Estonia, Finland, France, Germany, Greece, Italy, Ireland, Netherlands, Portugal, Slovakia, Slovenia, Spain, Bulgaria, Croatia, Czech Rep, Denmark, Hungary, Latvia, Lithuania, Poland, Romania, Sweden, UK, Montenegro, Norway, Serbia, Switzerland.	Suicide	11 years 2000–2011
Reeves A[145]	***	2015	Repeated cross-sectional	24 EU countries	Suicide	30 years 1981-2011
Chang S S[146]	***	2013	Repeated cross-sectional	54 countries	Suicide	9 years 2000-2009

Coope C[147]	***	2014	Repeated cross-sectional	UK	Suicide	10 years 2001-2011
Ruiz-Perez I[148]	***	2017	Repeated cross-sectional	Spain	Suicide	10 years 2002-2012
Corcoran P[149]	***	2015	Repeated cross-sectional	Ireland	Suicide	32 years 1980-2012
Mattei G[150]	***	2019	Repeated cross-sectional	Italy	Suicide	24 years 1990-2014
Mattei G[151]	***	2014	Repeated cross-sectional	Italy	Suicide	10 years 2000-2010
Paraschakis A[152]	***	2018	Repeated cross-sectional	Greece	Suicide	9 years 2006-2015
Basta M[153]	***	2018	Repeated cross-sectional	Crete, Greece	Suicide	14 years 1999 and 2013
Blomqvist S[154]	***	2014	Repeated cross-sectional	Sweden	GHQ12*	4 years 2006-2010
Thomson R M[155]	***	2018	Repeated cross-sectional	England	GHQ G-12*	23 years timeline 1991-2014

Thomson R M[156]	***	2018	Repeated cross-sectional	England	GHQ-12*	23 years 1991-2014
Odone A[157]	*	2018	Repeated cross-sectional	Italy	MSC* derived from SF-12*	8 years 2005-2013
Urbanos-Garrido R M[158]	***	2014	Repeated cross-sectional	Spain	Self-assessed health	5-6 years 2006 and 2011-2012
Tamayo-Fonseca N[159]	***	2018	Repeated cross-sectional	Spain	questions corresponding to GHQ-12*	5 years 2005 and 2010
Katikireddi S V[160]	***	2012	Repeated cross-sectional	England	GHQ-12*	19 years 1991-2010
Parker P D[161]	***	2016	Repeated cross-sectional	Australia	a measure similar to the Personal Wellbeing Index	7-10 years 1997-2013
Gonza G[162]	***	2016	Repeated cross-sectional	36 countries, mainly European	Subjective Well-Being assessed with two questions	10 years 2002-2012

Gudmundsdottir D G[163]	***	2011	Longitudinal cohort	Iceland	Happiness question: 'Taking all things together, how happy would you say you are?'', 1-10 scale	2 years Oct 2007 and Nov 2009
Sifaki-Pistolla D[164]	***	2018	Repeated Cross-sectional	Greece	DASS-21*	9 years Dec 2008 and Feb 2017
Golberstein E[165]	***	2019	Repeated cross-sectional	USA	SDQ*	12 years 2001–2013
Ruiz-Pérez I[166]	***	2017	Repeated Cross-sectional	Spain	GHQ*	5-6 years 2006 and 2011-2012
Houdmont J[167]	***	2012	Repeated cross-sectional	Ireland	Absence attributable to work-related stress	4 years 2005-2009
Hauksdóttir A[168]	***	2013	Longitudinal cohort	Iceland	PSS-4*	2 years 2007-2009

Bartoll X[169]	***	2013	Repeated cross-sectional	Spain	GHQ-12*	4-6 years 2006-2007 to 2011-2012
Malard L[170]	***	2015	Longitudinal cohort	France	MINI*	4 years 2006-2010
Rajmil L[171]	***	2013	Repeated cross-sectional	Spain	Parent version of SDQ*	6 years 2006-2012
Lindström M[172]	***	2016	Longitudinal cohort	UK	GHQ-12*	1 year 2007-2008
Kozman D[173]	***	2012	Repeated cross-sectional	USA	Prescription drugs utilisation	3 years 2007-2010
Bubonya M[174]	**	2019	Longitudinal cohort	Australia	SDQ*	4 years 2007-2011
Boyce C J[175]	***	2018	Longitudinal cohort	UK	GHQ-12* and a life satisfaction measure	3-4 years 2006-2007 and 2009-2010
Barrett A[176]	*	2014	Repeated cross-sectional	Ireland	CASP-12 quality of life	5-7 years 2006-2007 and 2012-2013

Sarracino F[177]	***	2020	Repeated cross-sectional	Belgium, Bulgaria, Switzerland, Cyprus, Germany, Denmark, Estonia, Spain, Finland, France, Great Britain, Hungary, Ireland, Netherlands, Norway, Poland, Portugal, Russian Fed., Sweden, Slovenia, Slovakia, Ukraine,	Well-being assessed in European Social Survey	2 years 2006 to 2008
Rathmann K[178]	*	2016	Repeated cross-sectional	31 countries in Europe, North America and Israel	HBSC*	4 years 2005/2006 and 2009/2010,

*** GHQ-12 General Health Questionnaire, CES-D Center for Epidemiologic Studies Depression, CIDI-SF The World Health Organization's Composite International Diagnostic Interview Short Form, MINI The Mini International Neuropsychiatric Interview,HBSC Health Behaviour in School- aged Children, PSS-4 Perceived Stress Scale, SF-12 MCS the 12-item Short Form Mental Health Summary, EURO-D Euro-Depression scale, SDQ Strengths and Difficulties Questionnaire, PRIME-MD Primary Care Evaluation of Mental Disorders, MSC Mental Component Summary, SF-12 12-item Short-Form health survey, K-6 Kessler Psychological Distress Scale - 6, DASS21 Depression and Anxiety Scale 21, K-10 Kessler Psychological Distress 10 item scale, WHO's CIDI-Auto 2.1 World Health Organization's Composite International Diagnostic Interview—Auto 2.1, SDQ Child Strengths and Difficulties Questionnaire PHQ-9 Patient Health Questionnaire 9. Quality assessment according to Newcastle-Ottawa criteria7: Good quality = *** Fair quality =** Poor quality =***

Table 3: SARS exposure

First Author	Quality	Year	Study design	Country	Main mental health outcome measure	Follow up period
Lai D W L[179]	*	2008	Longitudinal survey design	Hong Kong	15-item Geriatric Depression Scale	3-5 months dec 2002 - Jan 2003 and April-May 2003
Cheung Y[180]	***	2008	Observational, time trend	China	Suicide	9 – 11 years 1993-2002/2004
Yu H Y R[181]	***	2005	Longitudinal cohort study	Hong Kong	CES-D*	1 year 2002-2003

*** CES-D Center for Epidemiologic Studies Depressio. Quality assessment according to Newcastle-Ottawa criteria7: Good quality = *** Fair quality =** Poor quality =***

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Appendix

Search strings used in the database searches

PubMed

"mental illness"[Title] OR "stress"[Title] OR "depression"[Title] OR "Anxiety"[Title] OR "substance abuse"[Title/Abstract] OR "psychosis"[Title] OR "suicide"[Title] OR "panic disorder"[Title] OR "affective disorder"[Title] OR "eating disorder"[Title/Abstract] OR "burnout"[Title] OR "QOL"[Title] OR "prescription drugs"[Title/Abstract] OR "occupational health"[Title] OR "PTSD"[Title] OR "trauma"[Title] OR "post-covid"[Title] OR "long covid"[Title] OR "well-being"[Title] OR "mental health"[Title] OR "psychiatric disorder"[Title] OR (("emotions"[MeSH Terms] OR "emotions"[All Fields] OR "feeling"[All Fields] OR "feelings"[All Fields] OR "feels"[All Fields]) AND "of insecurity"[Title/Abstract]) OR "sleep disorder"[Title/Abstract] OR "psychosocial disability"[Title] OR "psychological distress"[Title] OR "worry"[Title/Abstract] OR "Mental Disorders"[MeSH Terms:noexp] OR ("Depressive Disorder"[MeSH Major Topic] OR "depression"[MeSH Major Topic]) OR "Depressive Disorder"[MeSH Terms:noexp] OR "Anxiety"[MeSH Terms:noexp] OR "psychotic disorders"[MeSH Terms] OR "suicide"[MeSH Terms] OR "panic disorder"[MeSH Terms] OR "feeding and eating disorders"[MeSH Terms] OR "burnout, professional"[MeSH Terms] OR "quality of life"[MeSH Terms] OR "prescription drugs"[MeSH Terms] OR "occupational health"[MeSH Terms] OR "stress disorders, post traumatic"[MeSH Terms] OR "Psychological Trauma"[MeSH Terms:noexp] OR (("post-acute"[All Fields] AND ("severe acute respiratory syndrome coronavirus 2"[Supplementary Concept] OR "severe acute respiratory syndrome coronavirus 2"[All Fields] OR "ncov"[All Fields] OR "2019 ncov"[All Fields] OR "covid-19"[All Fields] OR "sars cov 2"[All Fields] OR (("coronavirus"[All Fields] OR "cov"[All Fields]) AND 2019/11/01:3000/12/31[Date - Publication]))) AND "syndrome"[MeSH Major Topic]) OR ((("severe acute respiratory syndrome coronavirus 2"[Supplementary Concept] OR "severe acute respiratory syndrome coronavirus 2"[All Fields] OR "ncov"[All Fields] OR "2019 ncov"[All Fields] OR "covid-19"[All Fields] OR "sars cov 2"[All Fields] OR (("coronavirus"[All Fields] OR "cov"[All Fields]) AND 2019/11/01:3000/12/31[Date - Publication])) AND "post-intensive"[All Fields] AND "care"[All Fields]) AND "syndrome"[MeSH Major Topic]) OR "sleep wake disorders"[MeSH Terms] OR "psychological distress"[MeSH Terms] OR "mental health"[MeSH Major Topic]) AND "english"[Language] AND "english"[Language] AND ("pandemic"[Title] OR "epidemic"[Title] OR "economic crisis"[Title] OR "MERS"[Title] OR "SARS"[Title] OR "swine flu"[Title] OR "covid-19"[Title] OR "pandemics"[MeSH Major Topic] OR ("Epidemics"[MeSH Terms] NOT "Opioid Epidemic"[MeSH Terms]) OR "covid-19"[MeSH Major Topic] OR "economic recession"[MeSH Terms] OR "middle east respiratory syndrome coronavirus"[MeSH Terms] OR "sars virus"[MeSH Terms] OR "sars cov 2"[MeSH Terms]) AND ("Health"[Title/Abstract] OR "illness"[Title/Abstract] OR "hospitali*"[Title/Abstract] OR "isolation"[Title/Abstract] OR "loneliness"[Title/Abstract] OR

"economic hardship"[Title/Abstract] OR "unemployment"[Title/Abstract] OR "dept"[Title/Abstract] OR "discrimination"[Title/Abstract] OR "Violence"[Title/Abstract] OR "moral distress"[Title/Abstract] OR "trust"[Title/Abstract] OR "teleworking"[Title/Abstract] OR "lockdown"[Title/Abstract] OR "policy measures"[Title/Abstract] OR "travel restrictions"[Title/Abstract] OR "social distancing"[Title/Abstract] OR ("care"[All Fields] AND "about children"[Title/Abstract]) OR "distant education"[Title/Abstract] OR (("limit"[All Fields] OR "limitation"[All Fields] OR "limitations"[All Fields] OR "limited"[All Fields] OR "limiting"[All Fields] OR "limits"[All Fields]) AND "health care capacity"[Title/Abstract]) OR "media"[Title/Abstract] OR "quality of healthcare"[Title/Abstract] OR "Health"[MeSH Terms:noexp] OR "hospitalization"[MeSH Terms] OR "social isolation"[MeSH Terms] OR "loneliness"[MeSH Terms] OR "unemployment"[MeSH Terms] OR "Social Discrimination"[MeSH Terms:noexp] OR "Violence"[MeSH Terms:noexp] OR "trust"[MeSH Terms] OR "teleworking"[MeSH Terms] OR "physical distancing"[MeSH Terms] OR "Communicable Disease Control"[MeSH Terms:noexp] OR "child day care centers"[MeSH Terms] OR "education, distance"[MeSH Terms] OR "Health Resources"[MeSH Terms:noexp] OR "Quality of Health Care"[MeSH Terms:noexp] OR "Communications Media"[MeSH Terms:noexp] OR "Mass Media"[MeSH Terms:noexp]) AND ("english"[Language] AND 2000/01/01:2021/12/31[Date - Publication]) AND "english"[Language]

Web of Science

TI=(“pandemic*” OR “epidemic*” OR "economic crisis" OR “SARS” OR “MERS” OR “covid-19” OR "swine flu") AND TS=(“health” OR “illness” OR “hospitali*” OR “isolation” OR “loneliness” OR "economic hardship" OR “unemployment” OR “dept” OR “discrimination” OR “violence” OR "moral distress" OR “trust” OR “teleworking” OR “lockdown” OR "policy measures" OR "travel restrictions" OR "social distancing" OR "care about children" OR "distant education" OR "limited health care capacity" OR “media” OR "quality of healthcare") AND TI=("mental illness" OR “stress” OR “depression” OR “anxiety” OR "substance abuse" OR “psychosis” OR “suicide” OR "panic disorder" OR "affective disorder" OR "eating disorder" OR “burnout” OR QOL OR "prescription drugs" OR "occupational health" OR PTDS OR “trauma” OR "post-covid" OR "long covid" OR “well-being” OR "mental health" OR "psychiatric disorder" OR "feelings of insecurity" OR "sleep disorder" OR "psychosocial disability" OR "psychological distress" OR “worry”)

PsycInfo

(pandemic or epidemic or MERS or SARS or swine flu or covid-19).m_titl. AND (health or Illness or hospitalization or isolation or loneliness or economic hardship or unemployment or debt or discrimination or violence or moral distress or trust or teleworking or Lockdown or policy measures or travel restrictions or social distancing or care about children or distant education or limited health care capacity or media or quality of healthcare).mp. [mp=title, abstract, heading word, table

of contents, key concepts, original title, tests & measures, mesh] AND (mental illness or stress or depression or anxiety or substance abuse or psychosis or suicide or panic disorder or affective disorder or eating disorder or burnout or QOL or prescription drugs or occupational health or PTSD or trauma or post-covid or long covid or well-being or mental health or psychiatric disorder or feelings of insecurity or sleep disorder or psychosocial disability or psychological distress or worry).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]

Sociological abstracts

ti(pandemic OR epidemic OR economic crisis OR MERS OR SARS OR “swine flu” OR covid-19 OR MAINSUBJECT.EXACT("Economic Crises") OR MAINSUBJECT.EXACT("Epidemics")) AND ab(“health” OR “Illness” OR “hospitali*” OR “isolation” OR “loneliness” OR “economic hardship” OR “unemployment” OR “debt” OR “discrimination” OR “violence” OR "moral distress" OR “trust” OR “teleworking” OR “Lockdown” OR "policy measures" OR "travel restrictions" OR "social distancing" OR "care about children" OR "distant education" OR "limited health care capacity" OR “media” OR "quality of healthcare") OR MAINSUBJECT.EXACT("Health") OR MAINSUBJECT.EXACT("Illness") OR MAINSUBJECT.EXACT("Social Isolation") OR MAINSUBJECT.EXACT("Loneliness") OR MAINSUBJECT.EXACT("Economic Crises") OR MAINSUBJECT.EXACT("Unemployment") OR MAINSUBJECT.EXACT("Discrimination") OR MAINSUBJECT.EXACT("Trust") OR MAINSUBJECT.EXACT("Policy") OR MAINSUBJECT.EXACT("Social Distance") OR MAINSUBJECT.EXACT("Distance Education") OR MAINSUBJECT.EXACT("Mass Media") AND ab("mental illness" OR “stress” OR “depression” OR “anxiety” OR "substance abuse" OR “psychosis” OR “suicide” OR "panic disorder" OR “affective disorder” OR “eating disorder” OR “burnout” OR QOL OR "prescription drugs" OR "occupational health" OR PTSD OR “trauma” OR "post-covid" OR "long covid" OR "well-being" OR "mental health" OR "psychiatric disorder" OR "feelings of insecurity" OR "sleep disorder" OR "psychosocial disability" OR "psychological distress" OR “worry”) OR MAINSUBJECT.EXACT("Mental Illness") OR MAINSUBJECT.EXACT("Mental Health") OR MAINSUBJECT.EXACT("Depression (Psychology)") OR MAINSUBJECT.EXACT("Substance Abuse") OR MAINSUBJECT.EXACT("Suicide") OR MAINSUBJECT.EXACT("Affective Illness") OR MAINSUBJECT.EXACT("Eating Disorders") OR MAINSUBJECT.EXACT("Quality of Life") OR (MAINSUBJECT.EXACT("Posttraumatic Stress Disorder") OR MAINSUBJECT.EXACT("Trauma")) OR MAINSUBJECT.EXACT("Security")

PERISCOPE

Pan-European Response to the ImpactS of COVID-19 and future Pandemics and Epidemics