

Changes in mental health symptoms from April (COVID-19 outbreak) to December 2020 in Norway: A two-wave study

Kristen Hagen, Stian Solem, Anne Kristin Stavrum, Jarle Eid, Gerd Kvale, Oddrun Samdal & Stephanie Le Hellard

To cite this article: Kristen Hagen, Stian Solem, Anne Kristin Stavrum, Jarle Eid, Gerd Kvale, Oddrun Samdal & Stephanie Le Hellard (2023) Changes in mental health symptoms from April (COVID-19 outbreak) to December 2020 in Norway: A two-wave study, Cogent Psychology, 10:1, 2173998, DOI: [10.1080/23311908.2023.2173998](https://doi.org/10.1080/23311908.2023.2173998)

To link to this article: <https://doi.org/10.1080/23311908.2023.2173998>



© 2023 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license.



Published online: 20 Feb 2023.



Submit your article to this journal [↗](#)



Article views: 421



View related articles [↗](#)



View Crossmark data [↗](#)



Received: 14 December 2022
Accepted: 24 January 2023

*Corresponding author: Kristen Hagen, Molde Hospital, Møre og Romsdal Hospital Trust Postal address: Molde Hospital, Møre og Romsdal Hospital Trust, 6412 Molde, Norway
E-mail: kristen.hagen@helse-mr.no

Additional information is available at the end of the article

HEALTH PSYCHOLOGY | RESEARCH ARTICLE

Changes in mental health symptoms from April (COVID-19 outbreak) to December 2020 in Norway: A two-wave study

Kristen Hagen^{1,2,3*}, Stian Solem^{2,4}, Anne Kristin Stavrum^{5,6}, Jarle Eid^{7,8}, Gerd Kvale^{2,9}, Oddrun Samdal¹⁰ and Stephanie Le Hellard^{2,5,6}

Abstract: The main objective of the study was to investigate changes in mental health symptoms from the start of the pandemic in Norway (April) to December 2020. A total of 6017 participants completed an assessment of the survey at both time points. Main Outcome Measures: Symptoms of anxiety and depression were measured at both time points. Demographic variables and potential risk factors were assessed. There were significant changes (slight increase) in anxiety and depression, but effect sizes were small. Increases in symptoms in anxiety and depression occurred more in the general population than for people with pre-existing mental health problems. Baseline level of symptoms was the most important risk factor. Other significant risk factors included female sex, students, pre-existing mental health problems, increased tobacco use, lost job, and lacking government trust. The longitudinal results replicated findings from the first phase of the pandemic, suggesting that the number of risk factors experienced is associated with symptom severity. The results suggest that mental health symptoms have been quite stable from April to December but with a slight increase among people presenting with subclinical symptoms in April. The study obtained ethical approval from the Regional Committee for Medical and Health Research (REK Nord, 123,324).

Subjects: Health & Society; Health Conditions; Public Health Policy and Practice

Keywords: COVID-19; depression; anxiety; resilience; vulnerability; coping

1. Introduction and background

In Norway (population of 5.4 million), the coronavirus (COVID-19) was confirmed on February 26. For the remainder of that year, there has been continuously changes in number of people affected and different restrictions imposed. The number of infected increased from March before declining in April. Rates started increasing again slightly in August and there was a stronger increase in November. At the end of 2020, there were 50,138 infected across the nation. Almost 1 year into the epidemic, the effects on mental health are unclear. However, register data on Norwegian general practitioners' consultation regarding mental health suggested a possible increase from September to December 2020 (Hvide & Johnsen, 2022). This led the authors to raise concerns about potential accumulation of adverse effects of the pandemic on mental health.

Several cross-sectional surveys suggest somewhat higher rates of anxiety and depression and PTSD symptoms compared to historical estimates before the pandemic broke out (Fancourt et al., 2021; Hagen et al., 2021; Lai et al., 2020; Li et al., 2021; Á et al., 2020; Rodriguez-Rey et al., 2020; Sun et al., 2021; Wang, Pan, Wan, Tan, Xu, Ho et al., 2020). Different risk factors for mental health

problems have included younger people (students), people in the high-risk group, women, people with a history of mental health issues, and people losing their job and living in poverty (Cao et al., 2020; Druss, 2020; Fancourt et al., 2021; Lai et al., 2020; Á et al., 2020; Rodríguez-Rey et al., 2020; Rossi et al., 2020; Wright et al., 2020; Yao et al., 2020). Socioeconomic status could be associated with the pandemic impact on mental health. However, a Norwegian longitudinal study found no evidence of such an effect (Reme et al., 2022). The study found that increase in depressive symptoms was associated with lower levels of depression prior to COVID-19 and female gender. This could be indicative of subclinical changes.

In 2021, we published findings from a cross-sectional survey during the first month of the outbreak (Hagen et al., 2021). The study found that compared with studies pre-COVID-19, the levels of anxiety and depression were slightly higher (small effect sizes, $d = 0.2-0.3$). Furthermore, there was an increase in anxiety and depression symptoms with the accumulation of risk factors experienced. Ten specific risk factors were explored including possible/confirmed infection for oneself or one's family, female/other gender, students, having mental health problems, increased use of tobacco, increased use of alcohol, less exercise, losing employment, suffering economic impact, and having lower education. The results suggested that the total number of risk factors was significantly associated with symptoms of depression and anxiety. Overall, the results resembled previous research suggesting that the vast majority of the sample was resilient, but certain risk factors were associated with unhelpful coping. With respect to gender, fear of COVID-19 could be higher among women than men and the pandemic could affect mental health differently with more anxiety and distress in women (Sánchez-Teruel et al., 2022; Sánchez-Teruel, Robles-Bello, Valencia-Naranjo et al., 2021). This may be a result of gender differences in the emotional reactions related to the pandemic, as studies have indicated that gender may moderate the relationship between emotional stressors and resilience (Sánchez-Teruel et al., 2022), although the findings regarding the role of gender have been inconclusive (Robles-Bello et al., 2022; Sánchez-Teruel, Robles-Bello, Sarhani-Robles et al., 2021).

However, cross-sectional surveys cannot address changes in mental health symptoms. There have been some longitudinal studies reported. These have addressed changes in symptom based on existing register studies or changes from the outbreak and for the first couple of months into the epidemic. The longitudinal studies appear to be more conservative in their statements concerning increases in mental health symptoms than most of the cross-sectional studies. In a longitudinal survey from the UK, there was evidence that anxiety had increased during COVID-19 compared with pre-pandemic assessments (Asf et al., 2021). However, symptoms of depression were stable. The percentage of individuals with probable anxiety disorder (based on GAD-7 scores) increased from 13% to 24%. These findings correspond with a study (Pierce et al., 2020) finding that the prevalence of clinically significant levels of mental distress rose from 18.9% in 2018-19 to 27.3% in April 2020 (1 month into lockdown).

There are suggestions that anxiety could increase initially as a response to changes in society (Asf et al., 2021). Others have found that symptoms of anxiety may decrease, while levels of depressive symptoms are more stable during the first months (O'Connor et al., 2021). Worry could be an initial reaction to changes in circumstances, which could normalize with time (Wang, Pan, Wan, Tan, Xu, McIntyre et al., 2020). Results have also been somewhat conflicting. A study from Spain found initial increase in depression while anxiety symptoms were stable (González-Sanguino et al., 2020). There are also indications that many are coping quite well. One study on the well-being of older Swedish adults found that they were doing just as well as before the pandemic (Kivi et al., 2021). Many have also cautioned about possible detrimental effects for people with existing mental health problems. However, studies have also suggested that this group could show little change in mental health symptoms (Pan et al., 2021; Pinkham et al., 2020) and that the observed increases in symptoms occur more among those without existing mental health problems.

A picture emerging from the literature seems to be that the highest increase in mental health problems could occur immediately after an outbreak or a lockdown (Li et al., 2021), before

symptoms decrease as people adapt to their circumstances (Bendau et al., 2021; Mata et al., 2021). Also, changes may not be as dramatic as suggested by many as symptoms may be quite stable (Á et al., 2020). Effects of quarantine may also not have dramatic effects for the first couple of weeks (Canet-Juric et al., 2020). In Norway, it has been found that mental health problems among adolescents have increased slightly (Hafstad et al., 2021). However, all these studies have focused on response in the initial period after the outbreak. Studies are lacking on longer term coping.

To better understand the impact on mental health during the COVID-19 outbreak, we designed a study that will follow participants from the time of the outbreak to 2022. The aim of the current study was to report on data (symptoms of anxiety and depression) from the first (April 2020) to the second wave (December 2020) of data collection. We also wanted to test the findings from wave 1 that certain risk factors, and the number of risk factors for mental health problems experienced, the more distress will be reported. Our main hypothesis was that symptoms would be quite stable across time, and still related to the number of risk factors experienced.

2. Methods

2.1. Participants and procedure

This study is part of a longitudinal survey study called BryDeg2020 (TakeCare2020, <https://www.uib.no/en/takecare2020>). The sample was recruited using advertisements in social media; the study was mentioned by the Norwegian Broadcasting Corporation, and people were encouraged to participate. In addition, several organizations supported the study and participated in the recruitment process (sharing the survey invitation link with their members). This included most Universities and Colleges in Norway, the National Student Association, the Norwegian Council for Mental Health, and one of the largest hospital trusts. The study obtained ethical approval from the Regional Committee for Medical and Health Research Ethics in Northern Norway (REK Nord, reference number 123,324). Methods were performed in accordance with the relevant guidelines and regulations from institution. Participants were aged 18 and older and all participants signed informed consent before answering the survey.

A summary of the participants' demographic characteristics is displayed in Table 1. As the table shows, there were significant differences between those who only answered the first wave and those who took part in both assessments, but these were relatively small with respect to symptoms of depression ($d = 0.07$) and anxiety ($d = 0.08$). The wave 2 participants were somewhat older than the first wave ($d = 0.32$), included fewer students (51% vs. 66%), and more people with a completed education of bachelor level or above (68% vs. 57%). The sample was still predominantly female, and relatively large degree had suffered from mental health problems before the pandemic outbreak (32%). The number of confirmed infected participants had increased from 0.3% in April to 1.5% in December.

A summary of the representativeness of the sample is illustrated in supplementary material. The black and gray bars compare the rates of different characteristics of the general adult Norwegian population with that of this study's sample. Black bars crossing the 50% mark indicates higher rates of a given trait in the general population and vice versa. The figure shows that the sample had a high level of education, that the western and eastern parts of Norway were overrepresented, and that the sample had a predominance of young female students.

2.2. Measures

The Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001) was used for assessing symptoms of depression. The PHQ-9 is a self-report scale with nine items scored from 0 to 3, with a maximum score of 27. According to Kroenke et al. (2010), a score of 10 or more is indicative of a depressive disorder, but a cut-off value of 14 or higher has also been suggested (Levis et al., 2020). Cronbach's alpha was .91 in April and .90 in December.

Table 1. Characteristics of the sample (both waves) and comparisons with non-participants (first wave only)

Variable	Both waves (n = 6017)		First wave only (n = 13,355)		t	p
	M	SD	M	SD		
PHQ-9	8.20	6.43	8.66	6.57	4.58	<.001
GAD-7	6.00	5.00	6.40	5.10	5.18	<.001
Age	34.68	13.75	30.56	12.06	20.03	<.001
	%	n	%	n	χ^2	p
Age groups					431.9	<.001
18–29	50.2	3016	65.3	8705		
30–39	17.2	1031	13.7	1830		
40–49	15.2	914	10.5	1402		
50–59	10.9	655	7.2	955		
60+	6.6	394	3.4	448		
COVID infection April						
Possible inf. self/family	21.0	1265	21.7	2904	1.28	.259
Confirmed inf. Self	0.3	17	0.2	30	0.58	.448
Confirmed inf. Family	1.2	71	1.3	173	0.45	.503
COVID infection December						
Possible inf. self/family	17.7	1063				
Confirmed inf. self	1.5	88				
Confirmed inf. family	4.3	261				
Gender					32.36	<.001
Male sex	21.5	1292	25.1	3356		
Female sex	77.8	4680	74.3	9921		
Other gender	0.7	45	0.5	74		
Student	51.0	3066	66.0	8817	396.98	<.001
Bachelor's degree	67.5	3249	56.5	5481	161.47	<.001
At risk group for COVID-19	24.4	1174	21.9	2127	11.08	.001
Psychological disorder	31.9	1919	26.9	3591	51.04	<.001
Increased tobacco use	9.1	550	10.4	1386	7.06	.008
Increased alcohol use	18.4	1110	16.5	2202	11.24	.001
Less exercise	35.7	2148	37.9	5064	8.74	.003
Lost job/leave	2.5	150	2.0	261	5.80	.016
Neg. economic impact April	26.9	1296	32.6	3164	49.17	<.001
Neg. economic impact December	25.0	1504				

Note. PHQ-9 = Patient Health Questionnaire-9, GAD-7 = Generalized Anxiety Disorder-7. In case of missing data, valid percentage is reported.

The Generalized Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006) was used to assess symptoms of anxiety. The GAD-7 is a self-report scale with seven items scored from 0 to 3, yielding a maximum score of 21. The suggested cut-off value is 10. Cronbach's alpha was .90 in April and .91 in December.

Different risk factors were assessed in the survey. Most of these variables were assessed in April, while COVID-19 infection, suffering economic impact, and their trust in government were assessed in December. Participants self-reported (yes/no) if they belonged to an at-risk group for COVID-19, had lost their job, or suffered negative economic impact due to the pandemic. Changes in use of

alcohol was also recorded on a 1–5 scale and responses of 4 (“slight increase”) and 5 (“great increase”) were coded as “increased alcohol use”. The same procedure was used for changes in use of tobacco and time devoted to exercise. Trust in the government’s ability to handle crises was measured using the questionnaire developed by the Norwegian Citizen Panel (Norwegian Citizen Panel In, 2013). The questionnaire is a self-report scale scored from 1 (very high degree of trust) to 7 (very high degree of mistrust) on the following topics: (1) critical infrastructure, (2) accidents related to transportation, (3) terror, (4) natural disasters, (5) contamination related to food and drinking water, and (6) pandemics. The original questionnaire had five questions. The sixth item was added specifically for the current study.

2.3. Statistical analyses

Repeated measures ANOVAs were used to explore changes in symptoms of anxiety and depression. The analyses were repeated including split plots to compare different groups (people with and without a history of mental health problems, and people at risk or not at risk for COVID-19). Linear regression analyses using the enter method were used to explore possible risk factors. The dependent variables were PHQ-9 and GAD-7 assessments in December. Baseline levels of such symptoms were first entered before entering dichotomized potential risk factors (infection, female/other gender, student, history of mental health problems, increased use of alcohol or tobacco, less exercise, lost job, suffering economic impact, lower education, and trust in government). As in our first study, we also explored the correlation between number of risk factors experiences and symptom of anxiety/depression.

3. Results

3.1. Changes in mental health symptoms

Repeated measures ANOVAs found that there were significant changes in GAD-7 and PHQ-9, but effect sizes were weak. Table 2 summarizes the scores on anxiety and depression for the sample. As indicated by the table, there were small overall changes in symptoms of anxiety and depression. In April, 76.3% scored below the cut-off on GAD-7 in December compared to 78.1% in April, and 76.9% on the PHQ-9 compared to 80.6% in April. The proportion of people scoring above cut-off on the PHQ-9 and GAD-7 from April to December was significant according to the McNemar test ($p < .001$ for PHQ-9 and $p = .005$ for GAD-7).

Repeated measures ANOVAs investigated possible effects of risk factors for mental health problems and risk factors for COVID-19. There were few significant interaction effects, and those that were significant, showed weak effect sizes. However, one consistent finding (although also showing a weak effect size) was that increases in symptoms occurred more in the general population than for people with existing mental health problems. This interaction effect was present both for GAD-7 ($F = 20.99$, $p < .001$, $\eta p^2 = .003$) and PHQ-9 ($F = 9.25$, $p = .002$, $\eta p^2 = .002$), see Figure 1. For COVID-19 risk factors, there were also no clear interaction effects. The largest group difference was observed for the obesity group on the PHQ-9 ($F = 46.96$, $p < .001$), but again the effect size was weak ($\eta p^2 = .004$). It should be noted that there were few participants with kidney, cancer, or liver diseases in the sample.

The regression model from first wave was repeated, adding baseline values of PHQ-9 and GAD-7 (symptoms reported in April), and the score for trust in government was added. For a summary of the two regressions, see, Table 3. The independent variables were assessed in April, but two variables included updated data (COVID-19 infection and suffering economic impact). The baseline level of symptoms was clearly the most important risk factor of symptoms in December. The other risk factors showed similar patterns of significance for both depression and anxiety. All risk factors were still significant except for increased use of alcohol, less exercise, economic impact, and lower education. Infection was not associated with lower GAD-7 scores. This suggested that higher levels of anxiety and depression were associated with more symptoms experienced in April, female sex, students, those with existing mental health problems, those who had increased their tobacco use,

Table 2. Changes in symptoms of anxiety and depression from April to December 2020

	April		December		F	ηp^2
	M	SD	M	SD		
GAD-7	6.00	5.00	6.25	5.04	24.42	.004
PHQ-9	8.20	6.43	8.87	6.36	115.18	.019
GAD-7	N	%	N	%	N cha	% cha
Below cut-off (10)	4697	78.1	4677	76.3	-20	-1.8
Severity						
Minimal (0-4)	2845	47.3	2684	44.6	-161	-2.7
Mild (5-9)	1852	30.8	1918	31.9	+66	+ 1.1
Moderate (10-14)	824	13.7	892	14.8	+68	+1.1
Severe (15-21)	496	8.2	523	8.7	+27	+0.5
PHQ-9						
Below cut-off (10)	3926	65.2	3652	60.7	-274	-4.5
Below cut-off (14)	4941	80.6	4630	76.9	-311	-3.7
Severity						
Minimal (0-4)	2096	34.8	1764	29.3	-332	-5.5
Mild (5-9)	1830	30.4	1888	31.4	+58	+1.0
Moderate (10-14)	1015	16.9	1186	19.7	+171	+2.8
Moderate-severe (15-19)	620	10.3	708	11.8	+88	+1.5
Severe (20-27)	456	7.6	471	7.8	+15	+0.2

Note. GAD-7 = Generalized Anxiety Disorder-7, PHQ-9 = Patient Health Questionnaire-9.

lost their jobs, or don't trust the government. Regarding multicollinearity, VIF values ranged from 1.01 to 1.40 for the PHQ-9 analysis and from 1.01 to 1.33 for the GAD-7 analysis. The Durbin-Watson coefficient was 1.96 for the PHQ-9 model and 1.88 for the GAD-7 model.

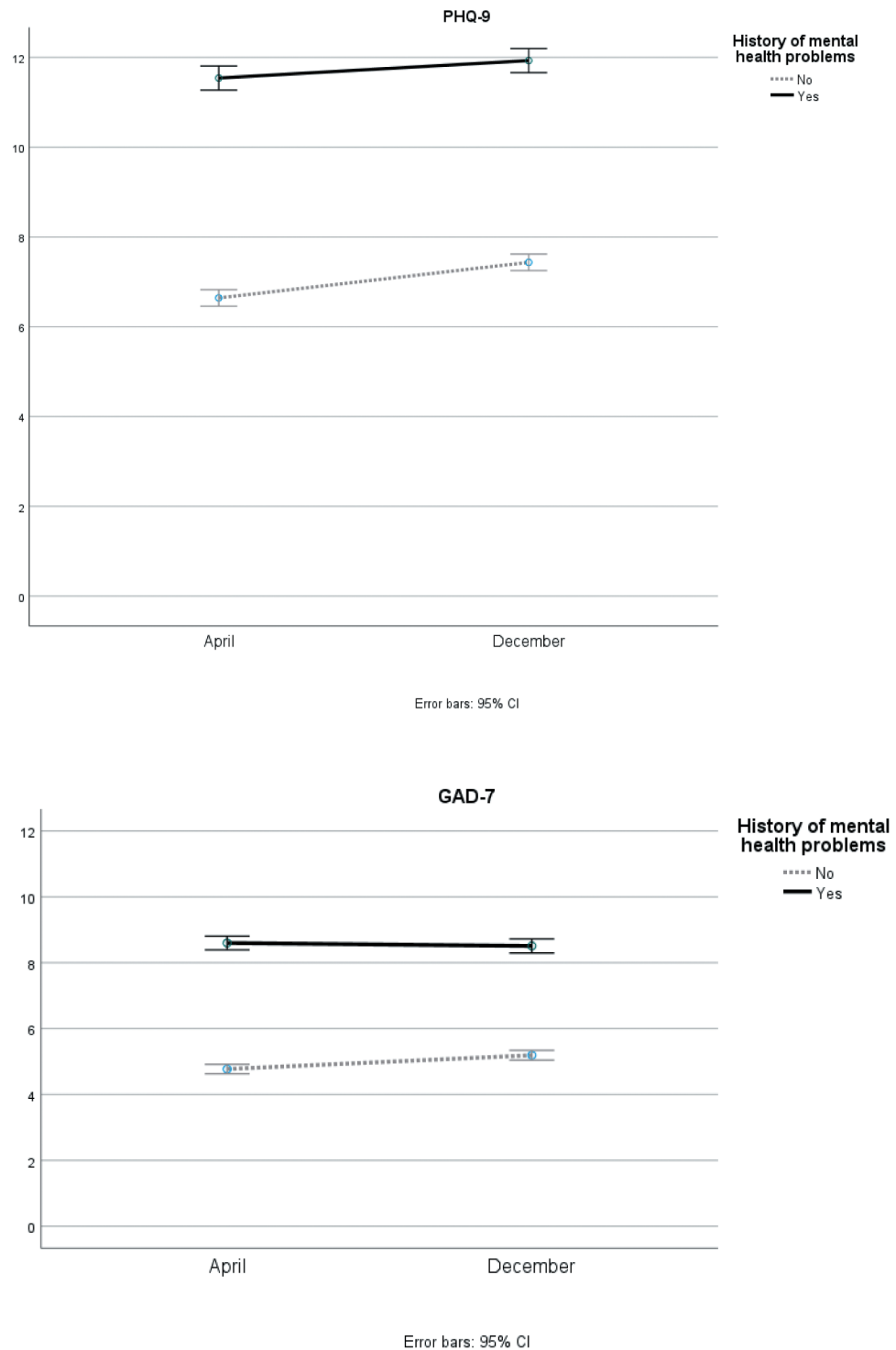
The correlation coefficients between the number of risk factors and PHQ-9 scores in December were .39 ($p < .001$) and .36 for GAD-7 (in comparison these correlations were .46 and .43 in April), supporting the notion that number of risk factor for mental health symptoms could be more important than single risk factors.

4. Discussion

The results suggested that there had been a slight increase in symptoms of anxiety and depression from April to December 2020. Increases in symptoms occurred more in the general population than for people with existing mental health problems. The baseline level of symptoms is the most important risk factor of symptoms while other significant risk factors included female sex, students, those with existing mental health problems, those who had increased their tobacco use, lost their jobs, or do not trust the government. People in the at-risk groups for COVID-19 did not show clear indications of increased anxiety or depression. The results replicated findings from the first wave suggesting that the number of risk factors experienced is associated with severity of symptoms. Most people had quite high scores regarding trust in government which was correlated weakly but significantly with symptoms of depression and anxiety.

In a longitudinal survey from the UK, percentage of individuals with probable anxiety disorder (based on GAD-7 scores) increased from 13% to 24% following the pandemic outbreak. In our study, 23.7% scored above cut-off on GAD-7, and 23.1% on PHQ-9. In comparison, other studies (Unnarsdóttir et al., 2022) report lower prevalence rates for anxiety and depression. An issue with previous studies on mental health and the pandemic has been the short follow-up period. The current study has an 8-month follow-up period, and the main finding is that symptoms are

Figure 1. Changes in symptoms of anxiety and depression for people with and without a history of mental health problems.



relatively stable. The length of the pandemic and possible exhaustion from changes in restrictions could likely influence symptoms in the long run, but the results were quite stable. People with self-reported mental health issues reported high levels of symptoms, but again, these have been relatively stable from April to December. The baseline level of symptoms was the most important risk factor. The results indicated, in fact, that changes in symptoms were mainly observed in the general population and suggest changes within the non-clinical spectrum. Other risk factors for

Table 3. Standardized beta coefficients for potential risk factors associated with current (December) symptoms of anxiety and depression

	PHQ-9 (Adj. $R^2 = .55$)		GAD-7 (Adj. $R^2 = .50$)	
	β	p	β	p
Baseline symptoms ^{April}	.639	<.001	.609	<.001
Possible infection self/family ^{December}	.034	<.001	.019	.068
Not male gender ^{April}	.028	.004	.036	.001
Student ^{April}	.039	<.001	.072	<.001
History of mental health problems ^{April}	.084	<.001	.071	<.001
Increased use of alcohol ^{April}	.011	.277	.011	.309
Increased use of tobacco ^{April}	.030	.002	.032	.002
Less exercise ^{April}	.004	.709	.006	.538
Lost job ^{April}	.069	<.001	.069	<.001
Economic impact ^{December}	-.014	.163	-.013	.233
Lower education ^{April}	.019	.082	.015	.194
Trust in government ^{Dec}	-.077	<.001	-.071	<.001

Note. PHQ-9 = Patient Health Questionnaire-9, GAD-7 = Generalized Anxiety Disorder-7. For the PHQ-9 model, baseline symptoms was assessed using PHQ-9 in April. For the GAD-7 model, baseline symptoms was assessed using GAD-7 values from April. A Bonferroni correction when using 12 independent variables would yield a threshold p -value of .0042.

symptoms of anxiety and depression included female sex, students, those who had increased their tobacco use, lost their jobs, or do not trust the government. Young people and students have been identified as a potential risk group for mental health problems during the pandemic (Wang, Pan, Wan, Tan, Xu, Ho et al., 2020). Their problems could be related to disruptions with familiar routines, changes in academic activities, living situations, and lack of social support during lockdown. The mental health of college students should be monitored during epidemics, and the group may need more institutional support such as availability of faculty and transparency of institutional information. The results also confirmed previous findings that women may report more distress and anxiety during the pandemic (Sánchez-Teruel et al., 2022; Sánchez-Teruel, Robles-Bello, Valencia-Naranjo et al., 2021). This may indicate that the role of gender in the response to the pandemic and that the role of gender is relevant to assess further (Sánchez-Teruel, Robles-Bello, Valencia-Naranjo et al., 2021).

The study also replicated results from the first wave (Hagen et al., 2021) suggesting a cumulative model of risk factors. The more risk factors experienced, the worse outcome. This indicates that although most of the participants are reporting relatively low levels of anxiety and depression, there are vulnerable groups struggling with the COVID-19 situation. It should be noted that the amount of explained variance using the cumulative risk index score was lower than in the ordinary regression analysis (Table 3). There are also limitations of using a cumulative risk index score such as dichotomizing of variables, problems with quantifying the amount of exposure to a risk factor and it says nothing about how long (duration) the person has experienced the different risk factors. However, the study did not find clear support for increased symptoms among people in the at-risk group for COVID-19. It should be noted that some of the at-risk groups suffered from small sample size issues.

4.1. Limitations

There are several limitations that must be taken into consideration when interpreting these findings. Selection- and attrition bias may have influenced the results and reduced the generalizability of the findings. There may be biases regarding the sample, since the participation was voluntarily and the bias is exemplified by the high percentage in female participants, which is

a trend seen recurrently in research samples. There is also a high percentage of students in the sample, which is a result of the recruitment process for the study (Hagen et al., 2021). Compared with the Norwegian population, the current sample had higher levels of education, more women, and a predominance of students. Furthermore, ethnic minorities could have higher risk of being affected by COVID-19; however, the current study did not assess ethnicity. Longitudinal studies with pre-pandemic data are vital for addressing changes in symptoms. Although we can assess the development of symptoms over time after the pandemic outbreak, we cannot conclude about the pre-level of symptoms of anxiety and depression, and thereby not conclude about the effect from before the pandemic outbreak to now. It should also be noted that the large sample size and use of bivariate analyses could inflate the results of individual predictors.

4.2. Conclusion

In conclusion, this survey suggests that the symptoms have been relatively stable from April to December. There was a slight increase in anxiety and depression, but the effect sizes were weak. People with no pre-existing mental health problem showed a subclinical increase in symptoms, while those who suffered from a mental disorder before the pandemic still reported the highest levels of anxiety and depression. We also replicated findings suggesting that there is a cumulative effect of risk factors. More risk factors experienced was associated with higher levels of anxiety and depression. However, people in the at-risk groups for COVID-19 did not show clear indications of elevated symptoms of depression and anxiety.

Funding

The authors received no direct funding for this research.

Author details

Kristen Hagen^{1,2,3}

E-mail: kristen.hagen@helse-mr.no

ORCID ID: <http://orcid.org/0000-0002-4286-1277>

Stian Solem^{2,4}

Anne Kristin Stavrum^{5,6}

Jarle Eid^{7,8}

Gerd Kvale^{2,9}

Oddrun Samdal¹⁰

Stephanie Le Hellard^{2,5,6}

¹ Department of Psychiatry, Molde Hospital, Møre og Romsdal Hospital Trust, Molde, Norway.

² Bergen Center for Brain Plasticity, Haukeland University Hospital, Bergen, Norway.

³ Department of Mental Health, Norwegian University of Science and Technology, Trondheim, Norway.

⁴ Department of Psychology, Norwegian University of Science and Technology Trondheim Norway.

⁵ NORMENT, Department of Clinical Science, University of Bergen, Bergen, Norway.

⁶ Department of Medical Genetics, Haukeland University Hospital, Bergen, Norway.

⁷ Department of Psychosocial Sciences, University of Bergen, Bergen, Norway.

⁸ Center for Crisis Psychology, University of Bergen, Bergen, Norway.

⁹ Department of Clinical Psychology, University of Bergen, Bergen, Norway.

¹⁰ Department of Health Promotion and Development, University of Bergen, Bergen Norway.

Abbreviations

ANOVA = analysis of variance, GAD-7 = Generalized Anxiety Disorder-7, N cha = number change, PHQ-9 = Patient Health Questionnaire-9, VIF = variance inflation factor.

Authors' contribution

K.H., S.L.H., G.K. and J.E. are responsible for the BryDeg2020 study, and obtained ethical approval for the study. K.H., S.S., S.L.H., G.K. and J.E. contributed to the conceptualization and design of the paper. K.H., S.S. and

A.K.S. contributed to the data preparation. KH and SS contributed to the formal analysis. K.H. and S.S. wrote the original draft. All authors contributed to rewriting and editing. All authors have read and agreed to the published version of the manuscript.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data sharing statement

The dataset for the study is available from the first author upon reasonable request.

Citation information

Cite this article as: Changes in mental health symptoms from April (COVID-19 outbreak) to December 2020 in Norway: A two-wave study, Kristen Hagen, Stian Solem, Anne Kristin Stavrum, Jarle Eid, Gerd Kvale & Oddrun Samdal, *Cogent Psychology* (2023), 10: 2173998.

References

- Á, P.-G., Odriozola-González, P., Iruirtia, M. J., & de Luis-García, R. (2020). Longitudinal evaluation of the psychological impact of the COVID-19 crisis in Spain. *J Affect Disord*, 277, :842–849. <https://doi.org/10.1016/j.jad.2020.09.018>
- Asf, K., RM, P., Mj, A., Northstone, K., Tilling, K., Smith, D., Fawns-Ritchie, C., Bould, H., Warne, N., Zammit, S., Gunnell, D. J., Moran, P. A., Micali, N., Reichenberg, A., Hickman, M., Rai, D., Haworth, S., Campbell, A., Altschul, D., ... Timpson, N. J. (2021). Mental health before and during the COVID-19 pandemic in two longitudinal UK population cohorts. *Br J Psychiatry*, 218(6), 334–343. <https://doi.org/10.1192/bjp.2020.242>
- Bendau, A., Plag, J., Kunas, S., Wyka, S., Ströhle, A., & Petzold, M. B. (2021). Longitudinal changes in anxiety and psychological distress, and associated risk and protective factors during the first three months of the COVID-19 pandemic in Germany. *Brain Behav*, 11(2), e01964. <https://doi.org/10.1002/brb3.1964>
- Canet-Juric, L., Andrés, M. L., Del Valle, M., López-Morales, H., Poó, F., Galli, J. I., Yerro, M., & Urquijo, S. (2020).

- A longitudinal study on the emotional impact cause by the COVID-19 pandemic quarantine on general population. *Front Psychol*, 11, 565688. <https://doi.org/10.3389/fpsyg.2020.565688>
- Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Res*, 287, 112934. <https://doi.org/10.1016/j.psychres.2020.112934>
- Druss, B. G. (2020). Addressing the COVID-19 pandemic in populations with serious mental illness. *JAMA Psychiatry*, 77(9), 891–892. <https://doi.org/10.1001/jamapsychiatry.2020.0894>
- Fancourt, D., Steptoe, A., & Bu, F. (2021). Trajectories of anxiety and depressive symptoms during enforced isolation due to COVID-19 in England: A longitudinal observational study. *Lancet Psychiatry*, 8(2), 141–149. [https://doi.org/10.1016/S2215-0366\(20\)30482-X](https://doi.org/10.1016/S2215-0366(20)30482-X)
- González-Sanguino, C., Ausín, B., Castellanos, M., Saiz, J., López-Gómez, A., Ugidos, C., & Muñoz, M. (2020). Mental Health consequences of the Coronavirus 2020 Pandemic (COVID-19) in Spain. A longitudinal study. *Front Psychiatry*, 11, 565474. <https://doi.org/10.3389/fpsy.2020.565474>
- Hafstad, G. S., Sætre, S. S., Wentzel-Larsen, T., & Augusti, E. M. (2021). Adolescents' symptoms of anxiety and depression before and during the Covid-19 outbreak - A prospective population-based study of teenagers in Norway. *Lancet Reg Health Eur*, 5, 100093. <https://doi.org/10.1016/j.lanep.2021.100093>
- Hagen, K., Solem, S., Stavrum, A. K., Eid, J., Kvale, G., Samdal, O., & Hellard, S. L. (2021). Mental health symptoms during the first months of the COVID-19 outbreak in Norway: A cross-sectional survey study. *Scand J Public Health*, 14034948211059525. <https://doi.org/10.1177/14034948211059525>
- Hvide, H. K., & Johnsen, J. (2022). COVID-19 and mental health: A longitudinal population study from Norway. *Eur J Epidemiol*, 37(2), 167–172. <https://doi.org/10.1007/s10654-021-00836-3>
- Kivi, M., Hansson, I., Bjälkebring, P., & Isaacowitz, D. M. (2021). Up and about: Older adults' well-being during the COVID-19 Pandemic in a Swedish Longitudinal Study. *J Gerontol B Psychol Sci Soc Sci*, 76(2), e4–e9. <https://doi.org/10.1093/geronb/gbaa084>
- Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: Validity of a brief depression severity measure. *J Gen Intern Med*, 16(9), 606–613. <https://doi.org/10.1016/j.genhosppsych.2010.03.006>
- Kroenke, K., Spitzer, R. L., Williams, J. B., & Lowe, B. (2010). The patient health questionnaire somatic, anxiety, and depressive symptom scales: A systematic review. *Gen Hosp Psychiatry*, 32(4), 345–359. <https://doi.org/10.1016/j.genhosppsych.2010.03.006>
- Lai, J., Ma, S., Wang, Y., Cai, Z., Hu, J., Wei, N., Wu, J., Du, H., Chen, T., Li, R., Tan, H., Kang, L., Yao, L., Huang, M., Wang, H., Wang, G., Liu, Z., & Hu, S. (2020). Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA Netw Open*, 3(3), e203976. <https://doi.org/10.1001/jamanetworkopen.2020.3976>
- Levis, B., Benedetti, A., Ioannidis, J. P. A., Sun, Y., Negeri, Z., He, C., Wu, Y., Krishnan, A., Bhandari, P. M., Neupane, D., Imran, M., Rice, D. B., Riehm, K. E., Saadat, N., Azar, M., Boruff, J., Cuijpers, P., Gilbody, S., Kloda, L. A., ... Thombs, B. D. (2020). Patient Health Questionnaire-9 scores do not accurately estimate depression prevalence: Individual participant data meta-analysis. *J Clin Epidemiol*, 122(115–128), e111. <https://doi.org/10.1016/j.jclinepi.2020.02.002>
- Li, Y., Zhao, J., Ma, Z., McReynolds, L. S., Lin, D., Chen, Z., Wang, T., Wang, D., Zhang, Y., Zhang, J., Fan, F., & Liu, X. (2021). Mental Health Among College Students During the COVID-19 Pandemic in China: A 2-Wave Longitudinal Survey. *J Affect Disord*, 281, :597–604. <https://doi.org/10.1016/j.jad.2020.11.109>
- Mata, J., Wenz, A., Rettig, T., Reifenscheid, M., Möhring, K., Krieger, U., Friedel, S., Fikel, M., Cornesse, C., Blom, A. G., & Naumann, E. (2021). Health behaviors and mental health during the COVID-19 pandemic: A longitudinal population-based survey in Germany. *Soc Sci Med*, 287, 114333. <https://doi.org/10.1016/j.socscimed.2021.114333>
- Norwegian Citizen Panel In.; 2013. Norwegian Citizen Panel 1 – Study Documentation
- O'Connor, R. C., Wetherall, K., Cleare, S., McClelland, H., Melson, A. J., Niedzwiedz, C. L., O'Carroll, R. E., O'Connor, D. B., Platt, S., Scowcroft, E., Watson, B., Zortea, T., Ferguson, E., & Robb, K. A. (2021). Mental health and well-being during the COVID-19 pandemic: Longitudinal analyses of adults in the UK COVID-19 Mental Health & Wellbeing study. *Br J Psychiatry*, 218(6), 326–333. <https://doi.org/10.1192/bjp.2020.212>
- Pan, K. Y., Kok, A. A. L., Eikelenboom, M., Horsfall, M., Jörg, F., Luteijn, R. A., Rhebergen, D., Oppen, P. V., Giltay, E. J., & Penninx, B. (2021). The mental health impact of the COVID-19 pandemic on people with and without depressive, anxiety, or obsessive-compulsive disorders: A longitudinal study of three Dutch case-control cohorts. *Lancet Psychiatry*, 8(2), 121–129. [https://doi.org/10.1016/S2215-0366\(20\)30491-0](https://doi.org/10.1016/S2215-0366(20)30491-0)
- Pierce, M., Hope, H., Ford, T., Hatch, S., Hotopf, M., John, A., Kontopantelis, E., Webb, R., Wessely, S., McManus, S., & Abel, K. M. (2020). Mental health before and during the COVID-19 pandemic: A longitudinal probability sample survey of the UK population. *Lancet Psychiatry*, 7(10), 883–892. [https://doi.org/10.1016/S2215-0366\(20\)30308-4](https://doi.org/10.1016/S2215-0366(20)30308-4)
- Pinkham, A. E., Ackerman, R. A., Depp, C. A., Harvey, P. D., & Moore, R. C. (2020). A Longitudinal Investigation of the Effects of the COVID-19 Pandemic on the Mental Health of Individuals with Pre-existing Severe Mental Illnesses. *Psychiatry Res*, 294, 113493. <https://doi.org/10.1016/j.psychres.2020.113493>
- Reme, B.-A., Wörn, J., & Skirbekk, V. (2022). Longitudinal evidence on the development of socioeconomic inequalities in mental health due to the COVID-19 pandemic in Norway. *Sci Rep*, 12(1), 3837. <https://doi.org/10.1038/s41598-022-06616-7>
- Robles-Bello, M. A., Sánchez-Teruel, D., & Valencia Naranjo, N., & Robles-Bello MA, Sánchez-Teruel D, Valencia Naranjo N. (2022). Variables protecting mental health in the Spanish population affected by the COVID-19 pandemic. *Current Psychology*, 41(8), 5640–5651. <https://doi.org/10.1007/s12144-020-01132-1>
- Rodríguez-Rey, R., Garrido-Hernansaiz, H., & Collado, S. (2020). Psychological impact of COVID-19 in Spain: Early data report. *Psychol Trauma*, 12(5), 550–552. <https://doi.org/10.1037/tra0000943>
- Rossi, R., Soccì, V., Talevi, D., Mensi, S., Niolu, C., Pacitti, F., Di Marco, A., Rossi, A., Siracusano, A., & Di Lorenzo, G. (2020). COVID-19 Pandemic and Lockdown Measures Impact on Mental Health Among the General Population in Italy. *Front Psychiatry*, 11, 790. <https://doi.org/10.3389/fpsy.2020.00790>
- Sánchez-Teruel, D., Robles-Bello, M. A., Lara-Cabrera, M., & Valencia-Naranjo, N., & Sánchez-Teruel D, Robles-Bello MA, Lara-Cabrera M, Valencia-Naranjo N. (2022). Gender implications of the Fear of COVID-19

- Scale in the Spanish population: A validation study. *Psychol Trauma*, 14(2), 258–265. <https://doi.org/10.1037/tra0001062>
- Sánchez-Teruel, D., Robles-Bello, M. A., Sarhani-Robles, M., & Sarhani-Robles, A. (2021). Exploring resilience and well-being of family caregivers of people with dementia exposed to mandatory social isolation by COVID-19. *Dementia*, 21(2), 410–425. <https://doi.org/10.1177/14713012211042187>
- Sánchez-Teruel, D., Robles-Bello, M. A., & Valencia-Naranjo, N., & Sánchez-Teruel D, Robles-Bello MA, Valencia-Naranjo N. (2021). Do psychological strengths protect college students confined by COVID-19 to emotional distress? The role of gender. *Pers Individ Dif*, 171, 110507. <https://doi.org/10.1016/j.paid.2020.110507>
- Spitzer, R. L., Kroenke, K., Williams, J. B., & Lowe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Arch Intern Med*, 166(10), 1092–1097. <https://doi.org/10.1001/archinte.166.10.1092>
- Sun, L., Sun, Z., Wu, L., Zhu, Z., Zhang, F., Shang, Z., Jia, Y., Gu, J., Zhou, Y., Wang, Y., Liu, N., & Liu, W. (2021). Prevalence and risk factors for acute posttraumatic stress disorder during the COVID-19 outbreak. *J Affect Disord*, 283, :123–129. <https://doi.org/10.1016/j.jad.2021.01.050>
- Unnarsdóttir, A. B., Lovik, A., Fawns-Ritchie, C., Ask, H., Köiv, K., Hagen, K., Didriksen, M., Christoffersen, L. A. N., Garðarsson, A. B., McIntosh, A., Kähler, A. K., Campbell, A., Hauksdóttir, A., Erikstrup, C., Mikkelsen, D. H., Altschul, D., Thordardóttir, E. B., Frans, E. M., Kvale, G., ... Valdimarsdóttir, U. A. (2022). Cohort Profile: COVIDMENT: COVID-19 cohorts on mental health across six nations. *Int J Epidemiol*, 51(3), e108–e122. e108-e122. <https://doi.org/10.1093/ije/dyab234>.
- Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., & Ho, R. C. (2020). Immediate Psychological Responses and Associated Factors during the Initial Stage of the 2019 Coronavirus Disease (COVID-19) Epidemic among the General Population in China. *Int J Environ Res Public Health*, 17(5). <https://doi.org/10.3390/ijerph17051729>
- Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., McIntyre, R. S., Chao, F. N., Tran, B., Ho, R., Sharma, V. K., & Ho, C. (2020). A longitudinal study on the mental health of general population during the COVID-19 epidemic in China. *Brain Behav Immun*, 87, :40–48. <https://doi.org/10.1016/j.bbi.2020.04.028>
- Wright, L., Steptoe, A., & Fancourt, D. (2020). How are adversities during COVID-19 affecting mental health? Differential associations for worries and experiences and implications for policy. *medRxiv*, 2020:2020.2005.2014.20101717. <https://doi.org/10.1101/2020.05.14.20101717>
- Yao, H., Chen, J. H., & Xu, Y. F. (2020). Patients with mental health disorders in the COVID-19 epidemic. *Lancet Psychiatry*, 7(4), e21. [https://doi.org/10.1016/S2215-0366\(20\)30090-0](https://doi.org/10.1016/S2215-0366(20)30090-0)



© 2023 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license.

You are free to:

Share — copy and redistribute the material in any medium or format.

Adapt — remix, transform, and build upon the material for any purpose, even commercially.

The licensor cannot revoke these freedoms as long as you follow the license terms.

Under the following terms:

Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made.

You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

No additional restrictions

You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.



Cogent Psychology (ISSN: 2331-1908) is published by Cogent OA, part of Taylor & Francis Group.

Publishing with Cogent OA ensures:

- Immediate, universal access to your article on publication
- High visibility and discoverability via the Cogent OA website as well as Taylor & Francis Online
- Download and citation statistics for your article
- Rapid online publication
- Input from, and dialog with, expert editors and editorial boards
- Retention of full copyright of your article
- Guaranteed legacy preservation of your article
- Discounts and waivers for authors in developing regions

Submit your manuscript to a Cogent OA journal at www.CogentOA.com

