This is a repository copy of *Mental health during COVID-19 lockdown in the United Kingdom*.

White Rose Research Online URL for this paper:
https://eprints.whiterose.ac.uk/181476/

Version: Accepted Version

Article:
Pieh, C., Budimir, S., Delgadillo, J. orcid.org/0000-0001-5349-230X et al. (3 more authors) (2021) Mental health during COVID-19 lockdown in the United Kingdom. Psychosomatic Medicine, 83 (4). pp. 328-337. ISSN 0033-3174

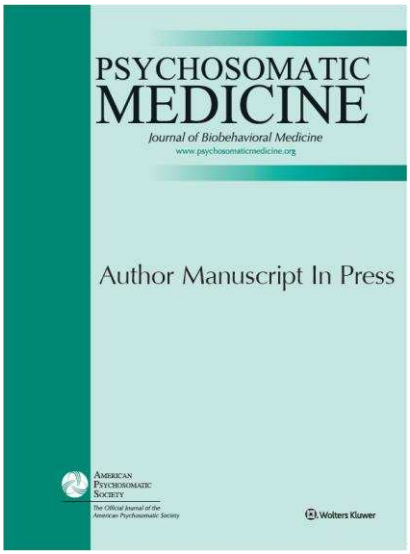
https://doi.org/10.1097/psy.0000000000000871

© 2020 American Psychosomatic Society. This is an author-produced version of a paper subsequently published in Psychosomatic Medicine. Uploaded in accordance with the publisher's self-archiving policy. This version is distributed under the terms of the Creative Commons Attribution-NonCommercial Licence (http://creativecommons.org/licenses/by-nc/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. You may not use the material for commercial purposes.

Reuse
This article is distributed under the terms of the Creative Commons Attribution-NonCommercial (CC BY-NC) licence. This licence allows you to remix, tweak, and build upon this work non-commercially, and any new works must also acknowledge the authors and be non-commercial. You don't have to license any derivative works on the same terms. More information and the full terms of the licence here:
https://creativecommons.org/licenses/

Takedown
If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.

eprints@whiterose.ac.uk
https://eprints.whiterose.ac.uk/



Psychosomatic Medicine
Author's Accepted Manuscript

Article Title: Mental health during COVID-19 lockdown in the United Kingdom

Authors: Christoph Pieh, Sanja Budimir, Jaime Delgadillo, Michael Barkham, Johnny R. J. Fontaine, and Thomas Probst

DOI: 10.1097/PSY.0000000000000871

Received Date: May 17, 2020
Revised Date: July 27, 2020

ACCEPTED

This manuscript has been accepted by the editors of *Psychosomatic Medicine*, but it has not yet been copy-edited; information within these pages is therefore subject to change. During the copy-editing and production phases, language usage and any textual errors will be corrected, and pages will be composed into their final format.

Please visit the journal's website (www.psychosomaticmedicine.org) to check for a final version of the article.

When citing this article, please use the following: *Psychosomatic Medicine* (in press) and include the article's digital object identifier (DOI).

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

Psychosomatic Medicine Publish Ahead of Print
DOI: 10.1097/PSY.0000000000000871

Mental health during COVID-19 lockdown in the United Kingdom

Christoph Pieh, M.D.[1], Sanja Budimir, PhD[1,3], Jaime Delgadillo, PhD[2], Michael Barkham, PhD[2], Johnny R. J. Fontaine, PhD[3], & Thomas Probst, PhD[1]

[1] Department for Psychotherapy and Biopsychosocial Health, Danube University Krems, Austria

[2] Clinical Psychology Unit, Department of Psychology, University of Sheffield, United Kingdom

[3]Department of Work, Organization and Society, Ghent University, Belgium

Corresponding Author

Prof. Dr. Christoph Pieh, M.D.

Department for Psychotherapy and Biopsychosocial Health

Danube University Krems

Austria

E-Mail: Christoph.pieh@donau-uni.ac.at

Phone: +436502000425

Funding: No funding.

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

Abstract

Objective: The Coronavirus Disease (COVID-19) pandemic and related lockdown measures have raised important questions about the impact on mental health. This study evaluated several mental health and well-being indicators in a large sample from the United Kingdom (UK) during the COVID-19 lockdown where the death rate is currently the highest in Europe.

Methods: A cross-sectional online survey with a study sample that mirrors general population norms according to sex, age, education, and region was launched four weeks after lockdown measures were implemented in the UK. Measures included mental health-related quality of life (WHO-QOL BREF psychological domain), well-being (WHO-5), depression (PHQ-9), anxiety (GAD-7), perceived stress (PSS-10), and insomnia (ISI). ANOVAs, Bonferroni-corrected post-hoc tests, and t-tests were applied to examine mental health indicators across different sociodemographic groups (age, sex, employment, income, physical activity, relationship status).

Results: The sample comprised N=1,006 respondents (54% women) from all regions of the UK. Approximately 52% of respondents screened positive for a common mental disorder, and 28% screened positive for clinical insomnia. Mean scores and standard deviations were as follows: PHQ-9: M=9.0±7.7; GAD-7: M=8.0±6.5; ISI: M=10.4±7.0; PSS-10: M=17.7±7.9; WHO-QOL BREF: M=58.6±21.4; WHO-5 score M=13.0±6.0. Statistical analyses consistently indicated more severe mental health problems in adults under 35 years, women, people with no work, and low income (all p-values <.05). Mental health indices also varied across UK regions.

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

Conclusions: The prevalence of depressive-, anxiety-, and insomnia symptoms is significantly higher in the UK, relative to pre-pandemic epidemiological data. Further studies are needed to clarify the causes for these high rates of mental health symptoms.

Keywords: Mental health, depression, anxiety, insomnia, UK, COVID-19

Abbreviations: PHQ-9: Patient Health Questionnaire; GAD-7: Generalized Anxiety Disorder 7 scale; ISI: Insomnia Severity Index; WHO-QOL BREF**:** World Health Organization *Quality-of-life* (psychological domain) brief version; WHO-5: World Health Organization *Well-Being Index*

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

Introduction

The Coronavirus disease 2019 (COVID-19) has spread quickly throughout the world. (1) In Europe alone, there are currently (3th of May 2020 at 10:00 CET) around 1.5 million confirmed COVID-19 cases and around 140,000 confirmed deaths. (2) In the UK, data released by the Office for National Statistics showed that 29,648 deaths registered in England and Wales with COVID-19 mentioned on the death certificate by 2nd of May. With the addition of the official death figures for Scotland and Northern Ireland, this was calculated to take the UK's toll to 32,313 (3), a figure viewed as the highest in Europe. The true figure is likely to be significantly higher due to missed cases and a lag in reporting.

As COVID-19 spreads easily between people who are in close contact (1), most governments have implemented restrictions to prevent the uncontrolled spread of the virus. Although social distancing and other measures such as the use of personal protective equipment could help to contain the uncontrolled spreading of COVID-19 (1), they might negatively affect mental health. (4)

There is a rapidly increasing number of publications on mental health during the COVID-19 pandemic. Many of them are commentaries about poor mental health due to COVID-19. (5) It is highly likely that many individuals feel stressed and worried in times of pandemics, with fears of falling ill or dying, being socially excluded in quarantine, or losing their income. Although such reactions may not necessarily impair functioning or general well-being, it is not clear to what extent such circumstances precipitate severe symptoms of mental disorders that warrant clinical care.

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

There is an increasing number of studies examining the effect of the COVID-19 pandemic on mental health, initially from Asian and European countries, and now also from other regions worldwide. Some of these have been published in scientific journals, and some have not been peer reviewed. Four observational studies on mental health in China have been reviewed recently and results showed anxiety and depression symptoms (16–28%) as well as stress-levels (8%) being common mental health problems during COVID-19. (6) In Japan, a representative population survey reported poorer mental health indicators in young and middle-aged individuals (relative to older people), as well as in unemployed individuals. (7) In India, high scores for depression, anxiety, and stress were also found, especially in younger adults. (8)

Findings from European countries appear to be generally consistent in identifying sociodemographic and lifestyle-related risk factors. An Italian survey found that poor mental health indicators were particularly acute in women and younger people. (9) A Portuguese study examining protective lifestyle factors indicated that people who were able to work, those who exercised frequently, and those without previous psychological or physical health problems had relatively better well-being indicators. (10) Cross-sectional surveys conducted in the UK in the early phase of the lockdown indicate that quarantine measures were associated with poor mental health, well-being and quality of life, especially in younger people, those with children at home, and those with pre-existing health problems. (11,12)

According to the World Health Organization (WHO) COVID-19 official information, the United Kingdom (UK) is among the most affected countries in Europe. (2) The aim of the

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

current study was to evaluate a broad set of mental health and well-being indicators in a representative UK adult sample, measured during the acute phase of the pandemic and four-weeks after the imposition of lockdown (quarantine) measures. Relevant sociodemographic confounders were also measured, such as sex, age, job situation, income, physical activity, and relationship status.

Methods

Study design

A cross-sectional online survey was designed to recruit a UK study sample that mirrored general population norms according to sex, age, education, and region. The survey was launched using the Qualtrics® population survey platform, measuring several mental health and well-being indicators during the COVID-19 lockdown. Data collection started four-weeks after quarantine measures were implemented in the UK, and data were collected until the point where a sample was obtained with a minimum sample size of N=1,000, which was specified *a priori*. Participants were contacted by the project team who organized and coordinated data collection. As part of the scoping process, Qualtrics implemented age, sex, educational, and regional quotas based on UK population census data. Overall, the target sample was attained within ten days, after which the survey closed. COVID-19 lockdown was officially implemented in the UK on 24th of March 2020, and the survey started on 21st of April 2020.

Ethical considerations

This study was conducted in accordance with the Declaration of Helsinki and approved by to the Ethics Committee of the Danube University Krems (approval code: EK GZ 26/2018-2021*)*. All

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

participants gave electronic informed consent for participation and before completing the questionnaires. Data were collected anonymously without IP addresses or GPS tracking, and this procedure was approved by the data protection officer of the Danube-University Krems, Austria.

Governmental restrictions during the survey

In the UK, COVID-19 social distancing measures became obligatory on 24th of March 2020. The UK population was required to adhere to quarantine with only the following exceptions justifying leaving the house: shopping for food and other necessities; exercising alone or with someone from the same household; for medical reasons including providing care to others; and traveling to and from work.

Study sample

In total, we collected data for N=1,006 participants across all regions of the UK, yielding a study sample that reflected general population norms according to sex, age, education, and region, as described above. Demographic characteristics of the study sample are presented in Table 1.

Measures

Quality of Life

The WHOQOL-BREF provides a reliable, valid, and brief assessment of quality-of-life. (13) The 26 items self-rating questionnaire measures physical health, psychological health, social relationships, and environment during the past two weeks. Only the psychological domain (6 items) was used in the present study as an indicator of mental quality of life. The general

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

population norm for the WHOQOL-BREF psychological domain has been reported to be 70.6 (14.0). (14) Cronbach's alpha for the psychological domain was α = .88 in the current sample.

Well-being

Well-being was measured with the WHO-5 Well-Being Index, which measures subjective psychological well-being within the last two weeks, using five self-rating items on six-point Likert scales; a higher score indicates better well-being (Example item: "*I have felt active and vigorous"*). The WHO-5 has well-established reliability and validity. (15) The raw score can range from 0 (absence of well-being) to 25 (maximal well-being). Cronbach's alpha was α = .91 in the current sample.

Perceived stress

Perceived stress (i.e., the subjective perception of the stress-level) was measured with the PSS-10, which includes 10 items on a five-point scale ranging from 0-4. (16) Participants are asked to rate their stress-level over the last month (Example item: "*In the last month, how often have you felt nervous and 'stressed'"?*). The PSS-10 is a reliable and valid tool measure stress-level. Cronbach's alpha was .88 in the current sample.

Depressive symptoms

Depressive symptoms were measured with the depression module of the Patient Health Questionnaire, the PHQ-9. (17) This validated screening tool for depression has 9 self-rating items on a four-point scale, scored from 0 to 3, which yields a total severity score between 0 and 27. Clinical cut-off points are 5 for mild depression, 10 for moderate depression and at least 15

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

for moderate to severe depression. The 10-point cut-off score was used in the present study to define clinically relevant depressive symptoms. Cronbach's alpha was $\alpha = .94$ in the current sample.

Anxiety symptoms

Anxiety symptoms were measured with the Generalized Anxiety Disorder 7 scale (GAD-7). (18) This validated screening tool for anxiety has 7 self-rating items on a four-point scale, from 0 to 3, yielding a total anxiety severity score between 0 and 21. Clinical cut-off points are 5 for mild, 10 for moderate and 15 for severe anxiety symptom levels. The 10-point cut-off score was used in the present study to define clinically relevant anxiety. Cronbach's alpha was $\alpha = .95$ in the current sample.

Insomnia

The Insomnia Severity Index (ISI) is a validated 7-item self-report scale with a five-point scale (from 0 to 4) measuring sleep quality and insomnia. (19) Symptom severity categories are: no clinically significant insomnia (0 – 7 points), subthreshold insomnia (8 – 14 points), clinical insomnia (moderate severity) (15 – 21 points), and clinical insomnia (severe) (22 – 28 points). The cut-off score of ≥ 15 was used to define moderate (i. e., clinically relevant) insomnia in this study. Cronbach's alpha was $\alpha = .91$ in the current sample.

Sex, age group, employment, income, relationship status and region

Participants had to self-report their sex, age group (18-24; 25-34; 35-44; 45-54; 55-64; 65+ years), if they were in paid employment during the lockdown restrictions (No, and did not before

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

the lockdown either; No, but before the lockdown I did; Yes, in Home-Office; Yes, as before at my workplace (not in my Home Office); Yes, but I've been put on reduced hours; I am retired), the net monthly income in their household (< GBP 900,-; GBP 900,- to GBP 1,800,-; GBP 1,800,- to GBP 2,700,-; GBP 2,700,- to GBP 3,600,-; > GBP 3,600,-), physical activity in the last 7 days (0; 1; 2; 3; 4 or more days), relationship status (category 1 including being single, separated, divorced and widowed; category 2 including married and living as married), and region (North East; North West; Yorkshire & Humber; East Midlands; West Midlands; East of England; London; South East; South West; Wales, Scotland; Northern Ireland).

Statistical analysis

Descriptive statistics were computed for the demographic characteristics and mental health scales. Based on the literature, we applied the cut-off ≥ 10 to examine the proportion of cases with clinically relevant depression (PHQ-9) and anxiety (GAD-7) symptoms. In addition, to aid comparability with epidemiological data, the recommended case-finding cut-off scores of PHQ-9 ≥ 10 (17) or/and GAD-7 ≥ 8 (18) were applied to identify the proportion of cases likely to meet diagnostic criteria for any common mental disorder (CMD). The 8-point cut-off (and not the 10-point cut-off) was selected for the GAD-7 to identify likely CMD cases, since it has adequate sensitivity (77%) and specificity (82%). (18) For the PHQ-9, the 10-point cut-off shows adequate sensitivity (88%) and specificity (88%). (17) This approach classified likely CMD cases if they scored above the case-finding threshold in one or both of these measures.

ANOVAs, Bonferroni-corrected post-hoc tests, and t-tests for independent samples were calculated to evaluate differences in mental health indicators, comparing different groups

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

according to sociodemographic and lifestyle variables (sex, age, work situation, income, physical activity, relationship status). For t-tests, between-group effect sizes were calculated with a correction for imbalanced samples (Hedge´s *g*), which can be interpreted as follows: small effect (g = .2 to .5), medium effect ($g \geq .5$ to .8), and large effect ($g \geq .8$). For ANOVAs, η^2 was used for between-group effect sizes, which can be interpreted as follows: small (η^2 = .01 to .06), medium ($\eta^2 \geq .06$ to .14), and large ($\eta^2 \geq .14$). Chi-squared tests were performed to evaluate differences in the distribution of cases across mental health severity categories between different sociodemographic groups. P-values <0.05 were considered statistically significant (2-sided tests). Given the relatively low sample sizes for less densely populated regions of the UK, regional differences were not statistically tested, but the variability in indices of mental health across regions was summarized and examined visually using heat maps.

All data were analyzed using SPSS version 24.

Results

Sample characteristics are presented in Table 1.

- Table 1-

The statistical distributions of mental health and well-being indices in the study sample are presented in Tables 2–7. These Tables also report statistical comparisons in mental health indices according to sex (Table 2), age (Table 3), work situation (Table 4), income (Table 5), physical

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

activity (Table 6), and relationship status (Table 7). The results of between-group comparisons are summarized below.

Demographics

The effect of sex was significant for all indicators of mental health, indicating that women were more burdened than men ($p<.05$).

- Table 2-

In addition, the effect of age was significant for all indicators ($p<.001$), as shown in Table 3. Bonferroni-corrected post-hoc tests (Table S1, Supplemental Digital Content, http://links.lww.com/PSYMED/A689) showed that younger individuals were most burdened and those aged 65+ years were least burdened ($p<.05$).

- Table 3-

Work and income

As is shown in Table 4, the associations with work were significant for all indicators of mental health ($p<.001$). According to Bonferroni-corrected post-hoc tests (Table S2, Supplemental Digital Content, http://links.lww.com/PSYMED/A689), retired individuals were least burdened ($p<.05$).

- Table 4-

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

Table 5 shows that the associations of income with depression and anxiety symptom severity categories were not significant (p>.05), but significant associations were found between income with insomnia severity categories and all continuous scales used to measure mental health (p<.05). According to Bonferroni-corrected post-hoc tests (Table S3, Supplemental Digital Content, http://links.lww.com/PSYMED/A689), less income was related to worse overall mental health (p<.05).

- Table 5 -

Social and lifestyle factors

Physical activity was significantly associated with all symptom severity categories (all p values <.05) (Table 6). Physical activity was also significantly related to all continuous scales used to measure mental health (p≤.001), except for anxiety and stress (p>.05). According to Bonferroni-corrected post-hoc tests (Table S4, Supplemental Digital Content, http://links.lww.com/PSYMED/A689), more physical activity was related to better mental health (p<.05).

- Table 6 -

Table 7 shows that relationship status was significantly associated with depression and anxiety symptom severity categories (p<.01), but not with insomnia symptom severity categories (p>.05). Relationship status was also significantly associated with all mental health scale scores

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

(p<.01) except for insomnia (p>.05). Those married or living as married had better mental health than those who were not married or not living as married (including single, separated, divorced and widowed respondents).

- Table 7-

Regional variations

A heat map showing mean depression symptom scores (and standard deviations) for each UK region is presented in Figure 1. The severity of depression varied across regions, with the lowest indices in the south west, and the highest indices in the south east, north east and Wales. Visual inspections for other indices of mental health were largely consistent with the findings observed for depression.

- Figure 1 -

Discussion

The prevalence of depression, anxiety, and insomnia symptoms is significantly higher in the UK, relative to pre-pandemic epidemiological data. The present study indicates that the point-prevalence of respondents meeting threshold for any common mental disorder (PHQ-9 ≥ 10 and/or GAD-7 ≥ 8) in the acute phase of COVID-19 is 52%, albeit using self-rated questionnaires rather than diagnostic interviews. In contrast, the prevalence of UK adults meeting diagnostic threshold for any common mental disorder before COVID-19 was ~17%, and this is a stable estimate relative to earlier epidemiological surveys that used structured diagnostic

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

interviews. (20). If we compare our results to other UK studies that used self-rated screening tools, earlier pre-pandemic samples report a point-prevalence of anxiety or depression symptoms of around 20% for respondents aged 16 or older. (21).

Regarding depression specifically, a previous study on individuals aged 15 or older using a self-rated screening tool reported a depression prevalence rate of 7% in the UK. (22) In contrast, 41% of the present study sample showed clinically relevant depressive symptoms (PHQ-9 $\geq$ 10) and 39% showed clinically relevant anxiety symptoms (GAD-7 $\geq$ 10). This is much higher than available pre-pandemic general population data in Europe (anxiety disorders: 14%; major depression: 6.9%). (23) Furthermore, 28% of the sample scored above the cut-off for clinical insomnia (moderate severity) on the ISI. According to a meta-analysis, the pre-pandemic prevalence of insomnia in Europe was around 7%. (23) For the sample as a whole, the average PHQ-9 and GAD-7 scores of 9.0 and 8.0 respectively approximate the cut-offs for clinically relevant depression and anxiety symptoms respectively, and average insomnia symptoms are already above the cut-off for sub-threshold insomnia.

The psychological health score (58.6) on the WHO-QOL BREF questionnaire was below the norm value of 70.6 reported by Hawthorne and colleagues. (14) Similarly, with a score of 13, well-being (WHO-5) was lower compared to a previous study from Denmark showing converted scores of 17. (24) The stress-level (18) was higher compared to a previous study reported scores of 13 for a representative sample (not UK but Germany) by Klein and colleagues. (25)

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

To our knowledge, two previous UK surveys have been published as pre-print reports. The study by Shevlin et al. surveyed a general population sample using the same mental health measures (PHQ-9, GAD-7) during the earliest phase of the pandemic, reporting a point-prevalence of 22.1% clinically relevant depression and 21.6% anxiety cases respectively. (11) Relative to these figures, the present study indicates that mental health indicators worsened over time, as the pandemic progressed into the acute phase four-weeks after lockdown. This corresponds to findings of a review that mental health is affected more when restrictions last longer. (4) The study by White and Van der Boor used a different measure (Hospital Anxiety and Depression Scale), so direct comparison is not possible, but their results also indicated that mean levels of depression and anxiety symptoms during the COVID-19 pandemic were elevated relative to available pre-pandemic normative data. (12) Overall, data emerging from the UK consistently indicate that the mental health of the general population during the COVID-19 pandemic was considerably poorer relative to available pre-pandemic indicators, and it appears that it has gradually deteriorated over the first four weeks since the implementation of lockdown measures.

There was a clear age-related effect in all tested mental health scales. These results are noteworthy and warrant more detailed consideration. For each aspect of mental health, the younger adult groups showed the worst scores and the older people the best. This is, perhaps, surprising in the context of COVID-19, since older people are more seriously physically threatened by COVID-19. Although the PHQ-9 is generally stable throughout all periods of adulthood, (26) two-thirds (63%) of people aged between 18 and 24 years showed depressive symptoms, compared to 11.5% in the age group 65+. Similarly, rates of anxiety symptoms are

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

59% in the age group from 18 to 24 vs. 12% in the group 65+. For insomnia symptoms there is also a decrease in the course of life, from 35% (age 18-24) to 13% (age 65+). Accordingly, the youngest age group (18 - 24) showed the lowest scores in psychological well-being. The differences are very marked; 47 vs. 71 (in the 65+ group). The same was observed with the WHO-5 questionnaire (11 vs. 15). In essence, older adults seem to be handling this exceptional situation better than younger ones. Possible explanations for these findings include more uncertain working conditions and therefore more serious financial problems for younger people, but also the impact of the lockdown on freedom of movement is likely to have a greater immediate impact for the lifestyle of younger people. In addition, older people may have a context of growing up in post-war years that made the current situation more familiar. But whatever the reasons, these results seem robust and are in line with several studies in other countries such as China, Japan, Italy, and Portugal. For the UK, this age effect has also been reported in the survey by Shevlin et al. during the earliest phase of the COVID-19 pandemic. (11)

Besides age, sex also shows an impact on mental health. Women scored worse in every tested scale compared to men. For example, 46.7% of women scored above the PHQ-9 cut-off greater-equal 10 points for depressive symptoms and 34.6% of men (35% more burden in women). Pre-pandemic values for the UK were 8.6% for women and 6.1% for men (41% more burden in women). (22) These results are in line with previous studies; sex differences in mental health are among the most intriguing and stable findings in psychiatry. (27)

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

Our results indicate that unemployed and low-income respondents had poorer mental health, and regional variations in the severity of depression were consistent with known regional variations in socioeconomic deprivation. These results are in line with previous findings on socioeconomic deprivation and mental health. People with mild to moderate mental illness, such as anxiety or depression, are twice as likely to be unemployed. (28) Unemployment rates for people with a severe mental disorder are five times as high as for people without a mental disorder. (28) In addition, the relationship status showed an expected effect due to social isolation. A recent review showed that relationship or marriage improves mental health. (29) Associations between physical activity and mental health have often been reported. (30)

The present results should be interpreted in the context of some limitations. First, the cross-sectional design allows no causal conclusions. A baseline stage immediately before the implementation of lockdown measures would have been a better control to study changes in mental health, but of course the spread of the pandemic was unforeseen – a 'black swan' event – so the circumstances require us to learn from limited available data and prior normative samples. Furthermore, we aimed to recruit a representative study sample according to age, sex, education, and region. However, the study sample was not entirely representative for combinations of these variables (e.g., age interlocked with sex). Thus, it is uncertain if our study sample is representative of the general population and if the results are generalizable. Moreover, the online survey was based entirely on self-rated questionnaires. Although valid and widely used, people are often biased when they report on their own experiences, and screening questionnaires can overestimate prevalence of mental disorders relative to structured diagnostic interviews. Higher values in levels of neuroticism or other background variables associated with negative affect

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

could have an impact on our results and we did not have data to adjust for these variables. Although we employed a representative sample according to region, the sample size limitations did not permit more fine-grained statistical investigations across different regions of the UK. We also cannot rule out that more seriously affected older adults were less likely to participate.

This study examined a broad range of mental health and well-being indicators during the acute phase of the COVID-19 pandemic four-weeks after lockdown. According to this evidence, the pandemic and associated lockdown restrictions had a major impact on mental health in the UK. In conclusion, self-reported mental health problems are higher and psychological well-being and quality of life is lower compared to pre-epidemiological data in the general population. It remains, however, unclear how similar these previous samples are in comparison to the sample of the current study.

Although the long-term effects of the pandemic cannot be estimated at this time, the short-term effect of the COVID-19 pandemic and the lockdown is likely to place a considerable burden on the mental health of many people. The lockdown is a major burden especially for younger adults, where almost two-thirds suffer from depressive or anxiety symptoms. Furthermore, younger people, women, the unemployed and those with low income appear to be more severely burdened. Access to psychological support, especially for the most burdened groups should be widely accessible to counteract this development.

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

Authors' contribution:

C.P. drafted the manuscript and contributed to the study design; S.B. revised the manuscript, performed statistical analyses, and contributed to the study design; J.D. revised the manuscript, performed statistical analyses, and contributed by interpreting the results; M.B. revised the manuscript and contributed by interpreting the results; J.F. revised the manuscript and contributed by interpreting the results; T.P. revised the manuscript, performed statistical analyses, and contributed to the study design.

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

References

1. Nussbaumer-Streit B, Mayr V, Dobrescu AI, Chapman A, Persad E, Klerings I, Wagner G, Siebert U, Christof C, Zachariah C, Gartlehner G. Quarantine alone or in combination with other public health measures to control COVID-19: a rapid review. Cochrane Database Syst Rev 2020; 2020: CD013574. DOI:10.1002/14651858.CD013574.
2. WHOEurope. COVID-19 situation in the WHO European Region. WHO Maps Arcgis. 2020. https://who.maps.arcgis.com/apps/opsdashboard/index.html#/ead3c6475654481ca51c248d52ab9c61
3. Office for National Statistics. Comparison of weekly death occurrences in England and Wales: up to week ending 24 April 2020. https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/articles/comparisonofweeklydeathoccurrencesinenglandandwales/latest
4. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, Rubin GJ.. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. The Lancet 2020; 395: 912–20. DOI: 1016/S0140-6736(20)30460-8
5. Pfefferbaum B, North CS. Mental health and the COVID-19 pandemic. N Engl J Med 2020; epub ahead of print. DOI: 10.1056/NEJMp2008017
6. Rajkumar RP. COVID-19 and mental health: a review of the existing literature. Asian J Psychiatr. 2020;52:102066. DOI:10.1016/j.ajp.2020.102066
7. Ueda M, Stickley A, Sueki H, Matsubayashi T. Mental health status of the general population during the COVID-19 pandemic: a cross-sectional national survey in Japan. medRxiv 2020.04.28.20082453. DOI:10.1101/2020.04.28.20082453

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

8. Kazmi SSH, Hasan K, Talib S, Saxena S. COVID-19 and lockdown: a study on the impact on mental health. SSRN Electron J 2020. DOI: 10.2139/ssrn.3577515

9. Rossi R, Socci V, Talevi D, Mensi S, Niolu C, Pacitti F, Di Marco A, Rossi A, Siracusano A, Di Lorenzo G. COVID-19 pandemic and lockdown measures impact on mental health among the general population in Italy. An N=18147 web-based survey. medRxiv 2020.04.09.20057802. DOI:10.1101/2020.04.09.20057802

10. Moreira PS, Ferreira S, Couto B, Machado-Sousa M, Fernandez M, Raposo-Lima C, Sousa N, Pico-Perez M, Morgado P. Protective elements of mental health status during the COVID-19 outbreak in the Portuguese population. medRxiv 2020.04.28.20080671. DOI:10.1101/2020.04.28.20080671

11. Shevlin M, McBride O, Murphy J, Gibson Miller J, Hartman TK, Levita L, Mason L, Martinez AP, McKay R, Stocks TV, Bennett KM, Hyland P, Karatzias T, Bentall R. Anxiety, depression, traumatic stress, and COVID-19 related anxiety in the UK general population during the COVID-19 pandemic. PsyArXiv 2020 DOI:10.31234/osf.io/hb6nq

12. White RG, Van Der Boor C. The impact of the COVID19 pandemic and initial period of lockdown on the mental health and wellbeing of UK adults. medRxiv 2020.04.24.20078550. DOI:10.1101/2020.04.24.20078550.

13. Skevington SM, Lotfy M, O'Connell KA. The World Health Organization's WHOQOL-BREF quality of life assessment: psychometric properties and results of the international field trial. a report from the WHOQOL group. Qual Life Res 2004; 13: 299–310. DOI: 10.1023/B:QURE.0000018486.91360.00

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

14. Hawthorne G, Herrman H, Murphy B. Interpreting the WHOQOL-Brèf: preliminary population norms and effect sizes. Soc Indic Res 2006; 77: 37–59. DOI: 10.1007/s11205-005-5552-1

15. Topp CW, Østergaard SD, Søndergaard S, Bech P. The WHO-5 Well-Being Index: a systematic review of the literature. Psychother Psychosom 2015; 84: 167–76. DOI: 10.1159/000376585

16. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health Soc Behav 1983; 24: 385–96. DOI: 10.2307/2136404

17. Kroenke K, Spitzer RL. The PHQ-9: a new depression diagnostic and severity measure. Psychiatr Ann 2002; 32: 509–15. DOI: 10.3928/0048-5713-20020901-06

18. Kroenke K, Spitzer RL, Williams JBW, Monahan PO, Löwe B. Anxiety disorders in primary care: prevalence, impairment, comorbidity, and detection. Ann Intern Med 2007; 146: 317-25. DOI: 10.7326/0003-4819-146-5-200703060-00004

19. Morin CM, Belleville G, Bélanger L, Ivers H. The Insomnia Severity Index: psychometric indicators to detect insomnia cases and evaluate treatment response. Sleep 2011; 34: 601–8. DOI: 10.1093/sleep/34.5.601

20. McManus S, Bebbington P, Jenkins R, Brugha T, NHS Digital, UK Statistics Authority. Mental health and wellbeing in England: Adult Psychiatric Morbidity Survey 2014 : a survey carried out for NHS Digital by NatCen Social Research and the Department of Health Sciences, University of Leicester 2016.

21. Evans J, Macrory I, Randall C. Measuring national well-being: life in the UK: 2016. Office for National Statistics 2016.

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/articles/measuringnationalwellbeing/2016#how-good-is-our-health

22. Hapke U, Cohrdes C, Nübel J. Depressive symptoms in a European comparison – Results from the European Health Interview Survey (EHIS) 2. Journal of Health Monitoring 2019; 4: 57-65. DOI: 10.25646/6227

23. Wittchen HU, Jacobi F, Rehm J, Gustavsson A, Svensson M, Jönsson B, Olesen J, Allgulander C, Alonso J, Faravelli C, Fratiglioni L, Jennum P, Lieb R, Maercker A, van Os J, Preisig M, Salvador-Carulla L, Simon R, Steinhausen H-C. The size and burden of mental disorders and other disorders of the brain in Europe 2010. Eur Neuropsychopharmacol 2011; 21: 655–79. DOI: 10.1016/j.euroneuro.2011.07.018

24. Bech P, Olsen LR, Kjoller M, Rasmussen NK. Measuring well-being rather than the absence of distress symptoms: a comparison of the SF-36 Mental Health subscale and the WHO-Five Well-Being Scale. Int J Methods Psychiatr Res 2003; 12: 85-91. doi:10.1002/mpr.145

25. Klein EM, Brähler E, Dreier M, Reinecke L, Müller KW, Schmutzer G, Wölfling K, Beutel ME The German version of the Perceived Stress Scale – psychometric characteristics in a representative German community sample. BMC Psychiatry 2016; 16: 159. DOI: 10.1186/s12888-016-0875-9

26. Tomitaka S, Kawasaki Y, Ide K, Akutagawa M, Ono Y, Furukawa TA. Stability of the distribution of Patient Health Questionnaire-9 scores against age in the general population: data from the National Health and Nutrition Examination Survey. Front Psychiatry 2018; 9: 390. DOI: 10.3389/fpsyt.2018.00390

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

27. Riecher-Rössler A. Sex and gender differences in mental disorders. Lancet Psychiatry 2017; 4: 8–9. DOI: 10.1016/S2215-0366(16)30348-0

28. OECD. Mental health and work: United Kingdom. OECD 2014. DOI:10.1787/9789264204997-en

29. Rapp I, Stauder J. Mental and physical health in couple relationships: is it better to live together? Eur Sociol Rev 2020; 36: 303–16. DOI: 10.1093/esr/jcz047

30. Penedo FJ, Dahn JR. Exercise and well-being: a review of mental and physical health benefits associated with physical activity. Curr Opin Psychiatry 2005; 18: 189-93. DOI: 10.1097/00001504-200503000-00013

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

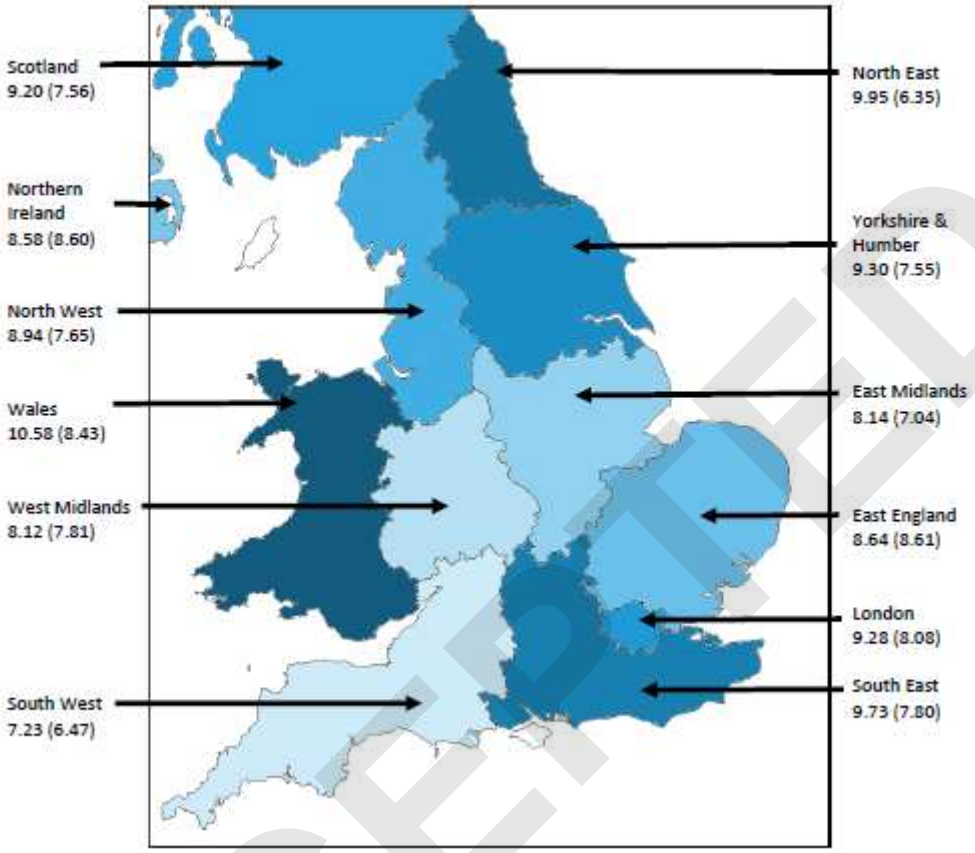
FIGURE CAPTION

Figure 1: Variability in depression severity during the COVID-19 pandemic across UK regions (mean PHQ-9 scores and standard deviation).

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

Figure 1. Heat map of mean depression (PHQ-9) severity during the COVID-19 pandemic across UK regions



ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

Table 1: Study sample characteristics (N=1006).

Variable	n	%
Sex		
Women	544	54.1
Men	462	45.9
Age		
18-24	98	9.7
25-34	203	20.2
35-44	190	18.9
45-54	194	19.3
55-64	173	17.2
65+	148	14.7
Region		
North East	43	4.3
North West	115	11.4
Yorkshire & Humber	84	8.3
East Midlands	76	7.6
West Midlands	92	9.1
East of England	87	8.6
London	114	11.3
South East	144	14.3
South West	88	8.7
Wales	48	4.8
Scotland	89	8.8
Northern Ireland	26	2.6
Education		
Below High school		
· No school	16	1.6
· Elementary school	35	3.5
· Trade/technical/vocational training	143	14.2
High school	405	40.3
Above High school		
· College	129	12.8
· Bachelor's degree	163	16.2
· Master's degree	90	8.9
· Doctoral degree	13	1.3
· Professional degree (MD, JD, etc.)	12	1.2

n: frequencies; %: percent

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

Table 2: Number of participants exceeding the cut-off score for clinically relevant depression/anxiety/insomnia, measures of psychological health, well-being and stress by sex.

	Sex			
	Male	Female	Total	Statistic
PHQ-9 ≥10 n (%)	160 (34.6)	254 (46.7)	414 (41.2)	$\chi^2(1)=15.00$; p<.001
GAD-7 ≥10 **n (%)**	144 (31.2)	248 (45.6)	392 (39.0)	$\chi^2(1)=21.84$; p<.001
ISI ≥15 **n (%)**	116 (25.1)	167 (30.7)	283 (28.1)	$\chi^2(5)=3.86$; p=.049
CMD **n (%)**	199 (43.1)	328 (60.3)	527 (52.4)	$\chi^2(5)=29.70$; p<.001
PHQ-9 M (SD)	7.60 (7.52)	10.09 (7.65)	8.95 (7.69)	t(1004)=-5.19; p<.001; g=.33
GAD-7 M (SD)	6.56 (6.32)	9.28 (6.42)	8.03 (6.52)	t(1004)=-6.74; p<.001; g=.43
ISI M (SD)	9.66 (7.09)	11.08 (6.95)	10.43 (7.04)	t(1004)= -3.21; p=.001; g=.20
WHOQOL BREF psychological domain M (SD)	62.67 (21.34)	55.16 (20.83)	58.61 (21.39)	t(1004)=5.63; p<.001; g=.36
WHO-5 M (SD)	14.03 (6.22)	12.05 (5.62)	12.96 (5.98)	t(1004)=5.29; p<.001; g=.33
PSS-10 M (SD)	15.66 (8.11)	19.45 (7.37)	17.71 (7.94)	t(1004)=-7.77; p<.001; g=.49

p: p-values (2-tailed); n: frequencies; M: mean score; SD: standard deviation, χ^2: Chi-square; F: F-test; ISI: Insomnia Severity Index, GAD-7 (Generalized Anxiety Disorder 7 scale); PHQ-9: Patient Health Questionnaire 9 scale; PSS-10: Perceived Stress Scale 10; WHO-5: Well-being questionnaire of the World Health Organization (WHO); WHO-QOL BREF: Quality of Life questionnaire of the World Health Organization (WHO); CMD: Common mental disorder: Yes if PHQ-9 ≥ 10 AND/OR GAD-7 ≥ 8 vs. No if PHQ-9 < 10 AND GAD-7 < 8.

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

Table 3: Number of participants exceeding the cut-off score for clinically relevant depression/anxiety/insomnia, measures of psychological health, well-being and stress by age.

	Age						Total	Statistic
	18-24	25-34	35-44	45-54	55-64	65+		
PHQ-9 ≥10 n (%)	62 (63.3)	107 (52.7)	99 (52.1)	77 (39.7)	52 (30.1)	17 (11.5)	414 (41.2)	$\chi^2(5)=103.14$; p<.001
GAD-7 ≥10 n (%)	58 (59.2)	99 (48.8)	93 (48.9)	72 (37.1)	52 (30.1)	18 (12.2)	392 (39.0)	$\chi^2(5)=83.77$; p<.001
ISI ≥15 n (%)	34 (34.7)	61 (30.0)	61 (32.1)	64 (33.0)	44 (25.4)	19 (12.8)	283 (28.1)	$\chi^2(5)=23.95$; p<.001
CMD n (%) n (%)	73 (74.5)	127 (62.6)	126 (66.3)	96 (49.5)	74 (42.8)	31 (20.9)	527 (52.4)	$\chi^2(5)=108.12$; p<.001
PHQ-9 M (SD)	13.72 (7.61)	10.99 (7.66)	10.54 (7.56)	8.38 (7.26)	7.21 (7.21)	3.72 (5.07)	8.95 (7.69)	$F(5,1005)=32.04$; p<.001; $\eta^2=.138$
GAD-7 M (SD)	10.94 (6.02)	9.52 (6.42)	9.87 (6.50)	7.60 (6.47)	6.66 (6.19)	3.86 (4.77)	8.03 (6.52)	$F(5,1005)=25.61$; p<.001; $\eta^2=.114$
ISI M (SD)	12.40 (6.56)	11.23 (6.82)	11.38 (6.86)	10.71 (7.55)	10.02 (7.02)	6.91 (6.07)	10.43 (7.04)	$F(5,1005)=10.80$; p<.001; $\eta^2=.051$
WHOQOL BREF psychological domain M (SD)	46.94 (22.12)	56.73 (20.47)	53.86 (20.99)	58.91 (20.39	61.34 (21.41	71.42 (16.79)	58.61 (21.39)	$F(5,1005)=21.15$; p<.001; $\eta^2=.096$
WHO-5 M (SD)	11.39 (4.98)	12.80 (5.77)	12.19 (6.06)	12.71 (6.08)	13.16 (6.15	15.30 (5.84)	12.96 (5.98)	$F(5,1005)=6.83$; p<.001; $\eta^2=.033$
PSS-10 M (SD)	21.64 (6.25)	19.34 (6.89)	19.89 (7.41)	17.61 (7.80)	16.19 (8.26	11.97 (7.36)	17.71 (7.94)	$F(5,1005)=29.87$; p<.001; $\eta^2=.130$

p: p-values (2-tailed); n: frequencies; M: mean score; SD: standard deviation, χ^2: Chi-square; F: F-test; ISI: Insomnia Severity Index, GAD-7 (Generalized Anxiety Disorder 7 scale); PHQ-9: Patient Health Questionnaire 9 scale; PSS-10: Perceived Stress Scale 10; WHO-5: Well-being questionnaire of the World Health Organization (WHO); WHO-QOL BREF: Quality of Life questionnaire of the World Health Organization (WHO); CMD: Common mental disorder: Yes if PHQ-9 ≥ 10 AND/OR GAD-7 ≥ 8 vs. No if PHQ-9 < 10 AND GAD-7 < 8.

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

Table 4: Number of participants exceeding the cut-off score for clinically relevant depression/anxiety/insomnia, measures of psychological health, well-being and stress by work.

	Work							
	No, and did not before the lockdown either	No, but before the lockdown I did	Yes, in Home-Office	Yes, as before at my workplace (not in my Home Office)	Yes, but I've been put on reduced hours	I am retired	Total	Statistic
PHQ-9 ≥10 n (%)	124 (51.0)	110 (46.8)	68 (38.6)	59 (44.4)	34 (43.6)	19 (13.5)	414 (41.2)	$\chi^2(5)=58.71$; p<.001
GAD-7 ≥10 n (%)	113 (46.5)	108 (46.0)	65 (36.9)	54 (40.6)	29 (37.2)	23 (16.3)	392 (39.0)	$\chi^2(5)=41.62$; p<.001
ISI ≥15 n (%)	85 (35.0)	71 (30.2)	40 (22.7)	40 (30.1)	27 (34.6)	20 (14.2)	283 (28.1)	$\chi^2(5)=24.12$; p<.001
CMD n (%)	152 (62.6)	140 (59.6)	83 (47.2)	78 (58.6)	41 (52.6)	33 (23.4)	527 (52.4)	$\chi^2(5)=66.44$; p<.001
PHQ-9 M (SD)	10.73 (8.12)	9.72 (7.20)	8.82 (7.89)	9.47 (7.52)	9.06 (7.49)	4.18 (5.62)	8.95 (7.69)	F(5,1005)=15.033; p<.001; η^2=.070
GAD-7 M (SD)	9.21 (6.70)	9.05 (6.41)	7.64 (6.32)	8.42 (6.48)	8.08 (6.43)	4.38 (5.33)	8.03 (6.52)	F(5,1005)=12.52; p<.001; η^2=.059
ISI M (SD)	11.47 (7.26)	11.16 (6.68)	9.65 (6.94)	11.08 (6.93)	10.85 (7.28)	7.55 (6.60)	10.43 (7.04)	F(5,1005)=7.20; p<.001; η^2=.035
WHOQOL BREF psychological domain M (SD)	52.93 (23.30)	54.86 (20.64)	61.17 (19.83)	58.27 (20.43)	61.43 (20.34)	70.21 (17.12)	58.61 (21.39)	F(5,1008)=14.92; p<.001; η^2=.069
WHO-5 M (SD)	11.31 (6.29)	12.19 (5.57)	13.99 (5.71)	13.15 (5.93)	14.18 (5.81)	14.95 (5.64)	12.96 (5.98)	F(5,1005)=9.73; p<.001; η^2=.046
PSS-10	19.09 (8.24	18.93 (7.34)	17.30 (7.65)	18.43 (7.72)	18.46 (6.97)	12.72 (7.59)	17.71 (7.94)	F(5,1005)=15.12; p<.001;

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

	M (SD)	η^2=.059

p: p-values (2-tailed); n: frequencies; M: mean score; SD: standard deviation, χ^2: Chi-square; F: F-test; ISI: Insomnia Severity Index, GAD-7 (Generalized Anxiety Disorder 7 scale); PHQ-9: Patient Health Questionnaire 9 scale; PSS-10: Perceived Stress Scale 10; WHO-5: Well-being questionnaire of the World Health Organization (WHO); WHO-QOL BREF: Quality of Life questionnaire of the World Health Organization (WHO); CMD: Common mental disorder: Yes if PHQ-9 ≥ 10 AND/OR GAD-7 ≥ 8 vs. No if PHQ-9 < 10 AND GAD-7 < 8.

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

Table 5: Number of participants exceeding the cut-off score for clinically relevant depression/anxiety/insomnia, measures of psychological health, well-being and stress by income.

	Net income					Total	Statistic
	< GBP 900,-	GBP 900,- to GBP 1,800,-	GBP 1,800,- to GBP 2,700,-	GBP 2,700,- to GBP 3,600,-	> GBP 3,600,-		
PHQ-9 ≥10 n (%)	65 (47.1)	137 (39.9)	114 (44.5)	56 (38.1)	42 (34.4)	414 8 (41.2)	$\chi^2(4)=6.28$; p=.179
GAD-7 ≥10 n (%)	64 (46.4)	129 (37.6)	107 (41.8)	49 (33.3)	43 (35.2)	392 (39.0)	$\chi^2(4)=6.99$; p=.137
ISI ≥15 n (%)	43 (31.2)	99 (28.9)	85 (33.2)	27 (18.4)	29 (23.8)	283 (28.1)	$\chi^2(4)=12.05$; p=.017
CMD n (%) n (%)	80 (58.0)	184 (53.6)	141 (55.1)	68 (46.3)	54 (44.3)	527 (52.4)	$\chi^2(4)=8.13$; p=.087
PHQ-9 M (SD)	9.95 (8.01)	9.03 (7.61)	9.50 (7.72)	7.77 (7.37)	7.85 (7.65)	8.95 (7.69)	F(4,1005)=2.42; p=.047; η^2=.010
GAD-7 M (SD)	9.01 (6.91)	8.08 (6.48)	8.46 (6.41)	6.86 (6.29)	7.28 (6.47)	8.03 (6.52)	F(4,1005)=2.68; p=.031; η^2=.011
ISI M (SD)	10.95 (7.42)	10.76 (7.07)	11.29 (7.07)	8.89 (6.08)	8.93 (7.15)	10.43 (7.04)	F(4,1005)=4.53; p=.001; η^2=.018
WHOQOL BREF psychological domain M (SD)	52.17 (23.03)	57.99 (21.58)	58.19 (20.92)	62.39 (19.66)	63.97 (19.99)	58.61 (21.39)	F(4,1005)=6.42; p<.001; η^2=.025
WHO-5 M (SD)	11.75 (6.26)	12.31 (6.03)	12.88 (5.90)	14.19 (5.45)	14.84 (5.67)	12.96 (5.98)	F(4,1005)=7.19; p<.001; η^2=.028
PSS-10 M (SD)	19.46 (8.61)	17.71 (8.17)	18.44 (7.42)	15.92 (7.51)	16.34 (7.56)	17.71 (7.94)	F(4,1005)=5.06; p<.001; η^2=.020

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

p: p-values (2-tailed); n: frequencies; M: mean score; SD: standard deviation, χ^2: Chi-square; F: F-test; ISI: Insomnia Severity Index, GAD-7 (Generalized Anxiety Disorder 7 scale); PHQ-9: Patient Health Questionnaire 9 scale; PSS-10: Perceived Stress Scale 10; WHO-5: Well-being questionnaire of the World Health Organization (WHO); WHO-QOL BREF: Quality of Life questionnaire of the World Health Organization (WHO); CMD: Common mental disorder: Yes if PHQ-9 $\geq$ 10 AND/OR GAD-7 $\geq$ 8 vs. No if PHQ-9 < 10 AND GAD-7 < 8.

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

Table 6: Number of participants exceeding the cut-off score for clinically relevant depression/anxiety/insomnia, measures of psychological health, well-being and stress by physical activity.

	Days of physical activity in the last 7 days					Total	Statistic
	0	1	2	3	4 or more		
PHQ-9 ≥10 n (%)	98 (41.7)	50 (47.6)	84 (52.2)	62 (42.2)	120 (33.5)	414 (41.2)	$\chi^2(4)=18.59$; p<.001
GAD-7 ≥10 n (%)	87 (37.0)	45 (42.9)	79 (49.1)	59 (40.1)	122 (34.1)	392 (39.0)	$\chi^2(4)=11.63$; p=.020
ISI ≥15 n (%)	69 (29.4)	37 (35.2)	54 (33.5)	47 (32.0)	76 (21.2)	283 (28.1)	$\chi^2(4)=14.64$; p=.006
CMD n (%)	120 (51.1)	56 (53.3)	104 (64.6)	81 (55.1)	166 (46.4)	527 (52.4)	$\chi^2(4)=15.46$; p=.004
PHQ-9 M (SD)	9.29 (7.50)	10.09 (8.30)	10.52 (7.77)	9.33 (7.71)	7.52 (7.37)	8.95 (7.69)	F(4,1005)=5.64; p<.001; η^2=.022
GAD-7 M (SD)	7.71 (6.55)	8.54 (6.90)	9.16 (6.52)	8.37 (6.28)	7.44 (6.43)	8.03 (6.52)	F(4,1005)=2.36; p=.052; η^2=.009
ISI M (SD)	10.43 (6.84)	11.80 (6.91)	11.40 (6.99)	11.17 (7.54)	9.28 (6.89)	10.43 (7.04)	F(4,1005)=4.61; p=.001; η^2=.018
WHOQOL BREF psychological domain M (SD)	54.54 (22.20)	55.24 (21.23)	57.09 (19.71)	59.67 (19.63)	62.52 (21.69)	58.61 (21.39)	F(4,1005)=6.19; p<.001; η^2=.024
WHO-5 M (SD)	11.54 (6.03)	12.10 (5.66)	12.54 (5.79)	13.29 (5.57)	14.20 (6.04)	12.96 (5.98)	F(4,1005)=8.22; p<.001; η^2=.032
PSS-10 M (SD)	17.96 (8.27)	17.55 (7.94)	18.65 (7.53)	18.25 (7.20)	16.94 (8.16)	17.71 (7.94)	F(4,1005)=1.64; p=.162; η^2=.007

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

p: p-values (2-tailed); n: frequencies; M: mean score; SD: standard deviation, χ^2: Chi-square; F: F-test; ISI: Insomnia Severity Index, GAD-7 (Generalized Anxiety Disorder 7 scale); PHQ-9: Patient Health Questionnaire 9 scale; PSS-10: Perceived Stress Scale 10; WHO-5: Well-being questionnaire of the World Health Organization (WHO); WHO-QOL BREF: Quality of Life questionnaire of the World Health Organization (WHO); CMD: Common mental disorder: Yes if PHQ-9 $\geq$ 10 AND/OR GAD-7 $\geq$ 8 vs. No if PHQ-9 < 10 AND GAD-7 < 8.

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.

Table 7. Number of participants exceeding the cut-off score for clinically relevant depression/anxiety/insomnia, measures of psychological health, well-being and stress by relationship status.

		Relationship status		Total	Statistic
		Not married / not living as married	Married / living as married		
PHQ-9 ≥10 n (%)		197 (47.7)	217 (36.6)	414 (41.2)	$\chi^2(1)=12.40$; p<.001
GAD-7 ≥10 n (%)		181 (43.8)	211 (35.6)	392 (39.0)	$\chi^2(1)=6.96$; p=.008
ISI ≥15 n (%)		129 (31.2)	154 (26.0)	283 (28.1)	$\chi^2(1)=3.34$; p=.068
CMD n (%) n (%)		240 (58.1)	287 (48.4)	527 (52.4)	$\chi^2(1)=9.21$; p=.002
PHQ-9	M (SD)	10.07 (8.04)	8.16 (7.33)	8.95 (7.69)	t(1004)=3.91; p<.001; g=.25
GAD-7	M (SD)	8.73 (6.65)	7.54 (6.38)	8.03 (6.52)	t(1004)=2.86; p=.004; g=.18
ISI	M (SD)	10.79 (7.13)	10.18 (6.98)	10.43 (7.04)	t(1004)=1.35; p=.177; g=.09
WHOQOL BREF psychological domain	M (SD)	53.39 (22.75)	62.25 (19.60)	58.61 (21.39)	t(1004)=-6.60; p<.001; g=.41
WHO-5	M (SD)	12.08 (6.19)	13.58 (5.75)	12.96 (5.98)	t(1004)=-3.94; p<.001; g=.25
PSS-10	M (SD)	18.76 (8.02)	16.98 (7.81)	17.71 (7.94)	t(1004)=3.52; p<.001; g=.23

p: p-values (2-tailed); n: frequencies; M: mean score; SD: standard deviation, χ^2: Chi-square; F: F-test; ISI: Insomnia Severity Index, GAD-7 (Generalized Anxiety Disorder 7 scale); PHQ-9: Patient Health Questionnaire 9 scale; PSS-10: Perceived Stress Scale 10; WHO-5: Well-being questionnaire of the World Health Organization (WHO); WHO-QOL BREF: Quality of Life questionnaire of the World Health Organization (WHO); CMD: Common mental disorder: Yes if PHQ-9 ≥ 10 AND/OR GAD-7 ≥ 8 vs. No if PHQ-9 < 10 AND GAD-7 < 8. The category not married / not living as married includes being single, separated, divorced and widowed.

ACCEPTED

Copyright © 2020 by the American Psychosomatic Society. Unauthorized reproduction of this article is prohibited.