

Variation in psychological well-being and symptoms of anxiety and depression during the COVID-19 pandemic: results from a three-wave panel survey

Research Letter

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Introduction

The COVID-19 pandemic continues to take its toll on the world. At the time of writing, there have been more than 78 million confirmed cases of COVID-19 worldwide and more than 1.7 million COVID-19-related deaths (Johns Hopkins University, 2020). In response to the pandemic, societies across the globe have taken a series of measures to reduce the spread of the novel coronavirus, including quarantine, social distancing and major lockdowns, the latter having a significant negative impact on the global economy.

As both the pandemic *per se* – and the societal response to it – may affect the mental health of the affected populations significantly (WHO, 2020), there has been substantial interest in this topic from research groups across the globe. The general tendency revealed by the studies conducted so far is that the COVID-19 pandemic seems to have had a negative impact on the mental health of the affected populations (Xiong *et al.*, 2020). There are, however, relatively few studies that have allowed for the examination of mental health in nationally representative samples over the course of the ongoing pandemic. We recently reported results from wave 2 of the COVID-19 Consequences Denmark Panel Survey 2020 (CCDPS 2020) – a survey representative of the Danish population on a number of key variables fielded from April 22 to April 30 2020 (Sønderskov *et al.*, 2020b). We found that the level of psychological well-being as reported on the WHO five-item well-being scale (WHO-5 (Topp *et al.*, 2015)) had increased compared to that reported by the same respondents in wave 1 of the CCDPS 2020 (Sønderskov *et al.*, 2020a), which was fielded from March 31 to April 6 2020. As the number of confirmed COVID-19 cases per day and the number of COVID-19-related deaths were both substantially lower during wave 2 compared to wave 1 of the survey, corresponding to the severity of societal restrictions, we interpreted these findings as being compatible with psychological well-being covarying with the intensity of the COVID-19 pandemic and the associated societal restrictions. In further support of this explanation, the level of psychological well-being in wave 1 of the CCDPS 2020 was lower than that reported in a comparable survey from 2016 (Nielsen *et al.*, 2017).

Following the second wave of the CCDPS 2020 at the end of April 2020, the pandemic was largely under control in Denmark over the spring and summer with a very low number of confirmed COVID-19 cases (mean per day in May–August 2020 : 65). In the fall, however, the number of cases rose gradually from a mean of 369 per day in September, 593 in October to 1138 in November. On December 10 2020, the number of confirmed daily COVID-19 cases passed 3000 ($n = 3132$) for the first time during the pandemic (SSI, 2020). This surge was accompanied by a series of restrictive societal measures, which included regional lockdowns as well as culling of all farmed mink (a fairly large industry in Denmark) to avoid the spread of mutated strains of the novel coronavirus from mink to humans. Following this quite dramatic development in the pandemic and the associated societal response, we conducted a third wave of the CCDPS 2020 with the hypothesis that the psychological well-being would have dropped compared to the level at wave 2.

Methods

The survey agency *Epinion*, which also undertook wave 1 and wave 2 of the CCDPS 2020, was commissioned to conduct the third wave. The third wave targeted the same people and contained the same questions pertaining to psychological well-being/distress, namely the WHO-5 and six questions on the level of anxiety/depression experienced over the past 2 weeks reported on a scale from 0 (not present) to 10 (present to an extreme degree). Wave 3 was fielded from November 20 to December 8 2020 and was completed by 1554 respondents who had also



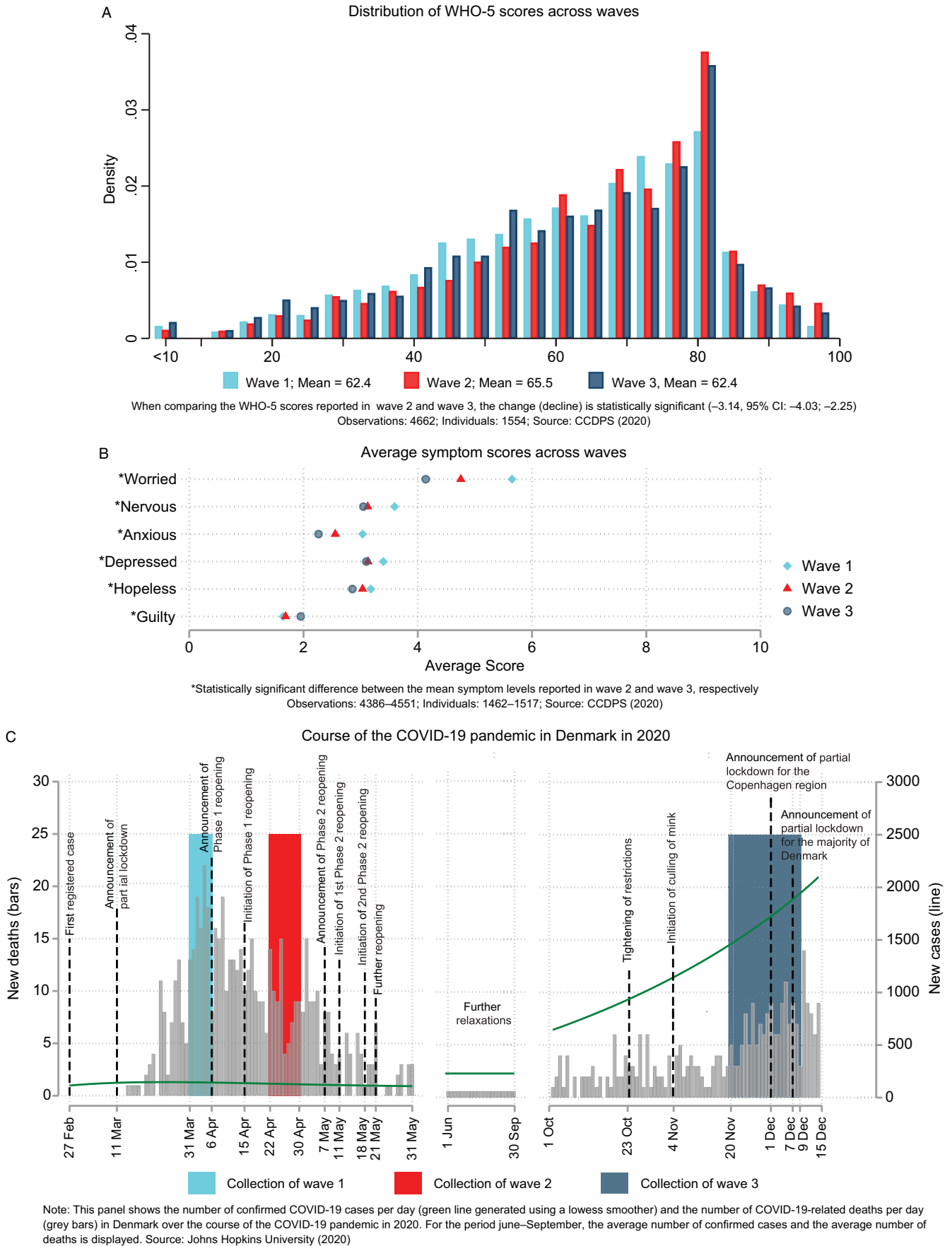


Fig. 1. Psychological well-being (Panel A), symptoms of anxiety/depression (Panel B) and confirmed cases of COVID-19 and COVID-19-related deaths in Denmark over time (Panel C). Sources: The CCDPS 2020 and Johns Hopkins University.

responded to both of the two first waves of the survey, resulting in a three-wave retention rate of 63% (2458 individuals responded to wave 1). After weighting (applied in all analyses), the sample is representative of the population on key demographic and political variables (age, gender, education, region and political party choice in the last election).

We conducted between-wave comparisons of the following indicators of psychological distress/well-being amongst the individuals having responded to all three waves of the CCDPS 2020 survey: the mean WHO-5 scores, the proportion of respondents with a WHO-5 total score <50% (indicative of depression) and the reported level of six symptoms of anxiety and depression (all paired sample *t*-test). Furthermore, we investigated the Pearson's correlation between changes in each of the six anxiety/depression symptoms and changes in the WHO-5 scores from wave 2 to wave 3. Finally, in a post hoc analysis, we also compared the individual WHO-5 item scores (paired sample *t*-test). All analyses were conducted both for the entire sample and stratified on gender. *P*-values < 0.05 were considered statistically significant.

Results

The 1554 respondents that participated in all 3 waves of CCDPS 2020 had a mean age of 49.3 years and 50.7% were females (weighted mean/proportion). The main results are shown in Fig. 1. Briefly, there was a statistically significant decline in psychological well-being from wave 2 to wave 3 (Panel A), which was more pronounced for men than for women (see Supplementary Fig. 1 and Supplementary Table 1). Accordingly, there was a statistically significant increase in the proportion of respondents with a WHO-5 total score <50 from wave 2 to wave 3 – both amongst men and women (see Supplementary Fig. 2 and Supplementary Table 2). Compared to wave 2, the levels of reported worrying, anxiety and hopelessness were decreased in wave 3, while feelings of guilt were increased (all *p*-values < 0.05 – see Panel B). The results of the gender-stratified analyses were largely consistent with this pattern (see Supplementary Fig. 3 and Supplementary Table 3). The results of the correlation analyses are reported in Supplementary Table 4 and discussed below. The results of the post hoc analysis of changes in the individual WHO-5 items are reported in Supplementary Fig. 4 and Supplementary Table 5 and discussed below.

Discussion

The main findings of this update from the CCDPS 2020 are the following: (I) The psychological well-being of the Danish population has decreased from the end of April (survey wave 2) to the end of November/beginning of December (survey wave 3) – mainly driven by not feeling active/vigorous or fresh/rested (WHO-5 items 3 and 4 – see Supplementary Fig. 4 and Supplementary Table 5). (II) Consistent with our comparison of the results from wave 1 and wave 2 of the CCDPS 2020, we observed a negative correlation between changes in symptoms of anxiety/depression and changes in psychological well-being (the more symptoms – the lower the level of well-being) from wave 2 to wave 3. (III) When not taking gender into account, the level of psychological well-being by the end of November/beginning of December was identical to that observed in late March/beginning of April 2020 (wave 1), (IV) gender-stratified analyses, however, showed that compared to the level in late March/beginning of April, the

psychological well-being of men was reduced by the end of November/beginning of December, while that of women had increased.

This study was not designed to address the mechanisms underlying the development of well-being over the course of the COVID-19 pandemic, so we can only speculate in this regard. There are plausibly at least two – potentially interacting – mechanisms at play.

First, the reduction in psychological well-being from wave 2 to wave 3 is compatible with the development in the COVID-19 pandemic, which is illustrated in Panel C in Fig. 1. Somewhat surprisingly, we did not observe a parallel increase in most symptoms of anxiety/depression (with the exception of guilt feelings), which could have been expected, given that we observed the contrary (reduction in these symptoms and increased well-being) from wave 1 to wave 2, when the pressure from the pandemic was relieved (Sønderskov *et al.*, 2020a, 2020b). We did, however, confirm the expected negative correlation between changes in symptom levels of anxiety/depression and changes in psychological well-being from wave 2 to wave 3, which suggests that the symptoms of anxiety/depression and well-being tend to move in tandem at the individual level.

Second, the changing seasons may also play a significant role. We have previously reported that the transition from summertime to standard time in the fall is associated with a substantially elevated incidence rate of depression in Denmark – lasting approximately 10 weeks (Hansen *et al.*, 2016). As wave 3 of the CCDPS 2020 was fielded from November 20 to December 8 – and the transition to standard time occurred on October 25 – this could also contribute to the observed reduction in psychological well-being. Indeed, lack of energy and feelings of not being well-rested (covered by the two WHO-5 items with the most prominent drop from wave 2 to wave 3) are common symptoms of seasonal affective disorder (Azorin *et al.*, 2015; Lyall *et al.*, 2018).

The gender difference observed across our studies based on the CCPDS 2020 is intriguing: While women had seemingly experienced more pronounced reductions in well-being at the very beginning of the pandemic compared to men (Sønderskov *et al.*, 2020a), the opposite appears to be the case towards the end of 2020. As of now, we cannot offer a good explanation for these findings, but will aim at collecting data that may contribute to elucidating this aspect in potential future waves of the CCPDS 2020.

In conclusion, by late November/early December 2020, the psychological well-being of the Danish population had dropped to the level observed at the spring apex of the pandemic in late March/early April 2020.

Supplementary material. To view supplementary material for this article, please visit <https://doi.org/10.1017/neu.2020.47>.

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Conflicts of interest. None.

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