Received: 8 April 2021 | Revised: 1 August 2021 | Accepted: 19 August 2021

DOI: 10.1111/aogs.14258

ORIGINAL RESEARCH ARTICLE

Mental health indicators in pregnant women compared with women in the general population during the coronavirus disease 2019 pandemic in Denmark

Elin R. Severinsen[1,2] | Lise K. A. Kähler[1,3] | Sofie E. Thomassen[3] | Tibor V. Varga[2] | Line Fich Olsen[1] | Kathrine V. R. Hviid[1] | Nina la Cour Freiesleben[1,4,5] | Naja H. Rod[2] | Henriette S. Nielsen[1,4,5]

[1]Department of Obstetrics and Gynecology, Copenhagen University Hospital Hvidovre, Hvidovre, Denmark

[2]Section of Epidemiology, Faculty of Health and Medical Sciences, University of Copenhagen, Copenhagen, Denmark

[3]Department of Obstetrics and Gynecology, Rigshospitalet Copenhagen University Hospital, Copenhagen, Denmark

[4]Department of Obstetrics and Gynecology, The Fertility Clinic, Copenhagen University Hospital Hvidovre, Hvidovre, Denmark

[5]Faculty of Health and Medical Sciences, Institute of Clinical Medicine, University of Copenhagen, Copenhagen, Denmark

Correspondence
Elin Rosenbek Severinsen, Section of Epidemiology, Faculty of Health and Medical Sciences, University of Copenhagen, Øster Farimagsgade 5, 1353 Copenhagen K, Denmark.
Email: elin.severinsen@sund.ku.dk

Funding information
HSN received a grant from the Danish Ministry of Research and Education for research of COVID-19 among pregnant women: 0237-00007B. HSN received a Ferring COVID-19 Investigational Grant for salary (LFO). The data collection for the 'Standing Together at a Distance' was funded by the Velux Foundation: 36336.

Abstract

Introduction: The coronavirus disease 2019 (COVID-19) pandemic and the associated regulations issued to minimize risk of disease transmission seem to have had an impact on general mental health in most populations, but it may have affected pregnant women even more because of pregnancy-related uncertainties, limited access to healthcare resources, and lack of social support. We aimed to compare the mental health response among pregnant women with that in similarly aged women from the general population during the first wave of the COVID-19 pandemic.

Material and methods: From April 14 to July 3, 2020, 647 pregnant women in their second trimester were enrolled in this study. For comparison, 858 women from the general Danish population (20–46 years) were sampled from an ongoing observational study. Participants responded to a questionnaire including six mental health indicators (concern level, perceived social isolation, quality of life, anxiety, mental health, and loneliness). Loneliness was measured using the UCLA Three-item Loneliness Scale and anxiety by the Common Mental Health Disorder Questionnaire 4-item Anxiety Subscale.

Results: The pregnant women had better scores during the entire study period for all mental health indicators, and except for concerns, social isolation, and mental health, the differences were also statistically significant. Pregnant women were more concerned about becoming seriously ill (40.2% vs. 29.5%, $p < 0.001$), whereas the general population was more concerned about economic consequences and prospects. Many pregnant women reported negative feelings associated with being pregnant during the COVID-19 pandemic and concerns regarding social isolation and regulation-imposed partner absence during hospital appointments and childbirth. All mental health indicators improved as Denmark began to reopen after the first wave of the pandemic.

Abbreviations: COVID-19, coronavirus disease 2019; QoL, quality of life; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.
© 2021 The Authors. *Acta Obstetricia et Gynecologica Scandinavica* published by John Wiley & Sons Ltd on behalf of Nordic Federation of Societies of Obstetrics and Gynecology (NFOG)

Conclusions: Pregnant women exhibited lower rates of poor mental health compared with the general population. However, they were more concerned about becoming seriously ill, expressed negative feelings about being pregnant during the pandemic, and were worried about the absence of their partner due to imposed regulations. These finding may be taken into account by policy-makers during pandemics to balance specific preventive measures over the potential mental health deterioration of pregnant women.

KEYWORDS
anxiety, coronavirus disease 2019, loneliness, mental health, pandemics, pregnancy, severe acute respiratory syndrome coronavirus 2, social isolation

1 | INTRODUCTION

The global coronavirus disease 2019 (COVID-19) pandemic has resulted in an economic, social and health crisis,[1] with severe negative impact on mental health.[2] The pandemic struck Denmark in February 2020. On March 11, 2020, the Danish government issued a national lockdown and the infection incidence and the hospitalizations peaked during the first wave in early April 2020.[3] A precautionary principle was applied to the pregnant population globally as well as in Denmark due to the limited knowledge about COVID-19's impact on pregnancy, coinciding with observed increased infectious morbidity and maternal mortality during the severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle Eastern respiratory syndrome coronavirs outbreaks.[4,5] The global pandemic, limited knowledge, and specific preventive measures to reduce transmission (eg, self-isolation, physical distancing, regulations of the regular antenatal and perinatal care—including restrictions of the presence of partners at the hospital) may have affected the mental health of pregnant women because of the resulting uncertainty and limited access to healthcare resources and social support.[6]

Studies have reported a worrisome mental health status among pregnant women during the COVID-19 pandemic.[7–10] However, only a few studies have compared the mental health response of pregnant women with the response in the general population. Some studies have reported higher anxiety, depression, and negative affect among pregnant women,[8,11] whereas others found less anxiety and depression compared with a non-pregnant population.[12,13] Our study adds to the literature by using a time-series design, and to the best of our knowledge by being the first European study to compare a pregnant population with the general population.

We aim to elucidate changes in the mental health response among pregnant women and compare the mental health response among pregnant women with the mental health response of similarly aged women from the general population during the first wave of the COVID-19 pandemic.

Key message

During the first wave of the COVID-19 pandemic, pregnant women reported a negative impact on their pregnancy experience and concerns about absent partners due to regulations' nonetheless their mental health was better compared with women from the general population.

2 | MATERIAL AND METHODS

The pregnant women, whose information on mental health was collected, were a subset of a prospective cohort study on the impact of SARS-CoV-2 in pregnancy and childbirth conducted at Copenhagen University Hospital, Hvidovre, Denmark.[14,15] Pregnant women were invited to participate during their second trimester of pregnancy when attending a routine 20-week ultrasound appointment (Figure 1). Pregnant participants who were enrolled between April 14 and July 3, 2020 were asked to fill in a mental health questionnaire. For comparison, a population of women aged 20–46 years were sampled from the general population of Denmark through the Standing Together—at a Distance project (Figure 1), documenting changes in mental health during the COVID-19 pandemic.[16] Participants were enrolled through an online registration to the Citizen Science project, or by responding to an online questionnaire administered in weekly time-series by a consumer-research agency (Epinion). Representativeness of the study populations has been discussed elsewhere.[16] We have refrained from the term "non-pregnant", because participants were not asked about pregnancy, hence we cannot preclude pregnancy among individuals in the general population. Data on the general population was collected between April 14 and June 30, 2020.

The general population responded to the Copenhagen Corona-Related Mental Health questionnaire,[16] and the pregnant population responded to a modified version, which included crisis-specific pregnancy-related and birth-related concerns, as well as feelings of being pregnant during the pandemic (Appendix S1 and S2). Danish language abilities were required for participation.

General concerns were measured by "How concerned are you about the corona crisis?", social isolation by "How socially isolated do you feel right now?" and quality of life (QoL) by "How would you rate your quality of life right now?". Participants responded on a 10-point

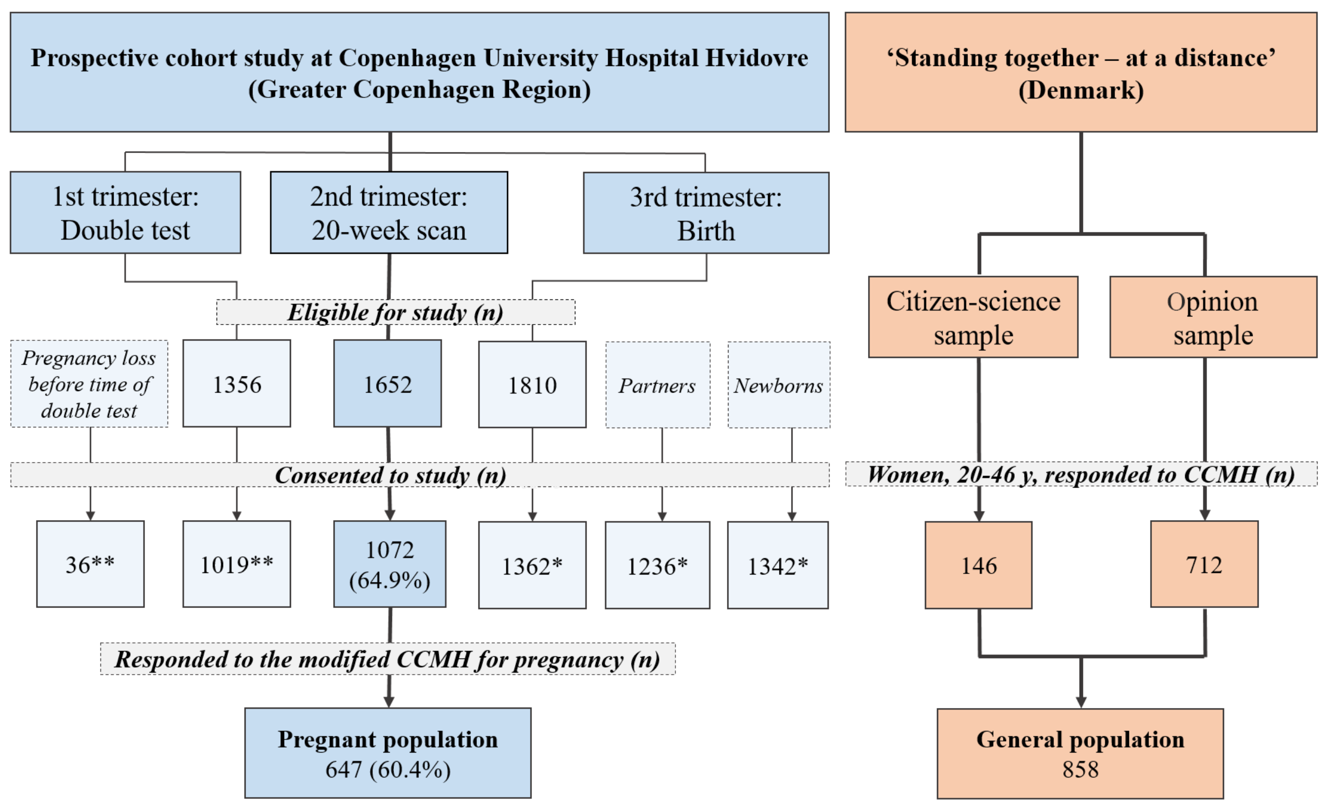

FIGURE 1 Study overview. The pregnant women (n = 647) were included from second-trimester participants in a large prospective cohort study on the impact of SARS-CoV-2 in pregnancy and childbirth (39.2% of the eligible women participated). The general population (n = 858) was included from a large observational study with two sampling strategies documenting changes in mental health in the Danish general population during the COVID-19 pandemic. CCMH, Copenhagen Corona-Related Mental Health questionnaire. *,[14] **[15]

Likert-scale (where 1 represents Not at all/Poor, and 10 represents Completely/Excellent). Loneliness was examined using the UCLA Three-item Loneliness Scale (α = 0.72).[17] We reported the summed score (ranging from 3 to 9 where a higher score represents higher levels of loneliness). Mental health was examined using the five core mental health questions developed at Johns Hopkins (adapted from the General Anxiety Disorder-7 scale, Center for Epidemiologic Studies Depression scale and Impact of Event Scale—Revised).[18] We reported the summed score (ranging from five to 20, where a higher score represents worse mental health). The four-item Common Mental Health Disorder Questionnaire Anxiety subscale was used to examine anxiety (area under the curve 0.87).[19] We reported the anxiety score as the average of the four items' scores (ranging from one to four where a higher score represents higher levels of anxiety). Specific COVID-19-related concerns were measured by "What are your concerns about the COVID-19 crisis?" Participants could agree or disagree with nine different statements. Similarly, regarding precautions we asked: "What precautions are you taking to avoid coronavirus infection?" with seven agree/disagree options. For pregnancy-related and birth-related concerns, we asked: "How concerned are you about …", where pregnant participants for 11 different questions rated their level of concern on a four-point Likert-scale (from 1, Not at all, to 4,Very much).

An open-ended question was included to permit pregnant participants to elaborate on their feelings. We asked: "Briefly describe your feelings about being pregnant during a pandemic". To explore the responses, we grouped reported feelings into themes, and categorized these themes as negative (eg "uncertainty", "nervous"), neutral (eg "fair", "unchanged") and positive affective feelings (eg "optimistic", "calmer"). Several feelings could be expressed in a single statement and were hence grouped into multiple themes. We report counts for each expressed theme.

2.1 | Statistical analyses

To analyze the development of the six different mental health indicators in the pregnant population, we examined the scores for each indicator, at each data collection time-point, during the research period. The non-parametric Wilcoxon rank sum tests were used to compare non-normally distributed ordinal variables. Chi-squared tests were used to compare categorical variables and p values less than 0.05 were considered statistically significant. To address confounding, we conducted sensitivity analyses in which we restricted the pregnant and the general populations to those without chronic disease (n = 506 and n = 723), without previous mental health

disorders ($n = 583$ and $n = 661$), with a partner ($n = 601$ and $n = 620$), with a long- or medium-cycle higher education ($n = 478$ and $n = 493$) and with shorter education (short-cycle higher education, low education [technical/vocational training or upper secondary education], primary school education or identified as "Other") ($n = 168$ and $n = 365$).

2.2 | Ethical approval

The study of the pregnant population was approved by the Knowledge Centre for Data Protection and Compliance, The Capital Region of Denmark (P-2020–255) on March 17, 2021 and by the Scientific Ethics Committee of the Capital Region of Denmark (journal number H-20022647) on April 14, 2021. All pregnant participants provided oral and written informed consent. The Standing Together—at a Distance study was approved by the Danish Data Protection Agency through the joint notification of The Faculty of Health and Medical Sciences at The University of Copenhagen. Survey-based studies do not require ethical approval according to Danish Law. All data were handled in accordance with GDPR guidelines.

3 | RESULTS

A total of 647 pregnant women of the 1652 eligible women in the second trimester of pregnancy responded to the questionnaire (39.2%). Among the 1072 women consenting to the cohort study, we found no differences between responders and non-responders ($n = 425$) to the questionnaire on age, pre-pregnancy body mass index, parity, chronic diseases or mental disorders (Table S1). For comparison, 858 women from the general population participated (Figure 1).

The median age was 31.4 years (interquartile range 28.7–34.6 years) for pregnant women, and 35 years (interquartile range 29–41 years) for the general population. The pregnant women were more often employed (78.4% vs. 63.4%), had higher levels of education (long-cycle higher education; 44.4% vs. 24.6%), reported fewer pre-existing mental disorders (9.8% vs. 23.0%), and more chronic diseases (21.7% vs. 15.7%) compared with the general population (Table 1). The majority of the pregnant women (53.3%) were nulliparous and 96.9% were in a relationship. Only 72.3% of the women from the general population reported living with a partner. Only a few participants from either population had ever tested positive for SARS-CoV-2 (1.4% vs. 0.3%).

First, we showed the weekly changes in the mental health indicators from the peak of the first wave of the COVID-19 pandemic (April 2020) and during the gradual re-opening until July 2020 among pregnant women (Figure 2). The level of concerns, perceived social isolation, and loneliness were high at the peak of the first wave and decreased with the decline of the first wave of the COVID-19 pandemic. Anxiety, general mental health, and QoL were relatively stable throughout the study period.

Second, we compared the development of mental health indicators between pregnant women and women from the general population during each month of the study period (Figure 3). The level of concerns about the COVID-19 crisis and social isolation decreased along with the decline of the first wave of the COVID-19 pandemic in both populations. The pregnant population was statistically significantly less concerned (mean 4.1 vs. 4.7, $p = 0.002$) and felt less socially isolated (mean 3.2 vs. 3.6, $p = 0.03$) in June 2020. QoL gradually increased in both populations and was statically significantly higher in the pregnant population during the study period. Loneliness decreased during the study period, and the pregnant population was less lonely throughout the study period (eg, April 2020, mean 4.4 vs. 5.0, $p < 0.001$). Similar results were found for mental health and anxiety throughout the study period, with better scores for the pregnant population (Figure 3). In the subset without chronic diseases, we found results similar to the main analysis (Figure S1). In the subset without pre-existing mental disorders (Figure S2), the subset having a partner (Figure S3), and the subset with longer education (Figure S4), the results on concerns, QoL, mental health, and loneliness did not change from the main analysis, but results for social isolation and anxiety in the month of June did not remain statistically significantly different between populations. Similarly, in the subset with shorter education, the differences in social isolation, mental health, and loneliness were diminished in selected months (Figure S5).

Among pregnant women, we analyzed the level of pregnancy-related and birth-related concerns during the COVID-19 pandemic (Figure 4). Levels of concern (measured on a 1–4 Likert-scale) about whether their partner, because of restrictions, was allowed to be present during childbirth (mean 3.36, 95% CI 3.3–3.4) as well as during scans and hospital appointments was high (mean 2.57, 95% CI 2.5–2.7). Participants were also concerned whether the expected child would become infected during birth (mean 2.60, 95% CI 2.5–2.7), after birth (mean 2.72, 95% CI 2.6–2.8), or during the pregnancy (mean 2.70, 95% CI 2.6–2.8). The pregnant women were the least concerned about becoming infected during appointments at the hospital (mean 1.92, 95% CI 1.8–2.0) and whether the necessary support, safety, and pain relief could be provided during childbirth (mean 2.00, 95% CI 1.9–2.1) (Figure 4).

Regarding specific COVID-19-related concerns, we found that the primary concern in both populations was related to whether someone close to them (eg, family member) would become seriously ill (Figure 5). Pregnant women were more concerned about becoming seriously ill themselves compared with the general population (40.2% vs. 29.5%, $p < 0.001$), whereas the general population was more concerned about a national economic crisis (58.5% vs. 34.1%, $p < 0.001$), financial problems privately or in the family (28.8% vs. 21.6%, $p = 0.002$), and long-term prospects for a normal everyday life (47.8% vs. 33.3%, $p < 0.001$) (Figure 5). Concerning COVID-19-related precautions, the populations reported similar behaviors apart from increased handwashing and sanitizing being more prevalent among pregnant women compared with the general population (98.9% vs. 95.3%, $p < 0.001$) (Figure 6).

TABLE 1 Characteristics of the populations. Characteristics are presented for the pregnant population (n = 647) and the general population (n = 858)

	Population					
	Pregnant (n = 647)			General (n = 858)		
	Median	IQR		Median	IQR	
Age (years)	31.4	[28.7–34.6]		35	[29–41]	
	N	%	Missing	*N*	%	Missing
Occupation						
Student	62	9.6	3	151	17.6	0
Employed	505	78.4		544	63.4	
Unemployed	38	5.9		49	5.7	
Other, sick leave	39	6.1		114	13.3	
Education						
Primary school	17	2.6	1	33	3.8	0
Low education	108	16.7		248	28.9	
Short cycle higher	31	4.8		74	8.6	
Medium cycle higher	191	29.6		282	32.9	
Long cycle higher	287	44.4		211	24.6	
Other	12	1.9		10	1.2	
Mental disorder						
Yes	63	9.8	1	197	23.0	0
No	583	90.2		661	77.0	
Chronic disease						
Yes	140	21.7	1	135	15.7	0
No	506	78.3		723	84.3	
Parity (only pregnant)						
Primiparous	330	53.3	28			
Multiparous	289	46.7				
Civil status (only pregnant)						
In a relationship	601	96.9	27			
Single	19	3.1				
Living with a partner (only general)						
Yes				620	72.3	0
No				238	27.7	
Tested positive for SARS-CoV-2						
Yes	9	1.4	1	3	0.3	0
No	637	98.6		855	99.7	
Month of participation						
April 2020	91	14.1	0	317	36.9	0
May 2020	304	47.0		250	29.1	
June 2020	212	32.8		291	33.9	
July 2020	40	6.2		0	0.0	

To broaden our understanding of pregnancy-related experiences during the COVID-19 pandemic, we examined responses to an open-ended question (Figure 7). We obtained 507 responses, which provided 701 feelings, which were grouped into themes and categorized. Most themes were categorized as negative affective feelings (70.3%). The most prevalent themes were “Worried”, “Unsafe”, and “Uncertainty”. Feelings with a social aspect were common as 35 feelings were grouped as “Lonely” and 29 feelings were about the inability to share their scans and appointments with a partner or the fear of not having their partner present during childbirth (“Partner not

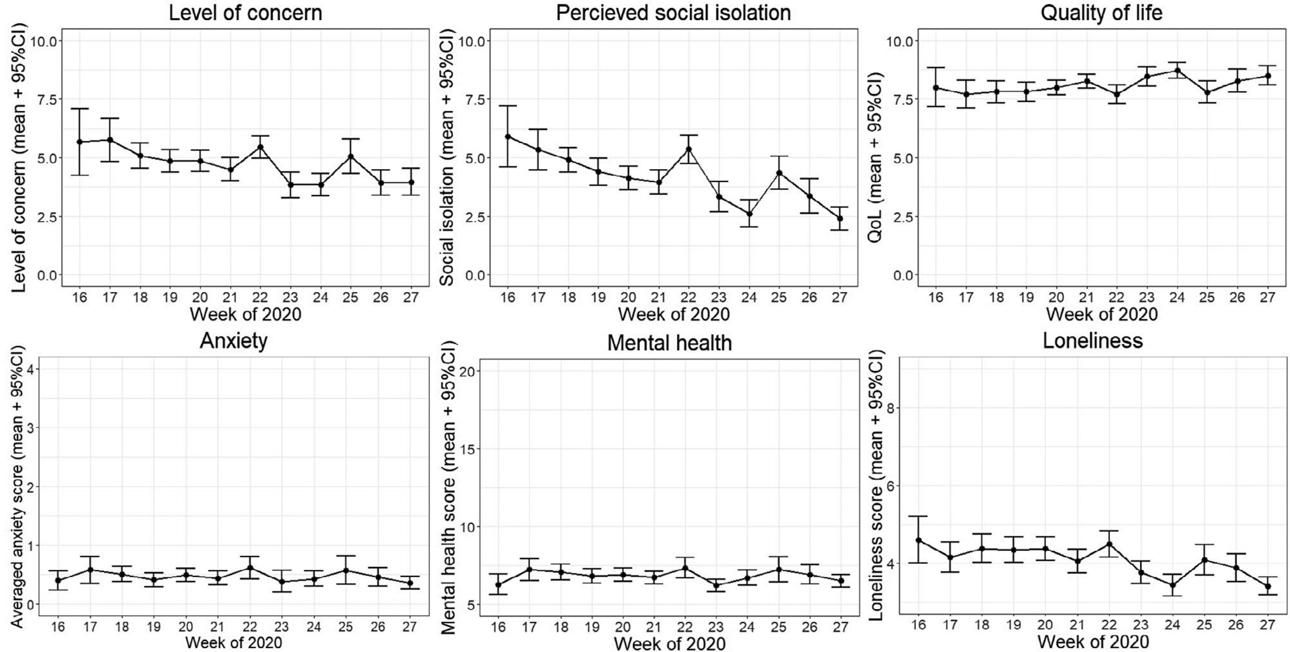

FIGURE 2 Mental health indicators among pregnant women by weekly resolution. Mental health indicators are presented with their mean value and 95% CI for week 16 to week 27 of 2020. Between $n = 10$ and $n = 77$ women responded each week. QoL, quality of life

present"). Finally, 15 feelings concerned regulation-imposed lack of contact with healthcare providers in a familiar safe physical setting as phone and virtual contacts were introduced (Figure 7). Although most expressed feelings were categorized as negative, 17.3% were neutral ($n = 121$) and 8.7% expressed positive feelings ($n = 61$), eg due to benefits during pregnancy from a calmer environment ("Fine") and work from home ("Optimistic") (Figure 7). Three responses elaborated on being considered a risk group, which was associated with negative feelings of frustration and additional precautions, but also positive feelings due to protection and consideration.

4 | DISCUSSION

In this large time-series study, we found that pregnant women did not in general exhibit poorer mental health compared with the general population during the first wave of the COVID-19 pandemic in Denmark. However, pregnant women were more concerned about getting seriously ill, expressed negative feelings about being pregnant during the pandemic and worried about the absence of their partner during hospital appointments and childbirth. Furthermore, we found that mental health gradually improved for both pregnant women and the general population as society reopened following the first COVID-19 wave in Denmark, in line with previous studies.[16]

We found that pregnant women generally scored better on the mental health indicators compared with women from the general population. These findings support previous studies reporting a better mental health status among pregnant women compared with non-pregnant women during the pandemic.[12,13] Our sensitivity analysis partly attributed the difference in social isolation and anxiety to confounding by pre-existing mental disorders, having a partner and educational level presumably due to the associated differences in vulnerability and social support. Work from home with the possibility of prioritizing self-care,[20] the opportunity to keep in contact with healthcare professionals,[12] relief from stressful demands of a social life and the strategy of prioritizing pregnant women as a risk group with increased protection and attention compared with the general population may contribute to the difference between the populations, as supported by the findings in our open-ended question analysis. Difference in the course of the pandemic, various governmental strategies to contain the virus and other national regulations may have contributed to differences between published studies.[7,12,13] Although this study is based on six mental health indicators, the clinical consequences of reported differences remain uncertain and warrant further research.

Notably, we found a marked difference in the specific concerns related to the COVID-19 crisis between pregnant women and the general population. The latter were more concerned about personal, familial, and national economic consequences, whereas pregnant women were more concerned about becoming seriously ill themselves. This finding was expected as pregnant women's health is linked to the health of their fetus. In line with our findings, previous studies also reported high levels of concern of contracting COVID-19 in pregnant populations.[21,22]

Pregnant women during the COVID-19 pandemic have reported higher negative affectivity compared with women who were pregnant before COVID-19,[7] This observation corresponds to our findings in the open-ended question analysis, where most of the pregnant participants reported negative feelings about being pregnant during the pandemic. When asked about pregnancy-related

FIGURE 3 Mental health indicators among pregnant women and the general population in comparison by monthly resolution. Mental health indicators are presented with their mean value and 95% CI. In April, May, and June of 2020 between $n = 84$ and $n = 301$ pregnant women responded each month and between $n = 250$ and $n = 317$ participants responded in the general population. In July only pregnant women participated, and between $n = 36$ and $n = 39$ individuals provided information for each indicator. For visual purposes the means of the populations are presented side-by-side but represent data collected through the entire month. Statistical testing was performed using Wilcoxon rank sum test, p values are reported. QoL, quality of life

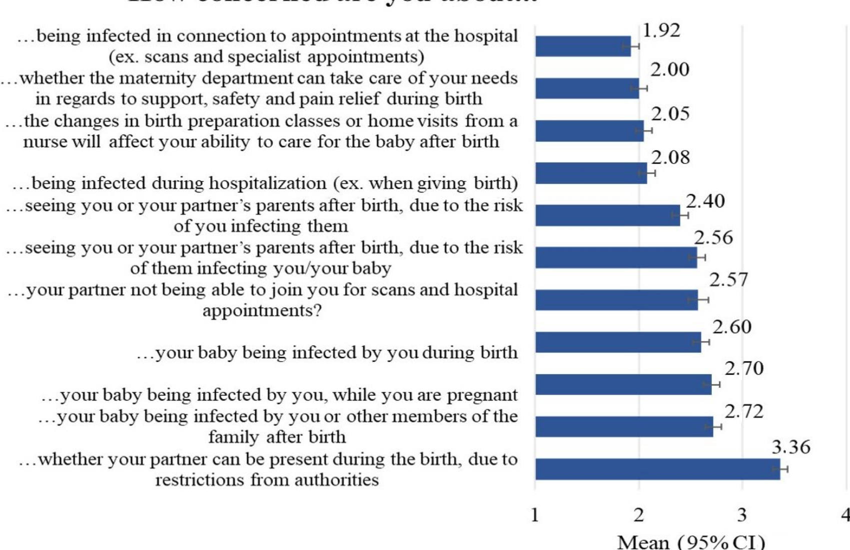

FIGURE 4 Pregnancy and birth-related concerns. The pregnant population responded to each of the 11 questions ($n = 599$ to $n = 623$). They were asked to rate their level of concern on a four-point Likert-scale. We have reported means and 95% CI

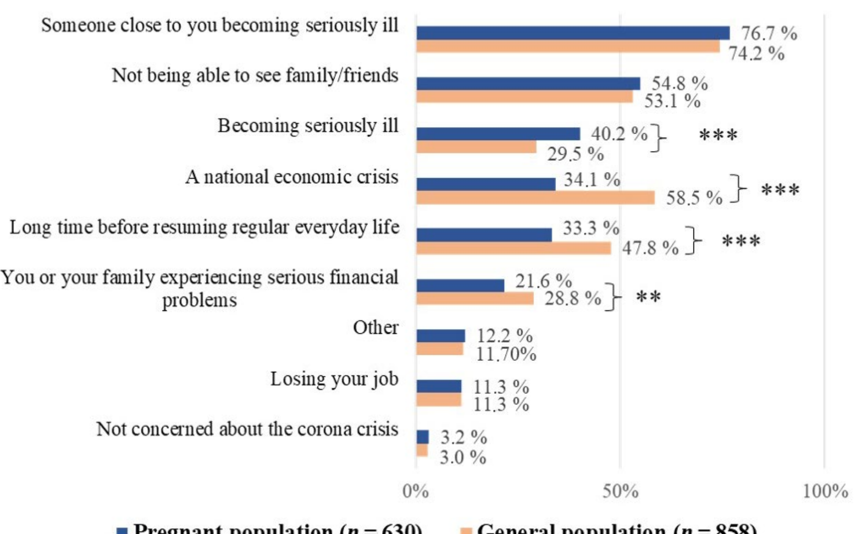

FIGURE 5 Specific COVID-19-related concerns. Nine different options were presented, and participants were asked to agree or disagree to being concerned. The pregnant women (missing, $n = 17$) and the general population were compared, and significance level for the chi-squared test of the counts is presented if statistically significant. p values: * <0.05, **<0.01, ***<0.001, **** <0.0001

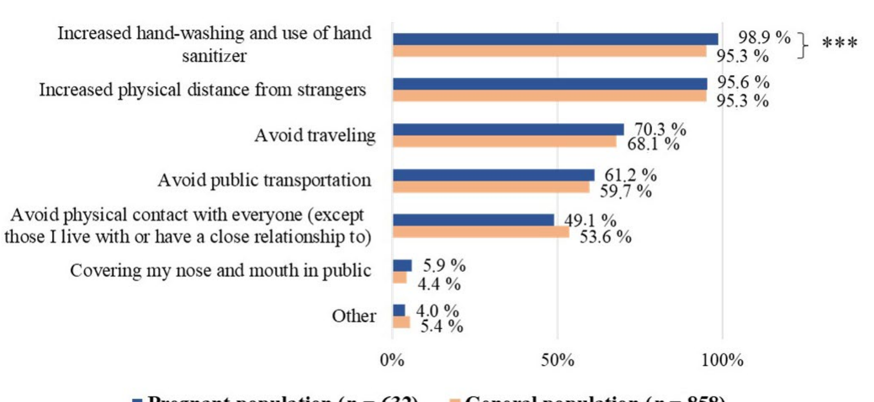

FIGURE 6 Specific COVID-19 related precautions. Six different options were presented to the participants. Participants could agree or disagree to the presented precautions to avoid infection with the coronavirus. A total of 632 pregnant women responded (missing, $n = 15$). The two populations were compared and significance level for the chi-squared test of the counts is presented if statistically significant. p values: * <0.05, **<0.01, ***<0.001, **** <0.0001

and birth-related concerns, we found low levels of concern about being infected in connection with appointments at the hospital and during hospitalization. Similar results were found in a Danish study from 2020 where pregnant women did not express concerns about attending their antenatal care appointments during the COVID-19 pandemic.[22] These results indicate that the Danish pregnant population trusts the safety of the healthcare system and does not worry about being infected in this setting.

Concerns about not having their partner present at hospital appointments and during childbirth were prevalent among the pregnant women. Similarly, a previous study from Sweden found that exclusion of partners was ranked as a prevalent concern among pregnant women.[23] This observation might prove important because previous studies identified unsupportive partners and lack of social support as risk factors for antenatal and postpartum depression,[24,25] and preliminary results show that social support protects against the negative mental health impact of the pandemic among pregnant women.[26] Further studies are warranted to gain a complete understanding of the consequences of absent partners because of authority-imposed restrictions. Such investigations will aid future strategies for weighting the exclusion of one partner from a shared environment vs the risk of restricted partner support.

The present study is in nature limited by its cross-sectional design and by its foundation on self-reported data. The urgency for a fast response to the pandemic resulted in a study design without the possibility of accounting for the selection process of the general population, hence we cannot account for a potential selection bias. The general population was not asked about pregnancy, so we cannot exclude the possibility that a pregnant participant could have participated in the general population as well, though this remains unlikely because of the very small overlap in geographical recruitment areas. Another limitation is that the two populations we compared are different in terms of a number of potential confounders which could explain some of the differences in mental health indicators. We addressed this limitation in our sensitivity analyses where largely we found similar results to the main analysis though restricted to women with the same educational level, with a partner, without a pre-exiting mental disorder, or without chronic disease,

N (feelings)	%	Theme (feelings were grouped according to themes below)
701	100	**All feelings**
493	70.3	**All negative affective feelings**
180	25.7	Worried
46	6.6	Unsafe
47	6.7	Uncertainty
41	5.8	Annoying
35	5.0	Lonely
29	4.1	Partner not present
23	3.3	Different
22	3.1	Strange
19	2.7	Difficult
15	2.1	Lack of physical contact/follow up with healthcare professionals
14	2.0	Impractical
13	1.9	Sad
9	1.3	Confusing
121	17.3	**All neutral affective feeling**
53	7.6	Unaffected
42	6.0	Ok
15	2.1	More cautious
11	1.6	Ambivalent
61	8.7	**All positive affective feelings**
24	3.4	Fine
17	2.4	Happy
10	1.4	Optimistic
10	1.4	Safe
26	3.7	Other

FIGURE 7 Feelings about being pregnant during a pandemic. All statements (*n* = 507) were thematized based on expressed feelings (*n* = 701). A statement could include several feelings. Each theme was categorized as expressing a negative, neutral, and positive affective feeling (percentages are presented). A total of 372 individuals provided statements with negative feeling(s), 120 individuals with neutral feeling(s), 59 individuals with positive feeling(s), and 26 with feelings grouped as Other. Please note that this adds up to more than 507 because 68 individuals expressed several feelings grouped under various themes with different affective content

arguing that the differences in potential confounders might be of less concern.

Previous studies rely heavily on web-based and social network-distributed surveys with no possibility of assessing or evaluating response rates.[7,8,12] We could identify only one study in the published literature with a comparison design, where pregnant and non-pregnant women were recruited when presenting at the hospital, in this case at an outpatient clinic with a specific appointment in a case–control design.[13] As all pregnant women in Denmark are offered a 20-week scan free-of-charge as part of the public antenatal and obstetric healthcare service, the present study avoids comprehensive selection bias of the pregnant population due to health status and economic position, which is supported by the findings of limited differences between responders and non-responders (Table S1).

5 | CONCLUSION

We found that pregnant women generally reported better mental health compared with women of similar age from the general population, especially when restrictions were relaxed following the first wave of the pandemic. Pregnant women were generally more concerned about contracting COVID-19 themselves, and less concerned about economic consequences and time to resume everyday life compared with women from the general population. A substantial proportion of pregnant women reported concerns of absent partners because of regulations, and negative affective feelings about being pregnant during the pandemic. Our results can support policy-makers and decision-makers within the healthcare system when deciding on the delicate balance between regulations regarding societal lockdowns to reduce the risk of disease transmission, and the risk of deterioration in mental health due to said restrictions.

AUTHOR CONTRIBUTION

HSN, NICF, and NHR produced the study design. ERS, LKAK, SET, TVV, KVRH, LFO, NICF, NHR, and HSN contributed to data collection, accuracy of the data, data interpretation, and revising the manuscript. ERS (primary), TVV, and LKAK contributed to statistical analysis and figures. ERS and LKAK performed the literature search. ERS drafted the manuscript. The corresponding author had full access to all the data in the study. All authors read and approved the final version of the manuscript.

ACKNOWLEDGMENTS

We would like to thank our colleagues in the Standing Together—at a Distance project group and at the Ultrasound Clinical at Copenhagen University Hospital Hvidovre for generously assisting us in the inclusion of participants to the present study.

CONFLICT OF INTEREST

HSN has received speaker's fees from Ferring Pharmaceuticals, Merck Denmark A/S, Cook Medical, and Ibsa Nordic (outside the submitted work). NCF has received an unrestricted grant from Gedeon Richter (outside the submitted work). The other authors have stated explicitly that there are no conflicts of interest in connection with this article.

ORCID

Elin R. Severinsen https://orcid.org/0000-0003-1986-5445
Tibor V. Varga https://orcid.org/0000-0002-2383-699X
Kathrine V. R. Hviid https://orcid.org/0000-0002-1172-6099
Nina la Cour Freiesleben https://orcid.org/0000-0002-5670-2015
Naja H. Rod https://orcid.org/0000-0002-6400-5105
Henriette S. Nielsen https://orcid.org/0000-0003-2106-8103

REFERENCES

1. Scott R, Connor G. United Nations Development Programme. Understanding what data tell us about COVID-19's socio-economic impact.At. https://www.undp.org/content/undp/en/home/blog/2020/understanding-what-data-tell-us-about-covid-19s-socio-economic-i.html. Accessed March 10, 2021.
2. Aknin LB, De Neve J-E, The Lancet's COVID-19 Commission Mental Health Task Force, et al. A review and response to the early mental health and neurological consequences of the COVID-19 pandemic. PsyArXiv. https://psyarxiv.com/zw93g/. Accessed March 30, 2021.
3. Statens Serum Institut - covid-19 - Danmark (Regionalt). COVID-19-Danmark. 2021. https://experience.arcgis.com/experience/aa41b29149f24e20a4007a0c4e13db1d/page/page_1/. Accessed March 12, 2021.
4. Wong SF, Chow KM, Leung TN, et al. Pregnancy and perinatal outcomes of women with severe acute respiratory syndrome. *Am J Obstet Gynecol*. 2004;191:292-297.
5. Alfaraj SH, Al-Tawfiq JA, Memish ZA. Middle East Respiratory Syndrome Coronavirus (MERS-CoV) infection during pregnancy: Report of two cases & review of the literature. *J Microbiol Immunol Infect*. 2019;52:501-503.
6. Thapa SB, Mainali A, Schwank SE, Acharya G. Maternal mental health in the time of the COVID-19 pandemic. *Acta Obstet Gynecol Scand*. 2020;99:817-818.
7. Berthelot N, Lemieux R, Garon-Bissonnette J, Drouin-Maziade C, Martel É, Maziade M. Uptrend in distress and psychiatric symptomatology in pregnant women during the coronavirus disease 2019 pandemic. *Acta Obstet Gynecol Scand*. 2020;99:848-855.
8. López-Morales H, del Valle MV, Canet-Juric L, et al. Mental health of pregnant women during the COVID-19 pandemic: a longitudinal study. *Psychiatry Res*. 2021;295:113567.
9. Hessami K, Romanelli C, Chiurazzi M, Cozzolino M. COVID-19 pandemic and maternal mental health: a systematic review and meta-analysis. *J Matern Neonatal Med*. 2020;1:1-8.
10. Ceulemans M, Foulon V, Ngo E, et al. Mental health status of pregnant and breastfeeding women during the COVID-19 pandemic-A multinational cross-sectional study. *Acta Obstet Gynecol Scand*. 2021;100:1219-1229.
11. Mirzaei N, Jahanian Sadatmahalleh S, Bahri Khomami M, Moini A, Kazemnejad A. Sexual function, mental health, and quality of life under strain of COVID-19 pandemic in Iranian pregnant and lactating women: a comparative cross-sectional study. *Health Qual Life Outcomes*. 2021;19:1-8.
12. Zhou Y, Shi H, Liu Z, et al. The prevalence of psychiatric symptoms of pregnant and non-pregnant women during the COVID-19 epidemic. *Transl Psychiatry*. 2020;10:319.
13. Yassa M, Yassa A, Yirmibeş C, et al. Anxiety levels and obsessive compulsion symptoms of pregnant women during the COVID-19 pandemic. *Turk J Obs Gynecol*. 2020;17:155-160.
14. Egerup P, Fich Olsen L, Christiansen AMH, et al. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) antibodies at delivery in women, partners, and newborns. *Obstet Gynecol*. 2021;137:49-55.
15. la Cour Freiesleben N, Egerup P, Hviid KVR, et al. SARS-CoV-2 in first trimester pregnancy: a cohort study. *Hum Reprod*. 2021;36:40-47.
16. Clotworthy A, Dissing AS, Nguyen T, et al. 'Standing together – at a distance': Documenting changes in mental-health indicators in Denmark during the COVID-19 pandemic. *Scand J Public Health*. 2021;49:79-87.
17. Hughes ME, Waite LJHL, Hawkley LC, Cacioppo JT. A short scale for measuring loneliness in large surveys: results from two population-based studies. *Res Aging*. 2004;26:655-672.
18. COVID-19 and Mental Health Measurement Working Group, Department of Mental Health Johns Hopkins Bloomberg School of Public Health (JHSPH). https://www.jhsph.edu/departments/mental-health/_docs/Mental health survey items request_04.29.2020.pdf. Accessed July 15, 2021.
19. Christensen KS, Fink P, Toft T, Frostholm L, Ørnbøl E, Olesen F. A brief case-finding questionnaire for common mental disorders: The CMDQ. *Fam Pract*. 2005;22:448-457.
20. Farewell CV, Jewell J, Walls J, Leiferman JA. A mixed-methods pilot study of perinatal risk and resilience during COVID-19. *J Prim Care Community Heal*. 2020;11:1-8.
21. Lebel C, MacKinnon A, Bagshawe M, Tomfohr-Madsen L, Giesbrecht G. Elevated depression and anxiety symptoms among pregnant individuals during the COVID-19 pandemic. *J Affect Disord*. 2020;277:5-13.
22. Overbeck G, Graungaard AH, Rasmussen IS, et al. Pregnant women's concerns and antenatal care during COVID-19 lock-down of the Danish society. *Dan Med J*. 2020;67:A06200449.
23. Naurin E, Markstedt E, Stolle D, et al. Pregnant under the pressure of a pandemic: a large-scale longitudinal survey before and during the COVID-19 outbreak. *Eur J Public Health*. 2020;31:30-36.
24. Bilszta JLC, Tang M, Meyer D, Milgrom J, Ericksen J, Buist AE. Single motherhood versus poor partner relationship: outcomes for antenatal mental health. *Aust N Z J Psychiatry*. 2008;42:56-65.
25. Liabsuetrakul T, Vittayanont A, Pitanupong J. Clinical applications of anxiety, social support, stressors, and self-esteem measured during pregnancy and postpartum for screening postpartum depression in Thai women. *J Obstet Gynaecol Res*. 2007;33:333-340.
26. Khoury JE, Atkinson L, Bennett T, Jack SM, Gonzalez A. COVID-19 and mental health during pregnancy: the importance of cognitive appraisal and social support. *J Affect Disord*. 2021;282:1161-1169.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

How to cite this article: Severinsen ER, Kähler LKA, Thomassen SE, et al. Mental health indicators in pregnant women compared with women in the general population during the coronavirus disease 2019 pandemic in Denmark. *Acta Obstet Gynecol Scand*. 2021;100:2009–2018. https://doi.org/10.1111/aogs.14258