



## Subjective social status, COVID-19 health worries, and mental health symptoms in perinatal women

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### ABSTRACT

Pregnant women and those who have recently given birth are considered an at-risk population during the COVID-19 pandemic with regards to the impact of both general stress and pandemic-related stressors. The extent to which subjective social status (SSS), one's perception of relative standing compared to others in a social hierarchy, might mitigate the effects of COVID-19-related health worries on mental health has not yet been reported, despite SSS often outperforming socioeconomic status as a predictor of various health outcomes including depression. This cross-sectional survey study tested the moderating effect of SSS on association between COVID-19-related health worries and mental health symptoms (depressive and generalized anxiety) among a sample of 1,637 perinatal women from the United States who took part in the Perinatal Experiences and COVID-19 Effects (PEACE) Study between May 2020 and June 2021. We found that high subjective social status was protective against depressive symptoms when self-reported COVID-19-related worry was low. When COVID-19-related worry was high, subjective social status was no longer influential. Higher levels of COVID-19-related health worries were associated with more anxiety symptoms, and higher subjective social status did not moderate anxiety symptomatology at either level of COVID-19-related worry. Although higher SSS has historically been protective against mental health decline, in the context of the COVID-19 pandemic it may not be sufficiently protective against anxiety, or against depression for those who experience high levels of worry regarding the effects of COVID-19 on health.

### 1. Introduction

Subjective social status (SSS) refers to one's perception of their standing relative to others in a social hierarchy (Adler, Epel, Castellazzo, & Ickovics, 2000) based upon their reported access to social and material resources (Kraus, Piff, Mendoza-Denton, Rheinschmidt, & Keltner, 2012). Although SSS is conceptually related to socioeconomic status (SES), it is a distinct construct. SES encompasses objective measures such as household income or educational level, whereas SSS assesses one's evaluation of their privilege or marginalized status (Adler et al., 2000) when compared to others from society. Thus, those with a low SES may endorse high SSS and vice versa. Accumulating data over the past two decades shows SSS to outperform SES as a predictor of various health outcomes, including depression (Cundiff, Smith, Uchino, & Berg, 2013). Scholars argue that unlike objective measures of SES, higher SSS reflects on one's perceived predictability and controllability of their

social environment (Keltner, Gruenfeld, & Anderson, 2003), and that lower SSS may reflect a sense of helplessness, uncertainty (Kraus, Tan, & Tannenbaum, 2013), or lack of agency. It is posited that such perceptions about oneself represent processes that explain the relations between SSS and health outcomes.

The extent to which SSS might buffer the effects of COVID-19-related health worries on mental health has not yet been investigated, despite the ways in which the COVID-19 pandemic has dramatically altered social environments, highlighted disparities in access to resources, and generated uncertainty regarding our well-being. The implications from the direct and indirect effects of the pandemic have conferred multiple threats to individuals on an ongoing basis, with major societal disruptions (e.g., isolation, lockdowns) revolving around the mitigation of health risks. The concerns of contracting COVID-19 and its threat to one's own health and the health of family members is a major stressor, and new evidence from studies conducted early in the pandemic

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suggests that the perception of COVID-19 as a health threat may lead to greater levels of depression and anxiety (Fitzpatrick, Drawve, & Harris, 2020; Wilson, Lee, & Shook, 2020). Feelings of being at high risk for COVID-19-related health problems may generate feelings of uncertainty and increased stress (Rahal et al., 2020), which together lead to increased depression and generalized anxiety symptoms. The question arises whether individuals with high SSS - those who perceive themselves as having a higher social standing - are protected against these negative mental health experiences during the COVID-19 pandemic.

SSS may play an important role in protecting the mental health of perinatal women under these circumstances. Perinatal women - those who are pregnant or who have recently given birth - are a population considered to be vulnerable to stress in general and to stressors that have arisen from the COVID-19 pandemic (Berthelot et al., 2020). The possibility of infection during pregnancy and potential for caesarean delivery (Cavalcante, Cavalcante, Sarno, Barini, & Kwak-Kim, 2021; Ciapponi et al., 2021; Elsaddig & Khalil, 2021), low birth weight (Cavalcante et al., 2021; Jafari et al., 2021), and preterm birth (Cavalcante et al., 2021; Ciapponi et al., 2021; Jafari et al., 2021), as well as transmission to the infant and other family members have been a continued concern for perinatal women (Panahi, Amiri, & Pouy, 2020; Preis, Mahaffey, Heiselman, & Lobel, 2020).

The perinatal period is a transition time for which mental health symptoms are highly prevalent. Stressors that occur during this period include a multitude of experiences ranging from the increased responsibilities such as preparing for the baby and infant caregiving after birth as well as the biological changes that take place during pregnancy and postpartum period (e.g., hormonal fluctuations, physical pains and recovery following labor and birth). The perinatal population is an ideal group for understanding the effects of SSS during the COVID-19 pandemic. First, the perinatal period is a time that is characterized by life stress, and women who are pregnant or in the postpartum period during the pandemic are exposed to the uncertain but continued threat of COVID-19 on the health and well-being of the mother and baby (e.g., COVID-19 transmission between mother and baby, the potential for no support during labor, delivery, and postpartum recovery). Studies focused on SSS with perinatal women are limited in general (Dennis et al., 2012; Goplerud, Hernandez, & Johnson, 2020; Reitzel et al., 2007; Scholaske, Buss, Wadhwa, & Entringer, 2020), and published studies on SSS in any population during the pandemic are also limited. Understanding the relationships between SSS, COVID-19-related health worries, and mental health symptoms in perinatal women would shed light on how SSS operates in relation to mental health risks conferred within a high-risk population and a high-risk context (i.e., a pandemic whose trajectory and health threats remain uncertain), which might offer potential opportunities for intervention.

Our study sought to examine the moderating effect of SSS on association between COVID-19-related health worries and mental health symptoms (depressive and generalized anxiety) among a sample of U.S. perinatal women who took part in the Perinatal Experiences and COVID-19 Effects (PEACE) Study from May 2020 to June 2021. In line with previous findings showing high SSS to be protective of mental health symptoms, we hypothesized that higher levels of SSS would be associated with lower levels of depressive and anxiety symptoms in perinatal women, with SSS having a stronger effect for those with higher levels of COVID-19-related health worries.

## 2. Methods

### 2.1. Study population

We relied on the self-report of participants who took part in the PEACE study ( $N = 1,637$ ) during May 21, 2020, to June 23, 2021. The purpose of the online survey was to “learn more about the effects of COVID-19 on women during the perinatal period” (pregnancy and postpartum), as it pertained to “stress, well-being, resilience, and social

support during this unprecedented time.” Participants were recruited through email distribution lists, social media, and dissemination via word of mouth (i.e., list serves and Facebook groups with U.S. women over the age of 18 starting from the second trimester of pregnancy and those who had given birth in the past six months eligible for the study). Once determined as eligible, those who provided consent were asked to complete a 30-to 40-min online REDCAP survey, where they were presented with standardized measures for assessment of COVID-19-related experiences, family-social risk, resilience, perceived relationship with fetus/infant, and health outcomes. To ensure data quality, attention checks were implemented throughout the survey, with data inspected visually for response irregularities prior to analysis. The study procedures were approved by the Institutional Review Board at Mass General Brigham.

### 2.2. Measures

#### 2.2.1. Risk and protective factors

One’s subjective social status was measured using the US version of the MacArthur Scale of Subjective Social Status (SSS-US; Adler et al., 2000) which has been used widely in studies on health outcomes (Cundiff et al., 2013; Tang, Rashid, Godley, & Ghali, 2016; Zell, Strickhouser, & Krizan, 2018). In this measure, participants are presented with a ladder with each rung labeled with a number between 1 and 10. The rungs represent where people stand in the US, where participants are told that those at the higher rungs represent those who have more money, education, and better jobs. Participants are asked “Where would you place yourself on this ladder now, compared to other people in the United States? Select the number that represents where you think you stand at this time in your life, relative to other people in the United States.” The single score provided by each participant is used for analyses.

To assess COVID-19-related health worries, we relied on four items from the Coronavirus Health Impact Survey (Merikangas, Milham, & Stringaris, 2020; Nikolaidis et al., 2021). These items required participants to rate how worried they were about contracting the virus, their friends and family becoming infected, and their physical and mental health being influenced by COVID-19 on a scale of 1–5, with 1 being *not at all* and 5 being *extremely*. Cronbach’s alpha for the items was 0.85, showing very good reliability. The sum of the items was used to produce a total score that was used for analyses.

#### 2.2.2. Outcomes

To assess depressive and generalized anxiety symptoms, participants were administered the 20-item scale The Center for Epidemiologic Studies-Depression (CES-D; Radloff, 1977) and asked to indicate whether each symptom occurred over the past week: rarely or none of the time (less than 1 day); some or a little of the time (1–2 days); occasionally or a moderate amount of the time (3–4 days), and most or all of the time (5–7 days). They were also asked to complete the Generalized Anxiety Disorder Scale (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006), where they were asked to indicate the frequency of anxiety symptoms over the past two weeks on a scale of 0–3, with 0 being “not at all” and 3 being “nearly every day.” The sum of scores from each of the measures were used for analyses.

#### 2.2.3. Covariates

We asked participants to endorse any occurrences of major life events within the past six months from a list of 13 items using the stressful life events list that has been used widely in the Pregnancy Risk Assessment Monitoring System (PRAMS), a U.S. population-based surveillance project that has taken place since 1987 (Buck, Gjelsvik, Vivier, Monteiro, & Amanullah, 2018; Liu et al., 2016, 2018; Liu & Tronick, 2013; Ward, Kanu, & Robb, 2017). Items were developed by the Centers for Disease Control and Prevention (CDC) through the PRAMS project. Examples of life events included: “I moved to a new address,” “my

partner lost their job,” and “I argued with my partner more than usual.” The sum of the items was used for analyses.

Maternal age, total family income from the past year from all sources ( $\leq \$74,999$ ,  $\$75,000$ – $\$149,999$ ,  $\$150,000$ – $\$224,999$ ,  $\geq \$225,000$ ), and perinatal status at the time of the survey completion (currently pregnant or in the postpartum period) were inquired of participants. Participants indicated the highest education level attained. Individuals who completed part of high school but didn't finish, obtained a GED, were high school graduates, had some college, vocational, or technical school education, graduated from a vocational or technical school, or who received an associate degree were designated as having “less than a college degree”. Those with “at least a college degree” were individuals who obtained a bachelor's degree (e.g., BA, BS), or had some advanced work but no college degree. Those with “a master's degree” included individuals who indicated having such a degree (MS/MA) or who had some work towards a doctorate or advanced degree. Finally, those who had “at least a doctorate degree” included individuals that indicated receiving a doctorate or other advanced degrees (i.e., MD, JD, DO, DDS, PhD).

Participants reported their race using the following options: White; Black or African American; Hispanic or Latinx; Asian or Pacific Islander; American Indian, Alaskan Native, or Native Hawaiian; Biracial or Multiracial; and Other. Given small sample sizes, individuals identifying as American Indian, Alaskan Native or Native Hawaiian; Biracial or Multiracial; and Other were recoded as “Other.” The responses for race were mutually exclusive.

To obtain information regarding pre-existing depression or generalized anxiety disorders, we asked women to indicate if they had been diagnosed with depression or generalized anxiety disorder (GAD) by a mental health professional prior to their recent pregnancy. They were presented with the following options: “No”; “Suspected, but not diagnosed”; “Yes, diagnosed but not treated”; and “Yes, diagnosed and treated.” Those who indicated “no” or “suspected” were categorized as having no pre-existing diagnosis, whereas those who indicated “yes” were categorized as those who did have a pre-existing diagnosis. These scores were not mutually exclusive, that is, those with a pre-existing diagnosis of depression could also have a pre-existing diagnosis of generalized anxiety.

To account for response variation based on when the survey responses were obtained the number of days between the date COVID-19 was formally declared a pandemic in the US (March 13, 2020) and the date the participant began the survey.

#### 2.2.4. Statistical analyses

Prior to analyses, the variables were visually inspected using histograms to determine normality as needed; no outliers were identified that required. Among participants, 5% did not provide information about household income; given the salience of income for our research question, and the small proportion of missing values for income, we elected not to impute missing values and to drop these cases (Bennett, 2001; Schafer, 2001; Tabachnick & Fidell, 2019). Race was completely linearly dependent with certain income dummy variables with coefficients of 1.0 observed for Black and the income level of  $\$75,000$ – $\$149,000$ ; Hispanic and the income level of  $\$150,000$ – $\$224,000$ ; and Asian and the income level of  $\$225,000$  and above. We therefore retained income but not race in analyses. VIF scores for the other predictors ranged from 1.0–3.6 for Block 1, 1.0–3.9 for Block 2, and 1.0–4.0 for Block 3 (with exception to the main and interaction terms). Note that the large majority of predictors across blocks had a VIF of 1.5 with exception to the education variables which were 3.1–4.0. Altogether, the values indicating acceptable levels of collinearity (VIF < 5).

A series of multiple regression models were conducted where depressive and generalized anxiety symptoms were separately regressed on the following predictors: sociodemographic characteristics, pre-existing mental health diagnoses, recent life events, current mental health symptoms, time since the pandemic (Block 1), SSS and COVID-

19-related health worries (Block 2), and SSS x COVID-19 (Block 3). For Block 3, predictor variables were first centered at zero to minimize collinearity (Baron & Kenny, 1986). Analyses were conducted using SPSS 26.0.

### 3. Results

Table 1 presents key variable characteristics from our sample. Participants were on average 32.9 years of age, with the majority college educated and White, and among those who reported household income, slightly more than half earning less than  $\$150,000$  per year. Approximately 56% of women were pregnant while the remainder had given birth in the past six months. Among participants, 16.4% reported having a pre-existing mental health diagnosis of depression and 24.3% reported a pre-existing mental health diagnosis of generalized anxiety disorder. On average, participants reported experiencing at least one life event in the past six months. With respect to our predictors, the average participant reported a SSS of 6.95, thus indicating being slightly higher in their status compared to the average person in the U.S. (SSS score of 5). The average COVID-19-related health worries score was approximately 12, reflecting a moderate level of worry about health. Fig. 1 displays the distribution of responses. The average level of depressive symptoms as assessed by the CES-D was 13.7 which corresponds with the average response being “rare or none of the time” to “some or a little of the time,” with the score being under the cut off score of 16. The score obtained in our sample is similar to the mean of a U.S. study of socio-demographically diverse pregnant women ( $M = 14.7$ ) (Kleih et al., 2022) but higher than the means of studies with mothers postpartum at 6 weeks ( $M = 12.6$ ) and 4 months ( $M = 9.2$ ) (Bigelow et al., 2018). The average level of generalized anxiety symptoms assessed through the GAD-7 was 6.3, which corresponds the average response being “not at all” to “several days” and under the cut off score of 10. The mean was slightly lower than in a sample of Canadian mothers with children 0–18 months of age during the pandemic ( $M = 7.3$ ) (Cameron et al., 2020), but higher than the mean score of a nationwide study involving U.S.

**Table 1**

Key variables from the PEACE Study, data collected between May 21, 2020 to June 23, 2021 ( $N = 1,637$ ).

Predictors	Means (SD, range) or %
Maternal age (years)	32.9 (3.70, 20.0–46.0)
Maternal education	
Less than college	8.5%
College	30.5%
Masters	43.0%
Doctorate	18.0%
Maternal race	
White	92.5%
Black or African American	0.9%
Hispanic or Latino	3.5%
Asian and Pacific Islander	3.1%
Other	0%
Household income (USD/year)	
< \$74,999	12.7%
\$75,000–149,999	40.1%
\$150,000–224,999	26.0%
≥ \$225,000	16.2%
Missing	5.0%
Perinatal status	
Pregnant	55.5%
Postpartum	45.5%
Pre-existing mental health diagnosis	
Depression	16.4%
Generalized anxiety disorder	24.3%
Life events	1.39 (1.41, 0–13)
Depressive symptoms (CES-D)	13.7 (9.03, 0–53)
Generalized anxiety symptoms (GAD-7)	6.31 (5.05, 0–21)
Subjective social status	6.95 (1.45, 1–10)
COVID-19 related health worries	11.95 (3.62, 4–20)
Pandemic days	142.48 (65.38, 69–423)

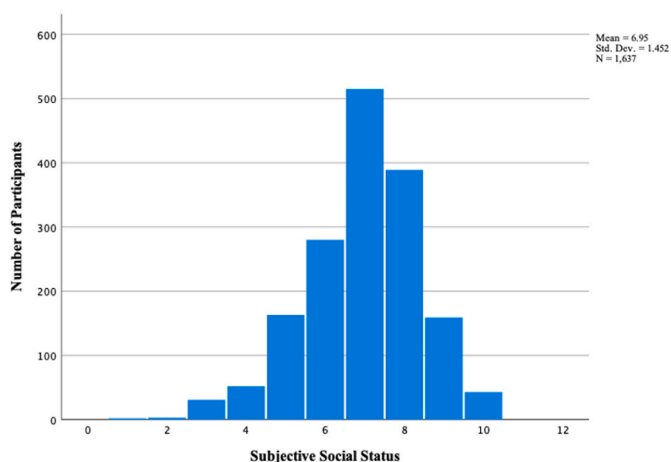


Fig. 1. Distribution of subjective social status.

Note: Subjective Social Status represent where respondents believe they stand in relation to others in the US. The higher values represent those who have more money, education, and better jobs whereas lower values represent those with the least money, education, and less favorable jobs.

mothers of school age children that took place prior to the pandemic (M = 3.4) (Sequeira et al., 2021).

The survey was completed between 69 and 423 days after the pandemic began, with the average days since the pandemic at time of response being 142.5 days or approximately 4–5 months.

Table 2 displays associations between predictors and depressive and generalized anxiety symptoms based on values obtained in the full model (Block 3). No differences in the associations between the covariates and either of the depressive and anxiety symptom outcomes across blocks were observed. Notable covariate effects include perinatal status, with pregnant women being more likely than postpartum women to report depressive symptoms, but less likely to report generalized anxiety symptoms. Pre-existing diagnoses also showed an effect: pre-existing

depression was positively associated with depressive symptoms and pre-existing generalized anxiety was positively associated with generalized anxiety symptoms. Comorbidity between depressive and generalized anxiety symptoms was also observed through their association. Higher number of life events was significantly associated with higher levels of generalized anxiety symptoms.

The addition of predictors in Block 2 and 3 were shown to be statistically significant in explaining model variance as demonstrated by R-squared values. When accounting for covariates, we observed a main effect of COVID-19-related health worries and depressive symptoms, with higher levels of SSS associated with lower levels of depressive symptoms but no main effect of COVID-19-related health worries. We then examined the potential moderating role of COVID-19-related health worries in the association between SSS and mental health symptoms. The final model yielded a significant moderating effect of COVID-19-related health worries ( $\beta = 0.193, p < .05$ ), on the association between SSS and depressive symptoms but not anxiety symptoms ( $\beta = -0.060, p > .05$ ). Analyses were stratified by pregnancy status to explore associations based those who were pregnant or in the postpartum period when participating in our study. No differences in the associations were observed based on pregnancy status.

We proceeded to use the PROCESS regression macro for IBM SPSS to perform a simple slopes test in order to examine effects at three values of the moderator (-1 SD below the mean, at the mean, +1 SD above the mean). As shown in Fig. 2, SSS was negatively associated with depressive symptoms but only for those reporting low COVID-19-related health worries ( $\beta = -3.48, t = -2.204, p < .027$ ). Fig. 3 displays only generalized anxiety level differences by COVID-19-related health worries ( $\beta = 0.248, p < .01$ ). For ease of interpretation, the values in the figures represent categorical predictors that are non-centered predictors. To clarify whether associations are driven by outliers or clustering, we display the distributions of outcomes by COVID-19-related health worry levels (Figs. 4 and 5). Here, we observe minimal clustering of low levels of anxiety symptoms at low and moderate COVID-19-related health worry levels and even less clustering of depressive symptoms.

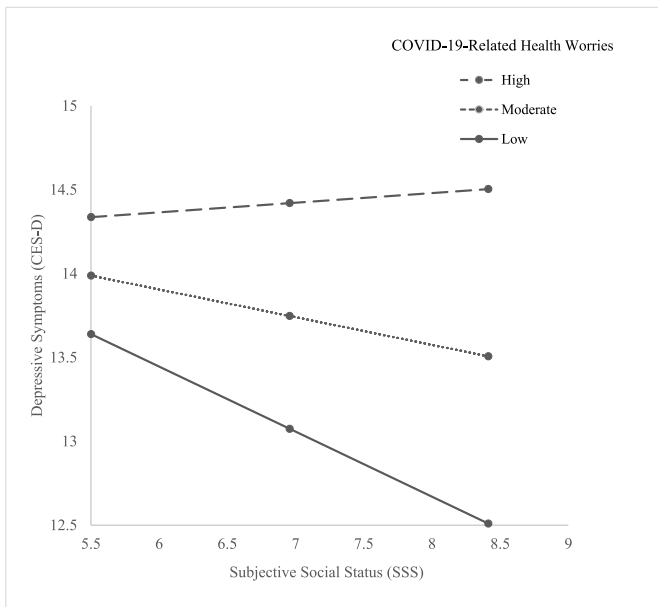
Table 2

Multiple regression predicting depression and generalized anxiety based on subjective social status (SSS) and COVID-19 related health worries in pregnant and postpartum women (values are based on the full model obtained in Block 3).

Blocks of variables entered in three steps	Depressive Symptoms				Generalized Anxiety Symptoms			
	B	$\beta$	$R^2$	$\Delta R^2$	B	$\beta$	$R^2$	$\Delta R^2$
<b>1. Covariates</b>			.552	.552***			.551	.551***
Maternal age	0.127	.052**			-0.064	-0.047**		
Maternal education (ref = less than college)								
College	-1.605	-.082**			0.646	0.059*		
Masters	-1.302	-.071*			0.374	0.037		
Doctorate	-0.830	-.035			0.590	0.045		
Household income (ref=< \$74,999)								
\$75,000–149,999	4.893	.050**			-1.170	-0.021		
\$150,000–224,999	0.093	.002			-0.359	-0.013		
≥\$225,000	0.243	.005			-0.375	-0.013		
Perinatal status (ref = postpartum)								
Pregnant	0.955	.053**			-0.505	-0.050**		
Pre-existing mental health diagnosis (ref = no)								
Depression	2.389	.098***			–	–		
Anxiety	–	–			0.793	0.067***		
Life events (sum)	0.223	.035†			0.314	0.088***		
Current mental health symptoms								
Depression	–	–			0.346	0.619***		
Anxiety	1.196	.669***			–	–		
Pandemic duration (days)	-0.005	-.033*			0.001	0.014		
<b>2. Predictors</b>			0.555	.003**			.584	.033***
Subjective social status (SSS)	-0.839	-.135*			0.040	0.012		
COVID-19 related health worries	-0.253	-.102			0.345	0.248**		
<b>3. Interaction term</b>			0.557	.001*			.583	.000
SSS x COVID-19 related health worries	0.059	0.193*			-0.010	-0.060		

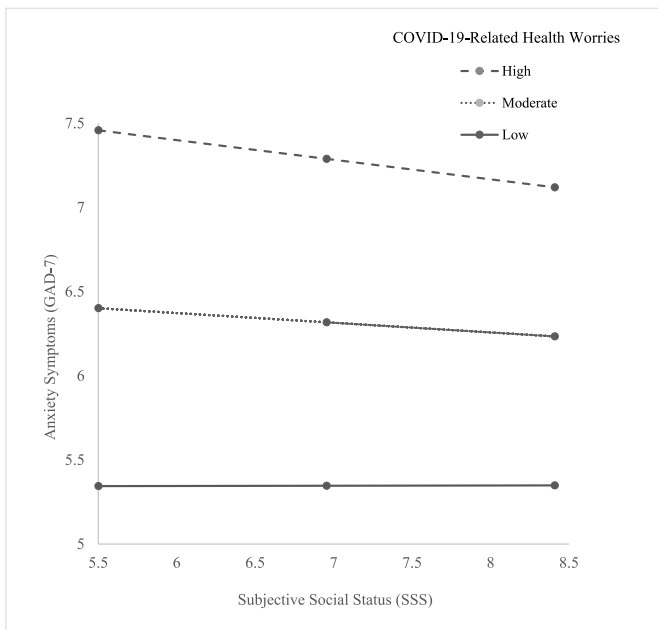
N = 1,637, †p < .1, \*p < .05, \*\*p < .01, \*\*\*p < .001.

Model does not include maternal race due to multicollinearity.



**Fig. 2.** Depressive symptoms based on SSS and COVID-19-related health worries.

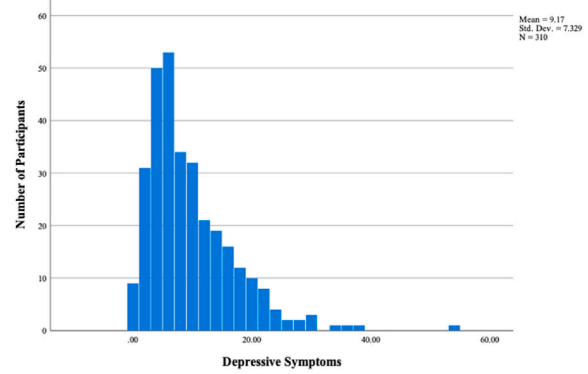
Note: Categorical levels were created based on whether participants responses were  $\pm 1$  SD from the mean values for COVID-19-related health worries and subjective social status. For COVID-19-health related worries with a mean of 11.94, this yielded the following levels: low (<8.31), moderate (8.31–15.56), and high (>15.56). For Subjective Social Status where the mean was 6.95, these levels corresponded to the following: low (<5.50), moderate (5.50–8.41), and high (>8.41).



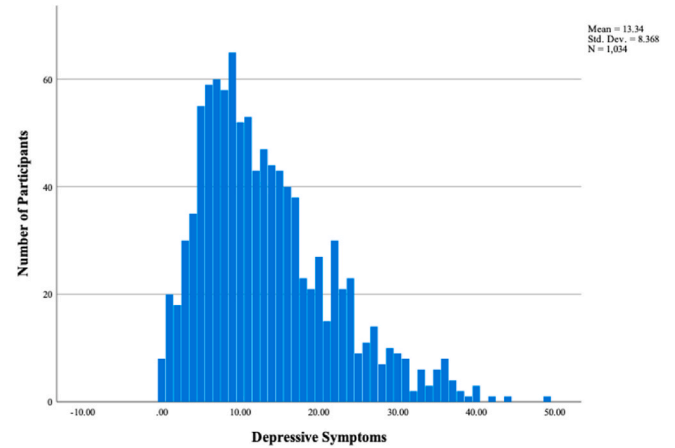
**Fig. 3.** Generalized anxiety symptoms based on SSS and COVID-19-related health worries.

Note: Categorical levels were created based on whether participants responses were  $\pm 1$  SD from the mean values for COVID-19-related health worries and subjective social status. For COVID-19-health related worries with a mean of 11.94, this yielded the following levels: low (<8.31), moderate (8.31–15.56), and high (>15.56). For Subjective Social Status where the mean was 6.95, these levels corresponded to the following: low (<5.50), moderate (5.50–8.41), and high (>8.41).

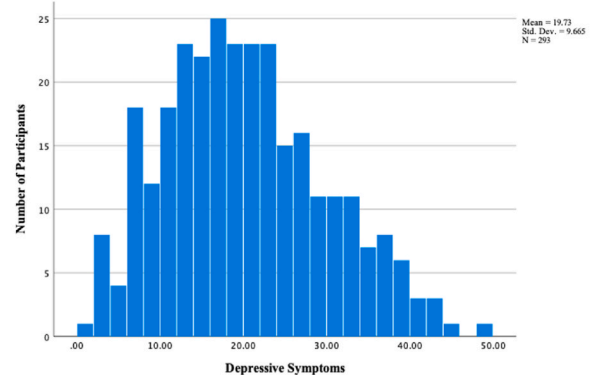
### Low COVID-19-Related Health Worries



### Moderate COVID-19-Related Health Worries



### High COVID-19-Related Health Worries

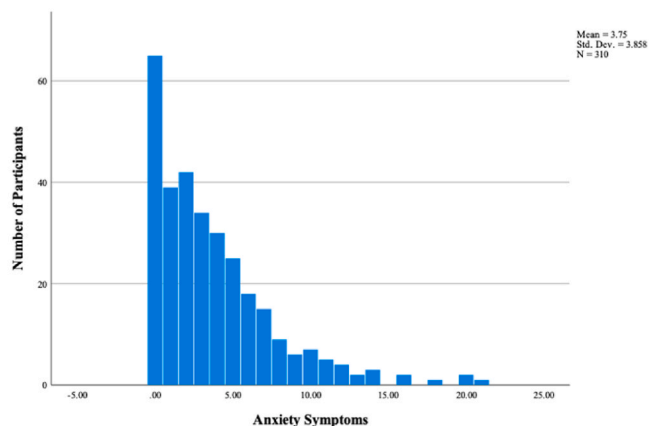


**Fig. 4.** Distribution of depressive symptoms by level of COVID-19-related health worries.

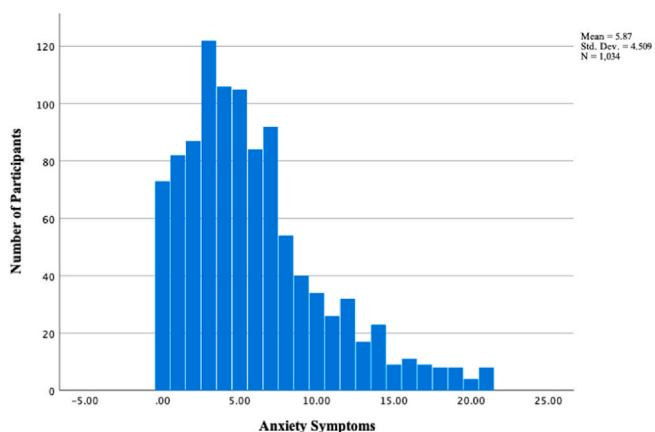
## 4. Discussion

The aim of this current study was to evaluate the moderating role of SSS on the effect of COVID-19 related health worries on mental health symptoms in U.S. perinatal women who were pregnant and who had given birth during the COVID-19 pandemic. Very little work has been conducted on the role of SSS on mental health during the COVID-19 pandemic. Our results were mixed with respect to the hypothesized direction of effects. First, SSS appeared to be protective against depressive symptoms, but specifically among those with low levels of COVID-19-related worries. No differences in depressive symptom levels across

### Low COVID-19-Related Health Worries



### Moderate COVID-19-Related Health Worries



### High COVID-19-Related Health Worries

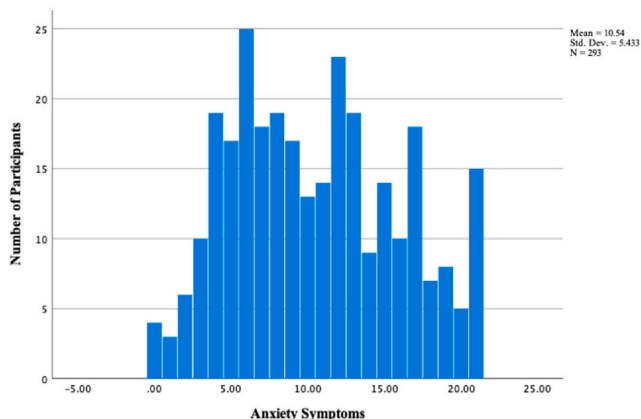


Fig. 5. Distribution of anxiety symptoms by level of COVID-19-related health worries.

SSS levels were observed among those who endorsed high levels of COVID-19-related worries. Second, whereas substantial evidence from pre-pandemic conditions have shown high SSS to be associated with lower levels of mental health symptoms, we did not find this to be true

for generalized anxiety symptoms. That is, COVID-19-related health worries but not SSS was associated with greater generalized anxiety symptoms.

One question is why higher SSS was only protective against depressive symptoms in those endorsing low COVID-19-related worries. A potential interpretation may arise from the unprecedented and uncertain nature of COVID-19 on health worries. High SSS may be sufficient for protecting against depressive symptoms for individuals who were not inclined to find COVID-19 to be as much of a threat to their and their family’s well-being. Perhaps more intriguing is that depressive symptoms did not vary by SSS among those with high levels of COVID-19-related health worries. Given the continued threat of COVID-19, one possible interpretation is that those with high levels of COVID-19-related health worries, regardless of SSS levels, engage greater fatalistic thinking regarding COVID-19 (e.g., there is no cure for the disorder, the virus is a death sentence). Exhibited across socioeconomic levels (Bell & Hetterly, 2014), fatalistic thinking has been linked to depressive symptoms during the pandemic (Hayes & Clerk, 2021). Moreover, subjective nearness-to-death – a concept that shares features of fatalism where one feels that life is approaching its end (Ring, Greenblatt-Kimron, & Palgi, 2020) – appears to be associated with elevated mental health symptoms among those worried about being infected by COVID-19 (Ring et al., 2020). Additionally, those who find uncertainty more challenging or those who are less psychologically flexible appear to be more vulnerable to health anxiety (Landi, Pakenham, Boccolini, Grandi, & Tossani, 2020; Wheaton, Messner, & Marks, 2021). Taken together, it is possible that those who are among the most worried about the health risks of COVID-19 do not possess a sense of agency in their situations, and this predisposes individuals to depressive symptoms despite the potential protection of having a high social status. COVID-19-related health worry might represent significant medical risks and generate uncertainty, fatalistic thinking, or a loss of agency that altogether disallows the buffering effect typically afforded by high SSS.

Some research suggests that higher SSS can be a liability in a pandemic, with a study of participants from China and the United States showing that among participants with ‘high perceived epidemic severity’, the propensity to engage in unethical behaviors (e.g., taking office supplies for personal purposes; borrow money from a cash register overnight without asking; receiving bribes from others due to your position and power) increased with the increase of SSS. In that study, the researchers hypothesized that people with high SSS were more sensitive to the threat of loss of status and control, thus having a propensity to engage in unethical behavior (Wang, Wang, Jiang, Wang, & Chen, 2021). In line with our findings, that study did not find an association amongst participants with low perceived epidemic severity. Taken together, individuals with high SSS may feel as if they have “more to lose” and may be motivated to preserve their perceived privileges in the context of COVID-19 related challenges; it is possible that such processes are involved in the elevated depressive symptoms observed in our study.

That high SSS did not show the expected buffering effect of COVID-19-related health worries on mental health symptoms could be particularly salient for pregnant and postpartum women. Understanding COVID-19 as a health risk may be qualitatively different among perinatal women compared to the broader population and SSS may not play a buffering role for the mental health during the perinatal period. During this period, women may experience fear associated with uncertain labor, delivery and postpartum procedures, and the separation from their partner and baby. Perinatal women may experience heightened concern about COVID-19 health risks, given the sense of responsibility and vulnerability in carrying a developing fetus and caring for an infant, and potential fear of transmitting the infection to their offspring. In a study of pregnant women from 64 countries conducted May to June of 2020, the majority of women reported worrying about the baby contracting COVID-19 (59%) and the lack of a support person during delivery (55%). In another study that took place even before that period, the

majority of an Italian sample of pregnant women (January to February 2020) reported fear of preterm birth (51.1%) and fetal growth restriction (65.2%) (Mappa, Distefano, & Rizzo, 2020). As more research is being conducted on the implications of COVID-19 on the physical and mental health of mothers and infants, there is more data that describes the implications involved in transmitting or contracting COVID-19 within this vulnerable population. According to the report by the Society for Maternal Fetal Medicine, these include greater risk for severe illness among pregnant women with COVID-19, and relatedly, greater risk for ICU admission and invasive ventilation, and death (Society for Maternal-Fetal Medicine (SMFM) (2020). The report also suggests that COVID-19 infection has the potential to increase the risk of stillbirth, cesarean delivery, and preterm birth (Society for Maternal-Fetal Medicine (SMFM), 2020). These findings in addition to the uncertainty of outcomes due to additional variants of COVID-19 may promote worries among this population (Lapinsky & Adhikari, 2021; Stock, Harmer, & Calvert, 2022). The potential for such risks suggests that the effects of COVID-19-related worries among those who report high levels of such worry may be universal regardless of SSS.

Given the downstream effects of altered perinatal mental health on maternal and child outcomes (Grace, Evindar, & Stewart, 2003), further research is needed to understand under what circumstances and for what populations SSS might exert any protective effects on mental health.

The association we observed between COVID-19-related health worries and generalized anxiety is consistent with the other emerging research on COVID-19-related health worries (Kira, Alpay, et al., 2021; Liu, Mittal, & Erdei, 2021, 2020; Warren et al., 2021; Wheaton et al., 2021) and contributes to evidence regarding perceived COVID-19-related health worries as a risk for generalized anxiety. These directions of effects are expected when considering COVID-19-related health worries as a representation of stress exposure, where increases reflect risk for the experience of anxiety symptoms (Kira, Shuwiekh, Ashby, Elwakeel, et al., 2021; Kira, Shuwiekh, Ashby, Rice, et al., 2021). However, SSS did not moderate this link as was the case for depressive symptoms as an outcome; it is possible that the nature of SSS does not operate in a way that affects generalized anxiety symptoms or that GAD-7 as a measure was not sensitive to possible effects of SSS. Additional research is needed to determine the conditions under which SSS might exert an effect on anxiety symptoms.

#### 4.1. Limitations

The limitations within this present study should be acknowledged. First, we relied on convenience sampling to obtain as many participants as possible, starting from the earlier phase of the pandemic (May 2020–June 2021). This period did not include the Omicron variant detected in the fall of 2021 that led to a subsequent surge in infection rates within the U.S. Thus, our findings may not generalize to other periods within the pandemic. As well, the self-selected nature of this sample may reflect a biased perspective. Although the participants in our sample showed a wide range of SSS, it is possible that SSS might operate differently among those from different SES backgrounds and in different racial backgrounds. For example, our sampling relied on those with access to the internet and thus findings may not reflect individuals without such resources. Furthermore, because our sample was mostly high-SES White women, it is possible that our findings do not capture a wider range of experiences and therefore caution is needed in generalizing the findings to all perinatal women. There is also uncertainty regarding the socioeconomic backgrounds of our participants, as those with the lowest income of \$75,000 may be a mix of individuals under the poverty line who may or may not be those who are students. For instance, high SSS among high-SES women may represent privileges that may differ greatly from high SSS among women of color with objectively low-SES. Second, although we used standardized measures as much as possible to increase validity, the data may be prone to recall bias given

the use of self-report, which may reduce internal validity. Third, the cross-sectional design disallows for causal interpretation, as such, it is possible that mental health symptoms influence the report of COVID-19-related health worries or SSS; even more, such symptoms may affect one's motivation or concentration in providing responses. Thus, future research is needed to determine how COVID-19-related health worries and SSS might exert effects on subsequent perinatal mental health outcomes.

## 5. Conclusion

SSS moderates the effects of COVID-19-related health worries on depressive symptoms in perinatal women, with high SSS protecting against depressive symptoms for women with low COVID-19-related health worries but not high COVID-19-related health worries. COVID-19-related health worries were associated with higher levels of anxiety symptoms; no effect of SSS on anxiety symptoms were observed. Although high SSS is generally considered to be protective against mental health concerns, it may not be sufficiently protective against depression for those who experience high levels of worries regarding the effects of COVID-19 on their health.

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## Author contributions

The authors designed the study. Liu analyzed the data. Liu and Koire wrote the first draft. All authors helped to revise the first draft.

## Ethical statement

Written consent was obtained from all study participants prior to the data collection. Procedures were approved by the Institutional Review Board at Mass General Brigham.

## Declaration of competing interest

None.

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