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Mental health among pregnant women with COVID-19–related stressors and worries in the United States

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Abstract

Background: Few studies have evaluated whether pandemic-related stressors, worries, and social distancing have affected the mental health of pregnant women during the COVID-19 pandemic.

Methods: Data came from an online survey of United States pregnant women (n = 715), conducted in May 2020. The Edinburgh Postnatal Depression Scale and Generalized Anxiety Disorder Scale were used to assess depressive symptoms, thoughts of self-harm, and moderate or severe anxiety. Multiple logistic regressions were used to examine the associations of COVID-19 experiences with mental health outcomes.

Results: Participants were racially diverse. The prevalence of adverse mental health outcomes was 36% for probable depression, 20% for thoughts of self-harm, and 22% for anxiety. Women who reported family members dying from COVID-19 had four times higher odds of having thoughts of self-harm than women who did not experience family death. Depression was more prevalent among women who canceled or reduced medical appointments. Women were more likely to have worse mental health outcomes if they expressed worry about getting financial or emotional/social support, about their pregnancy, or about family or friends. Strict social distancing was positively associated with depression. A higher proportion of adults working from home was inversely associated with depression and thoughts of self-harm.

Conclusion: High percentages of pregnant women had symptoms of depression or anxiety, suggesting an urgent need to screen and treat mental health conditions among pregnant women during the pandemic. Pandemic-related risks and protective factors are relevant to developing tailored interventions to address the mental health of pregnant women during pandemic circumstances.

KEYWORDS
COVID-19, pandemic, perinatal anxiety, perinatal depression, suicidal ideation

1 | INTRODUCTION

SARS-CoV-2, the novel coronavirus that causes COVID-19, has caused more than 1 million deaths globally.[1] High infectiousness in susceptible populations, the potential for severe disease and death, and the absence of a vaccine early in the pandemic may contribute to increased mental health stress. The anxiety that SARS-CoV-2 triggers stems from

factors including fear of contracting COVID-19 and worry about family members, friends, and acquaintances becoming infected.[2] Anxiety related to testing, feelings of guilt related to positive diagnosis, and feelings of despair and grief because of deaths within and outside family may also affect mental health. COVID-19 can also detract from mental health because of factors such as loneliness stemming from recommended mitigation strategies (eg, social distancing, quarantine, isolation)[3,4] and COVID-19-related job loss or changes in working location.[5]

Depression and anxiety are common mood disorders that typically affect one in seven pregnant women.[6,7] During the COVID-19 pandemic, pregnant women represent a uniquely vulnerable group.[8,9] With reduced social support, disruptions in traditional in-person prenatal care visits, and safety concerns about delivering a baby in a hospital,[10] we hypothesize that pregnant women may experience heightened depressive symptoms and anxiety.

To date, a growing number of studies have examined the prevalence of depression and anxiety among pregnant women worldwide.[11] At least four published studies have examined depression or anxiety among pregnant women living in the United States,[12-15] but the inferences are limited as these studies have been limited in scope and/or sample size.[12,13,15] Furthermore, few studies have directly investigated pregnant women's COVID-19-related stressors (such as income loss, change in medical appointments, and family death), self-reported worries, and social distancing practices in relationship to their mental health,[16] although these factors have been evaluated in the general population.[17-19] To effectively mitigate the negative impacts that a pandemic can have on women and infants, research is needed to advance understanding of COVID-19-related stressors, worries, and social distancing on the mental health of birthing people. The purpose of this study was to evaluate associations between COVID-19-related experiences and mental health outcomes (ie, depressive symptoms, thoughts of self-harm, and anxiety) among United States pregnant women.

2 | MATERIALS AND METHODS

2.1 | Study design

We conducted a cross-sectional, online survey of pregnant women early in the pandemic (May 6-8, 2020). The 126-question survey was designed to examine the impacts of the COVID-19 pandemic on pregnancy health, health behaviors, and prenatal care. Before beginning the survey, all participants were screened for the following eligibility criteria: 18-44 years of age, ≥8 weeks' pregnant, United States residence, and prenatal care status in the United States. The study's protocol was approved by the Institutional Review Board at the University of South Carolina, and all respondents consented to participate. To recruit a diverse sample of pregnant women that oversampled black or African American women, we advertised the study on group Facebook accounts for minoritized pregnant women, and within community health programs that served a large proportion of ethnically and racially diverse families. We capped enrollment for black women at 50% of our target sample size (n = 750).

A total of 881 survey responses were received. After excluding duplicate responses from the same IP address (n = 32) and responses from those whom: (a) did not meet the inclusion criteria (n = 46); (b) did not complete the survey (n = 48) or completed <90% of questions (n = 2); (c) reported an expected due date before the interview date (n = 9); or (d) had missing values for key variables (n = 31), 715 valid survey responses were analyzed.

2.2 | Independent variables: COVID-19–related experiences

Adapted from the Pandemic Stress Index,[20,21] COVID-19–related experiences were measured by: (a) COVID-19–related stressors, (b) COVID-19–related worries, (c) social distancing, and (d) changes in working arrangements among household adults. COVID-19–related stressors included the following: (a) family members in or outside the household dying from COVID-19 or related complications; (b) losing a source of income because of COVID-19; and (c) canceled or reduced medical appointments. Six questions were used to evaluate a woman's degree of COVID-19–related worries (Cronbach's α = 0.76 in our study sample) about: (a) their pregnancy, (b) friends and family, (c) stigma or discrimination, (d) having enough basic supplies, (e) getting emotional or social support from family, partners, a counselor, or someone else, and (f) receiving financial support from family, friends, partners, an organization, or someone else. These items measured similar domains (ie, own health, money problems, and relationship with family and friends) used in a validated Cambridge Worry Scale for pregnant women.[22] The scale included five response options: not at all (0), a little (1), sometimes (2), most of time (3), and all the time (4). A summary score of all 6 items was created (range: 0-24). Furthermore, women were asked whether they practiced social distancing (ie, reducing their physical contact with other people in social, work, or school settings by avoiding large groups and staying 3-6 feet away from other people). Women who responded "yes, very strictly" were coded as strictly social distancing vs. others ("yes, but not strictly" and "No, I am not"). Finally, the survey asked the number of adults (including the respondent) living in the household and the number of adults in the household who worked from home, who stopped working as a result of COVID-19, and who still worked outside the home despite COVID-19. Using the data, we derived two

measures to assess adults' working arrangements during the pandemic: (a) the percentage of adults working from home; and (b) most adults in the household stopped working as a result of COVID-19 (percentage of adults who stopped working ≥50%).

2.3 | Dependent variables: mental health measures

The validated Edinburgh Postnatal Depression Scale (EPDS)[6,23] (Cronbach's α = 0.75 in our sample) was used to screen for depressive symptoms in the 2 weeks before survey completion. Women who scored above 13 based on all 10 items were defined as probable depression.[23,24] The 10th item, thoughts of self-harm (ie, often, sometimes), was analyzed separately because of its severity.

The validated 7-item Generalized Anxiety Disorder Scale (Cronbach's α = 0.85) was used to evaluate anxiety experienced in the last 2 weeks.[25] The answer options were "not at all (0)," "several days (1)," "over half the days (2)," and "nearly every day (3)." Respondents with a summary score of all items ≥10 were categorized as experiencing moderate/severe anxiety. This cutoff point has been shown to have good sensitivity and specificity for identifying anxiety disorder, panic disorder, social anxiety disorder, and post-traumatic stress disorder.[25]

2.4 | Covariates

To control for confounding, the following covariates were considered:[26] age, race/ethnicity, education, annual household income, health insurance, employment status, parity, prepregnancy body mass index, pregnancy trimester, any diagnosis of pregnancy complications, and the census region (Northeast, Midwest, South, and West) of residence. Pregnancy complications included high blood pressure, HELLP, gestational diabetes, anemia, placenta previa, or other diagnoses.

2.5 | Statistical analyses

We first examined whether depressive symptoms, thoughts of self-harm, or moderate/severe anxiety was related to the above-mentioned covariates using the chi-square tests of independence. The bivariate associations of COVID-19 experiences with each mental health outcome were examined using the chi-square tests for categorical variables and t tests for continuous variables. Multiple logistic regressions were run to examine the associations of all COVID-19–related experiences with each mental health outcome while adjusting for covariates. To examine the robustness of our results and to improve our model efficiency, we also ran a model where we replaced the individual worry items with a summary worry score. Clustered standard

errors were used to account for heteroskedasticity across census regions. The variance inflation factor (VIF) was used to examine multicollinearity in regression variables. All analyses were conducted with SAS 9.4 (SAS Institute, Cary, NC, USA).

3 | RESULTS

Participants were racially diverse (44.1% non-Hispanic black, 9.4% Hispanic, and 38.9% non-Hispanic white), with representation from all 50 states and Washington, DC. The proportion of sample women residing in the South, West, Midwest, and Northeast census regions was 38.9%, 26.0%, 21.7%, and 13.4%, respectively. The majority of respondents had earned a bachelor's degree (62.8%) or higher (7.6%), worked full-time during pregnancy (64.9%), were multiparous (57.1%), were in the first (34.7%) or second (39.2%) trimester, and were normal weight before their pregnancy (81.1%). Over one-half (51.3%) lived in households with total annual incomes <$50 000 (Table 1).

Approximately 36% of women suffered from probable depression during pregnancy. One in five pregnant women reported thoughts of harming themselves. Nearly 22% of women reported anxiety during pregnancy (Table 1). More than two out of five (43.3%) women were identified as having probable depression or anxiety or both during pregnancy. Women with probable depression were more likely to report thoughts of self-harm than women who were not depressed (53% vs 1.3%). These women were also more likely to have symptoms of anxiety (41.5% vs 10.8%; data not shown). The percentages of probable depression, self-harm, and anxiety in each subcategory of sample characteristics are summarized in Table 1.

3.1 | COVID-19–related experiences

Early in the pandemic, 6% of pregnant women reported that one family member inside or outside their household died from COVID-19. About one-fourth (27.6%) of women reported lost income because of the COVID-19 pandemic, and nearly 60% canceled or reduced medical appointments (Table 2). On a 0-4 scale with 4 being the most worry, on average, pregnant women expressed low to moderate levels of worry, but worried most frequently about their friends and family (mean response 2.2), their pregnancy (2.1), having enough basic supplies (1.9), stigma or discrimination (1.8), and worried slightly less about getting emotional or social support (1.5) or financial support (1.4). Among pregnant women, 61.3% reported strictly practicing social distancing. Pregnant women reported that an average of 71.8% of adults in their households were working from home because of COVID-19; 17.3% of adults stopped working as a result of the pandemic, and 10.7% of adults continued to work outside the home (Table 2).

TABLE 1 Sample characteristics and mental health risk factors

	All participants	Depression		Self-harm		Anxiety	
	n (%)	%	P-value[a]	%	P-value[a]	%	P-value[a]
All, n (%)	715 (100.0)	260 (36.4)		144 (20.1)		157 (21.9)	
Age, y							
18-24	21 (2.9)	66.7	0.0001	28.6	0.20	28.6	0.007
25-29	343 (48.0)	31.8		17.8		16.6	
30-34	311 (43.5)	36.3		20.9		26.0	
35-40	40 (5.6)	60.0		30.0		32.5	
Race/ethnicity							
Hispanic	67 (9.4)	44.8	<0.0001	32.8	<0.0001	32.8	<0.0001
Non-Hispanic white	278 (38.9)	60.4		30.2		33.1	
Non-Hispanic black	315 (44.1)	14.0		9.8		5.4	
Non-Hispanic Other	55 (7.7)	32.7		12.7		47.3	
Education attainment							
Lower than bachelor's degree	212 (29.7)	54.2	<0.0001	33.0	<0.0001	33.0	<0.0001
Bachelor's degree	449 (62.8)	26.1		12.0		14.3	
Graduate degree	54 (7.6)	51.9		37.0		42.6	
Health insurance							
Private insurance only	465 (65.0)	18.7	<0.0001	8.8	<0.0001	14.6	<0.0001
Medicaid	108 (15.1)	74.1		48.1		38.0	
Other insurance	118 (16.5)	65.3		36.4		33.1	
No insurance	24 (3.4)	66.7		33.3		37.5	
Employment status							
Full-time employed	464 (64.9)	22.8	<0.0001	11.4	<0.0001	15.7	<0.0001
Part-time employed	128 (17.9)	58.6		44.5		39.8	
Out of work/homemaker	123 (17.2)	64.2		27.6		26.8	
Parity							
Primiparous	307 (42.9)	48.5	<0.0001	25.7	0.001	28.0	0.0007
Multiparous	408 (57.1)	27.2		15.9		17.4	
Trimester							
1st Trimester	248 (34.7)	21.0	<0.0001	11.3	<0.0001	9.7	<0.0001
2nd Trimester	280 (39.2)	38.2		19.3		23.9	
3rd Trimester	100 (14.0)	40.0		15.0		34.0	
Don't know	87 (12.2)	70.1		54.0		36.8	
Prepregnancy BMI							
Underweight	64 (9.0)	54.7	0.004	29.7	0.04	21.9	<0.0001
Normal	580 (81.1)	34.0		19.7		19.5	
Overweight/obese	71 (9.9)	39.4		15.5		42.3	
Any pregnancy complications							
No	580 (81.1)	29.1	<0.0001	14.1	<0.0001	17.1	<0.0001
Yes	135 (18.9)	67.4		45.9		43.0	
Census regions							
Northeast	96 (13.4)	39.6	0.11	26.0	0.09	19.8	0.52
Midwest	155 (21.7)	33.5		16.8		25.2	
South	278 (38.9)	32.0		17.3		19.8	
West	186 (26.0)	43.6		24.2		23.7	

Abbreviation: BMI, body mass index.

[a]P-values were based on the chi-square tests of independence.

TABLE 2 COVID-19–related experiences and depression in pregnant women

| COVID-19 Experiences | All | | | | |
	Mean ± SD or %	Depressed	Not depressed	P-value[a]	aOR (95% CI)[b]
All, n (%)	715 (100.0)	260 (36.4)	455 (63.6)		
COVID-19–related stressors					
Family members died from COVID-19					
No	672 (94.0)	33.0	67.0	<0.0001	1.0
Yes	43 (6.0)	88.4	11.6		2.9 (0.7-12.2)
Lost source of income					
No	518 (72.4)	23.4	76.6	<0.0001	1.0
Yes	197 (27.6)	70.6	29.4		1.2 (0.5-3.0)
Canceled or reduced medical appointments					
No	281 (40.1)	38.1	61.9	0.35	1.0
Yes	419 (59.9)	34.6	65.4		**1.3 (1.1-1.5)**
COVID-19–related worries, range 0-4					
Worrying about…..					
Your pregnancy	2.1 ± 0.9	2.3 ± 1.1	2.0 ± 0.9	0.0003	**1.2 (1.1-1.4)**
Your friends and family	2.2 ± 1.0	2.3 ± 1.1	2.1 ± 0.9	0.009	0.8 (0.7-1.0)
Stigma or discrimination	1.8 ± 1.1	2.1 ± 1.1	1.7 ± 1.0	<0.0001	1.2 (0.9-1.5)
Having enough basic supplies	1.9 ± 1.0	2.2 ± 1.0	1.8 ± 0.9	<0.0001	1.1 (0.8-1.5)
Getting emotional or social support	1.5 ± 1.2	2.2 ± 1.1	1.1 ± 1.1	<0.0001	**2.1 (1.5-3.1)**
Getting financial support	1.4 ± 1.2	2.1 ± 1.1	1.0 ± 1.1	<0.0001	**1.2 (1.2-1.3)**
Strictly social distancing					
No	277 (38.7)	34.3	65.7	0.36	1.0
Yes	438 (61.3)	37.7	62.3		**1.3 (1.0-1.6)**
Adults working arrangement in a household					
% of adults working from home	71.8 ± 33.1	51.0 ± 31.8	83.5 ± 27.7	<0.0001	**0.8 (0.7-1.0)**
Adults stopped working ≥50%[d]					
No	573 (81.9)	29.8	70.2	<0.0001	1.0
Yes	127 (18.1)	64.6	35.4		0.8 (0.5-1.4)

Abbreviations: aOR, adjusted odds ratios; CI, confidence interval; SD, standard deviation.

[a]*P*-values were based on the chi-square tests of independence for categorical variables or t tests for continuous variables.

[b]The multiple logistic regression model adjusted for all COVID-19 experiences listed in the table plus additional adjustment of age (categorical), race, education, health insurance, employment, parity, prepregnancy BMI categories, pregnancy trimester, any diagnosis of pregnancy complications, and census region. Odds ratios for covariates are presented in Table S1. Odds ratios in bold face are statistically significant at the 0.05 level. Sample size for the model was 649.

[c]aOR was measured per 10 percentage increase.

[d]The sample size was 700 because of missing values.

3.2 | Associations between COVID-19 experiences and mental health

3.2.1 | Depression

As shown in Table 2, after adjusting for all covariates and other COVID-19 experiences, depression was significantly higher among women who canceled or reduced medical appointments (adjusted odds ratio [aOR] 1.3 95% confidence interval [95% CI] 1.1-1.5) compared with those who did not have such experiences. The odds of depression was highest among those who reported worrying about getting emotional or social support (2.1 [1.5-3.1]), followed by worrying about the pregnancy (1.2 [1.1-1.4]) and worrying about getting financial support (1.2 [1.2-1.3]). Strict social distancing was also associated with higher odds of depression

TABLE 3 COVID-19–related experiences and thoughts of self-harm in pregnant women

	Self-Harm			
	Mean ± SD or %	No self-harm	*P*-value[a]	aOR (95% CI) [b]
All, n (%)	144 (20.1)	571 (79.9)		
COVID-19–related stressors				
Family members died from COVID-19				
No	16.5	83.5	<0.0001	1.0
Yes	76.7	23.3		**4.3 (2.8-6.4)**
Losing source of income				
No	11.6	88.4	<0.0001	1.0
Yes	42.6	57.4		1.2 (0.3-5.0)
Canceled or reduced medical appointments				
No	22.4	77.6	0.14	1.0
Yes	17.9	82.1		1.2 (0.7-1.9)
COVID-19–related worries, range 0-4				
Worrying about…..				
Your pregnancy	2.2 ± 1.1	2.1 ± 1.0	0.11	1.0 (0.9-1.1)
Your friends and family	2.3 ± 1.1	2.1 ± 1.0	0.07	0.7 (0.4-1.2)
Stigma or discrimination	2.1 ± 1.1	1.7 ± 1.0	<0.0001	1.2 (0.7-1.9)
Having enough basic supplies	2.3 ± 0.9	1.8 ± 1.0	<0.0001	1.1 (0.8-1.4)
Getting emotional or social support	2.2 ± 1.0	1.3 ± 1.2	<0.0001	1.2 (0.6-2.3)
Getting financial support	2.3 ± 1.1	1.2 ± 1.1	<0.0001	**2.1 (1.3-3.6)**
Strictly social distancing				
No	19.9	80.1	0.88	1.0
Yes	20.3	79.7		0.8 (0.5-1.1)
Adults working arrangement in a household				
% of adults working from home	48.5 ± 29.0	77.5 ± 31.5	<0.0001	**0.8 (0.7-0.9)**
Adults stopped working ≥50%				
No	15.9	84.1	<0.0001	1.0
Yes	37.8	62.2		1.6 (0.6-4.5)

Abbreviations: aOR, adjusted odds ratios; CI, confidence interval; SD, standard deviation.

[a]*P*-values were based on the chi-square tests of independence for categorical variables or t tests for continuous variables.

[b]The multiple logistic regression model adjusted for all COVID-19 experiences listed in the table plus additional adjustment of age (categorical), race, education, health insurance, employment, parity, prepregnancy BMI categories, pregnancy trimester, any diagnosis of pregnancy complications, and census region. Odds ratios for covariates are presented in Table S1. Odds ratios in bold face are statistically significant at the 0.05 level. Sample size for the model was 649.

[c]aOR was measured per 10 percentage increase.

(1.2 [1.0-1.6]). Each 10-percent increase in adults working from home was associated lower odds of depression (0.8 [0.7-1.0]).

3.2.2 | Thoughts of self-harm

Losing a family member because of COVID-19 (4.2 [2.8-6.4]) and worrying about getting financial support (2.1 [1.3-3.6]) were positively associated with thoughts of self-harm (Table 3). Adults working from home were inversely associated with thoughts of self-harm (0.8 [0.7-0.9]).

3.2.3 | Anxiety

Worrying about friends and family (1.4 [1.1-1.8]) and worrying about getting financial support (1.5 [1.1-1.8]) were positively associated with anxiety (Table 4).

In a model using a summary worry score, a one-unit change in the summary worry score was associated with higher odds of depression (1.2 [1.2-1.3]), thoughts of self-harm (1.2 [1.1-1.2]), and anxiety (1.2 [1.2-1.3]) (Table S2). Other reported significant associations for COVID-19 experiences were not changed. Several COVID-19 experiences became significant at the 0.05 level in these models, including: strictly social

TABLE 4 COVID-19–related experiences and anxiety in pregnant women

	Anxiety			
	Mean ± SD or n (%)	No anxiety	*P*-value[a]	aOR (95% CI)[b]
All, n (%)	157 (21.9)	558 (78.0)		
COVID-19–related stressors				
Family members died from COVID-19				
No	20.4	79.6	<0.0001	1.0
Yes	46.5	53.5		**1.6 (1.2-2.1)**
Losing source of income				
No	14.3	85.7	<0.0001	1.0
Yes	42.1	57.9		1.7 (0.7-4.1)
Canceled or reduced medical appointments				
No	21.7	78.3	0.82	1.0
Yes	21.0	79.0		1.3 (1.0-1.7)
COVID-19–related worries, range 0-4				
Worrying about…..				
Your pregnancy	2.6 ± 1.1	1.9 ± 0.9	<0.0001	1.3 (0.9-1.9)
Your friends and family	2.6 ± 1.1	2.0 ± 0.9	<0.0001	**1.4 (1.1-1.8)**
Stigma or discrimination	2.0 ± 1.2	1.8 ± 1.0	<0.0001	0.9 (0.7-1.1)
Having enough basic supplies	2.3 ± 1.1	1.8 ± 0.9	<0.0001	1.0 (0.7-1.5)
Getting emotional or social support	2.4 ± 1.1	1.2 ± 1.1	<0.0001	1.6 (1.0-2.7)
Getting financial support	2.3 ± 1.2	1.2 ± 1.1	<0.0001	**1.5 (1.1.-1.8)**
Strictly social distancing				
No	24.5	75.5	0.18	1.0
Yes	20.3	79.7		1.0 (0.7-1.5)
Adults working arrangement in a household				
% of adults working from home[c]	55.2 ± 34.6	76.4 ± 31.2	<0.0001	1.0 (0.9-1.2)
Adults stopped working ≥50%				
No	18.2	81.9	<0.0001	1.0
Yes	37.0	63.0		1.1 (0.7-1.9)

Abbreviations: aOR, adjusted odds ratios; CI, confidence interval; SD, standard deviation.

[a]*P*-values were based on the chi-square tests of independence for categorical variables or *t* tests for continuous variables.

[b]The multiple logistic regression model adjusted for all COVID-19 experiences listed in the table plus additional adjustment of age (categorical), race, education, health insurance, employment, parity, prepregnancy BMI categories, pregnancy trimester, any diagnosis of pregnancy complications, and census region. Odds ratios for covariates are presented in Table S1. Odds ratios in bold face are statistically significant at the 0.05 level. Sample size for the model was 649.

[c]aOR was measured per 10 percentage increase.

distancing (0.5 [0.3-0.9]) and losing income (2.2 [1.0-4.5]) for anxiety (Table S2).

3.3 | Sociodemographic and clinical correlates of mental health outcomes

Table S1 provides aORs for all sociodemographic and clinical correlates for each mental health outcome. Because of space limitations, we reported results only for race/ethnicity and several selected covariates with large aORs. Compared with non-Hispanic white women, women who identified as

non-Hispanic black, Hispanic, or non-Hispanic other had lower odds of depression (aOR range: 0.2, 0.3). Compared with women with private insurance only, Medicaid recipients and those without health insurance had higher odds of depression (aOR range: 5.5, 6.2). Hispanic women (aOR: 0.4) had lower odds of reporting thoughts of self-harm than non-Hispanic white women. Women with graduate educations (aOR: 2.4) had higher odds of reporting thoughts of self-harm. Non-Hispanic black women (aOR: 0.2) and women with bachelor's degrees (aOR: 0.7) had lower odds of anxiety. Non-Hispanic other women had higher odds of anxiety (aOR: 2.3).

4 | DISCUSSION

We found that at the height of the stay-at-home lockdown in the United States during the COVID-19 pandemic, at least two out of five (43.3%) respondents in a sample of United States pregnant women had either depression and/or anxiety, which was at least 2.5 times higher than the prepandemic prevalence among pregnant women.[27] The prevalence of depression (36%) in our sample was higher than the levels in China (29.6%), which used a lower cutoff point (≥10) to define depressive symptoms instead of the cutoff point of ≥13 in the present study.[28] Furthermore, the prevalence of depression was higher than that among United States adults aged ≥18 (30.9%) based on online surveys conducted during June 24-30, 2020.[29] This indicates that pregnant women in the United States were particularly at risk for mood disorders and poor mental health during the COVID-19 pandemic.

Consistent with several published studies among pregnant women[16] and in the general population,[17-19] this study further contextualized the pandemic-related risk factors that likely affect pregnant women's mental health. These risk factors include COVID-19–related general worries such as COVID-19 deaths in the family, financial distress (eg, losing income), and worries about getting emotional, social, and financial support, and social disruptions (eg, social distancing). Despite the necessity of frequent prenatal care visits to ensure maternal and fetal health, we found that 3 out of 5 women indicated canceled or reduced medical appointments, which was significantly related to depression. Evidence on social distancing in relation to mental health remains sparse. In the present study, strict social distancing was a risk factor for depressive symptoms, but a protective factor for anxiety. This suggests that strict social distancing may result in depressive symptoms from isolation, whereas it has the advantage of relieving anxiety of being infected by a potentially fatal virus. A noteworthy observation was that women from households with a higher percentage of adults working from home because of COVID-19 were less likely to experience depression and thoughts of self-harm, likely because of enhanced financial security, more social support, and reduced loneliness; we are not aware of any prior reports documenting this association.

Our findings have significant implications for public health policies and clinical care for pregnant women and population health in general. First, because untreated antenatal depression and other mood disorders can have negative consequences on pregnancy health,[6] the high prevalence of mood disorders among pregnant women highlights the need for prenatal screening for depressive and anxiety symptoms and efficient treatment referrals, and community outreach for mental health awareness for pregnant women during the COVID-19 pandemic. Mental health support and free and confidential crisis resources (eg, how to connect to a skilled, trained counselor locally) should be offered to pregnant women who experience significant COVID-19–related stressors. Second, the fact that most pregnant women experienced health care disruptions and associated adverse mental health outcomes highlights the need for clinical and policy interventions to facilitate virtual visits or in-person visits with appropriate safety protection at clinics. For women who face barriers to telehealth, timely assistance should be offered. It is important to develop multidisciplinary, integrated, community-wide interventions to improve perinatal mental health during this and future pandemics. For example, psychologists and psychiatrists can use the Internet and social media to share strategies for dealing with psychological stress: enhanced social support, eliminating stigma associated with mental health issues, telephone-based and Internet-based counseling, etc For low-income women, practitioners may refer them to trained social workers or community health workers working in federally funded programs for pregnant women. Lastly, the protective nature of some mitigation policies on mental health such as adults working from home and strict social distancing indicates the importance of continuation of these policies at workplaces or offering the flexibility of working arrangements for pregnant women and their family members during the pandemic. Our results concerning the negative impact of worry about family finances suggest that government policies that provide income to families in need during a pandemic may benefit the mental health of pregnant women.

The COVID-19 pandemic is a public health emergency. Because of structural racism, socially vulnerable groups have been disproportionately affected by the pandemic and existing inequities in health care access and outcomes have been exacerbated.[30,31] In this study, we aimed at recruiting a diverse sample of pregnant women (44% non-Hispanic black, 39% non-Hispanic white women) to examine this disparity. To our surprise, we found that non-Hispanic black women had significantly lower odds of depression and anxiety than non-Hispanic white women after adjusting for covariates. Another study also found lower rates of depression among minoritized groups during pandemic compared with prepandemic time.[13] This might be explained by the evidence that black women had higher resilience (eg, higher self-reliance and emotion regulation) than white women during the pandemic.[16,32] A contributing factor may be that the non-Hispanic black women who participated in our online survey were more educated and more advantaged than the general population of non-Hispanic black women in the United States. Compared with non-Hispanic white women, non-Hispanic black women in our sample were more likely to have a bachelor's degree, be in their first trimester, have more than one previous live birth, have private health insurance, and be employed full-time (data not shown). This impression is reinforced by the fact that in another study[16] that recruited more socially disadvantaged black women (eg, more likely to be single, Medicaid

recipients, coming from low socioeconomic neighborhoods), non-Hispanic black women had a higher crude prevalence of depression than non-Hispanic white women, though the racial difference in depression disappeared after adjusting for covariates.

The results of this study indicate the need for further research evaluating the impact of COVID-19 on mental health to improve treatment and mental health care planning for pregnant women. First, future studies are needed to evaluate the effects of COVID-19 on mental health in a representative sample of pregnant women in the United States, particularly to resolve the questions about potential racial disparities in mental health outcomes during the pandemic. Second, future studies are needed to examine the impacts of COVID-19–related stress and mental health problems on pregnancy health such as pregnancy complications, birth outcomes, and maternal and infant mortality. One recent study found pregnant women who experienced high stress during the COVID-19 pandemic were at risk for adverse birth outcomes.[33] Third, testing innovative telehealth interventions with the goal of preventing mental health problems and treating the psychological problems associated with the pandemic among pregnant women will advance evidence-based medicine in this area.

4.1 | Strengths and limitations

This study innovatively linked COVID-19–related stressors, worries, social distancing practices, and changes in working arrangements among household adults with pregnant women's mental health status using data from a racially diverse sample of United States pregnant women. Findings will be useful for policymakers and clinicians who are considering the mental health consequences of COVID-19 and planning mitigation strategies. The study has several limitations. First, women who participated in our survey are not fully representative of United States pregnant women. Participants had higher socioeconomic status than the general population, suggesting that the prevalence of depressive and anxiety syndromes may have been underestimated. Second, a diagnostic evaluation tool for depression or anxiety was not used; however, clinically validated screening instruments were adopted to assess symptoms. Third, our COVID-19–related stressors and worries were adapted from a validated pandemic stress index[21] ; yet, these measures have not yet been validated among pregnant women. Furthermore, this study captured mental status among pregnant women in May 2020; the prevalence of mental health problems and the magnitude of those associations may have varied as the pandemic continued. Moreover, pregnancy status was self-reported, thus increasing the likelihood of measurement error. Lastly, using

a cross-sectional design, we cannot examine the causal association between COVID-19 experiences with mental health outcomes.

5 | CONCLUSION

Every three months, approximately one million women in the United States are giving birth during a global pandemic.[34] Meeting the mental health needs of pregnant people during the COVID-19 pandemic is critical because mental health disorders in pregnancy can have devastating effects on women, infants, and families.[6] To date, the empirical evidence about the mental health impact of this pandemic in pregnancy in the United States is still limited and based on cross-sectional studies. Our finding of markedly elevated prevalence of depressive symptoms, thoughts of self-harm, and anxiety symptoms associated with the COVID-19 pandemic suggest the urgent need to screen, prevent, and treat these conditions among pregnant women. Although effective interventions for pregnant women are still exploratory, the high prevalence of mental health problems in pregnant women highlights the need for clinical interventions to address maternal mental health during and beyond the COVID-19 pandemic.

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SUPPORTING INFORMATION

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