Early effects of the COVID-19 pandemic on fertility preferences in the United States: an exploratory study

Christine H. Naya, M.P.H.,[a] Darby E. Saxbe, Ph.D.,[b] and Genevieve F. Dunton, Ph.D.[a,b]

[a] Department of Preventive Medicine, Keck School of Medicine, and [b] Department of Psychology, University of Southern California, Los Angeles, California

Objective: To explore early disparate impacts of the COVID-19 pandemic on fertility preferences

Design: Cross-sectional study

Setting: Online survey questionnaire

Patient(s): A total of 440 female participants who were trying to conceive (TTC) in the past year or currently are TTC.

Intervention(s): No interventions administered.

Main Outcome Measure(s): Change in fertility preference

Result(s): Approximately 1 in 3 participants reported changing their fertility preferences because of the COVID-19 pandemic. Of those that reported changing their fertility preferences, 23.9% reported TTC earlier and 61.6% reported TTC later. Preliminary findings show the odds of changing fertility preferences in black or African American women were 5.45 (95% confidence interval [CI], 1.50–19.90) times that of white women and in nonheterosexual women were 2.76 (95% CI, 1.41–5.42) times that of heterosexual women. Furthermore, every 1 unit increase in state anxiety and depressive symptoms was associated with a 26% (95% CI, 3%–54%) or 17% (95% CI, 5%–31%) increase in odds of pushing back TTC, respectively.

Conclusion(s): This exploratory study highlights how the fertility preferences of racial and ethnic minorities, sexual minorities, and those experiencing mental health issues may be disparately influenced by the pandemic. Research is needed to examine further the disparate effect of the COVID-19 pandemic on fertility preferences. (Fertil Steril® 2021;116:1128–38. ©2021 by American Society for Reproductive Medicine.)

El resumen está disponible en Español al final del artículo.

Key Words: Coronavirus, COVID-19, pandemic, fertility preference, disparity

F&S **DIALOG:** You can discuss this article with its authors and other readers at https://www.fertstertdialog.com/posts/32184

The unprecedented toll of the COVID-19 pandemic has re-shaped many people's social landscape, including their family planning. Fertility preferences—individuals' choices and desires around number of children and/or timing of births—often are informed by personal health, financial, and social considerations and the broader socioeconomic context (1, 2). The process around trying to conceive (TTC) can differ for each individual or couple and can range from discussing pregnancy plans to making changes to one's health behaviors, finances, and housing to better accommodate a growing family (3).

Between the pandemic-related economic uncertainty, social distancing mandates, and restrictions in everyday functions, the prospect of pregnancy became increasingly complicated for people who were TTC (4). A study conducted in Italy found that more than 1 in 3 respondents who were planning to have a child before the COVID-19 pandemic abandoned their intention (5). Another study in the United States reported that one-third of their participants wanted to become pregnant later or wanted fewer children because of the

pandemic. On the other hand, both studies also found 10%–20% of their participants who did not previously intend for a child now reported wanting a child or wanting to have a child sooner because of the pandemic (5, 6). Therefore, the COVID-19 pandemic seems to be leading to conflicting changes in fertility preferences.

These inconsistencies could be in part because of demographic, socioeconomic, and health disparities that are becoming exacerbated by the pandemic. For example, a recent study conducted in the United States in the spring over the week of April 30–May 6, 2020 found that among 2,009 cisgender women between 18 and 49 years of age who were sexually active in the United States, black and Hispanic women, in comparison to white women, were more likely to report wanting to have children later or wanting fewer children because of the pandemic (6). Queer women compared with straight women and lower-income women compared with higher-income women also reported similar changes in fertility preference (6). These findings suggest that the fertility preferences of socially disadvantaged groups, such as racial/ethnic minorities, sexual minorities, and low-income populations, may be disproportionately affected by the COVID-19 pandemic. However, this previous study focused on adult women, regardless of prepandemic pregnancy intentions (6). Therefore, it is unclear whether the disparate influence of the COVID-19 pandemic on fertility preferences also exists among those who were TTC.

In March and April of 2020, various medical professional societies in the United States, as well as state and local governments, recommended the limitation of nonemergency medical care to prioritize health care resources for those caring for COVID-19 patients (7). However, people who were TTC before the pandemic may already have begun altering their lifestyle, health behaviors, and finances, and seeking medical care to prepare for the future child. Thus, the impact of the COVID-19 pandemic on fertility preferences may have been heightened further among those who were TTC (8). Identifying disparities in this group is especially important so that the clinical providers can be aware of those who may need extra support and care on their "TTC journey" during the pandemic.

This exploratory study investigated the early impact of the COVID-19 pandemic (between May 2020 and July 2020) on the fertility preferences of people who were TTC in the past year or currently are TTC. We explored the potential disparate impact of the COVID-19 pandemic on fertility preferences by examining differences in demographic characteristics, financial status/ access to health care, COVID-19–related experiences, and physical, reproductive, and mental health by comparing those who did or did not change their fertility preferences because of the pandemic (Aim 1). Then, among those who reported changing their fertility preferences, we examined differences in demographic characteristics, financial status/access to health care, COVID-19–related experiences, and physical, reproductive, and mental health comparing those who chose to try to conceive later than previously intended and those who chose to try to

conceive earlier than previously intended because of the pandemic (Aim 2).

MATERIAL AND METHODS
Study Design

The University of Southern California "Trying to Conceive during COVID-19" study explored how the COVID-19 pandemic affected people's fertility preferences in the United States. An online survey was completed between May 15, 2020, and July 13, 2020 via the survey platform Qualtrics (Qualtrics, Provo, UT) in English. The survey began with an online screening form, where all potential participants answered questions pertaining to the inclusion criteria. Then, the eligible participants were provided with an informed consent sheet asking for an electronic signature. On completion of the survey, the participants were entered into a lottery to win one of twenty $40 gift cards. The institutional review board at the University of Southern California approved all aspects of this study (UP-20-00390).

Recruitment and Participants

An online convenience sampling strategy was used to recruit adults living in the United States during the COVID-19 pandemic. The study was promoted through social media platforms (e.g., Instagram, Facebook, Reddit, Twitter, and LinkedIn), email list servers for universities and academic societies, and online message boards focused on fertility and conception. Inclusion criteria for recruitment were as follows: living in the United States; age of 18 years or older; biological sex at birth as female; currently not pregnant; and TTC in the past year or currently TTC.

Measures

Demographics. The participants reported their age, ethnicity, race, sex, sexual orientation, highest level of education attained, marital status, household size, and number of children. These measures were included in the study as previous studies have found that one's fertility preferences and reproductive health significantly differ by these demographic factors (9–13). For example, unmarried women, more educated women, older women, and women with higher number of children are less likely to want more children (9, 10), nonheterosexual women are less likely to receive clinical contraceptive counseling (11), and white women and those with higher socioeconomic status are more likely to receive fertility treatment (12, 13).

Financial status/ access to health care resources. The participants were asked to report their annual household income, employment status, current health insurance status, and access to parental leave (i.e., family leave or maternity leave). Parental leave was defined as the right for employees with 12 months' service to take up to 18 weeks of unpaid leave to care for a child before the child's 18th birthday. People who are employed, have health insurance coverage, and report higher income are more likely to use reproductive health

care and fertility treatment (12, 14), and access to parental leave increases people's intended number of children (15).

Mental health and social support. Four separate mental health-related measures were included in the survey as these measures are known correlates of fertility preferences. Increased perceived stress is associated with decrease in fertility intention (measured via the fertility intension scale developed by Li et al. [16]), whereas increased social support from family and friends is positively associated with fertility intention (17). Qualitative studies also have found higher anxiety in general, specifically about financial issues, and these issues decrease people's desire for more children (18), and changes in fertility treatment are correlated with both anxiety and depressive symptoms (8).

Anxiety. We used the 6-item short-form of the State-Trait Anxiety Inventory and only focused on state anxiety, where the participants indicated how calm, tense, upset, relaxed, content, and worried they felt right now at this moment (19). Prorated summary scores, which ranged from 20–80, were comparable to the full-form, with higher scores representing more anxiety. The measure of internal consistency, Cronbach's alpha, was 0.84.

Depression. The 10-item Center for Epidemiologic Studies Depression (CESD) Scale was used to measure self-reported depressive symptoms. The participants reported how often they felt or behaved a certain way in the previous week, and scores ranged from 0–30, with higher scores representing more depressive symptoms (20, 21). The Cronbach's alpha was 0.85.

Perceived stress. We used the 4-item Perceived Stress Scale (PSS) that asked about subjective stress levels during the past month (22). The summary scores ranged from 0–16, and higher values indicated more stress (23). The Cronbach's alpha was 0.75.

Social support. Lastly, we also implemented the 12-item Interpersonal Support Evaluation List. The summary score ranged from 12–48, and higher scores represented higher perceived social support. The Cronbach's alpha was 0.84.

Physical health. The participants reported on their current perceived health status on a scale from 1 (Poor) to 5 (Good) or cannot judge based on the scale validated by Miilunpalo et al. (24). Self-reported subjective health status is a validated health status indicator, and poor subjective health is associated with desire to stop childbearing (25). Actual health status also may affect future fertility preferences; for example, living with a chronic illness or sexually transmitted disease could influence one's desires and intentions for childbearing, especially when informed of any potential risks to the future child (26, 27). Thus, we also assessed health factors specific to COVID-19, such as underlying medical conditions known to increase the risk of severe illness based on the Centers for Disease Control and Prevention guidelines (28).

COVID-19-related experiences. In addition, we expected the COVID-19 pandemic may differentially affect people's fertility preferences based on how much their daily life was upended or impacted by the pandemic. Therefore, we also adopted the Epidemic-Pandemic Impacts Inventory's

questions on the participants' physical distancing, quarantine, and COVID-19 infection history during the past 3 months (29).

Reproductive health and fertility preferences. The participants reported how long they have been TTC and their method (e.g., natural conception or assisted reproductive technology [ART]) before the pandemic and currently. In addition, the participants shared whether their fertility preferences changed or remained unchanged because of the COVID-19 pandemic. If the participants answered that their preferences changed, they then answered how they were altered, such as "Sped up timeline (TTC earlier than previously intended)," "Pushed back timeline (TTC later than previously intended)," "Made permanent decision to stop TTC," "Try an alternative way to TTC," or "Other."

Statistical Analysis

All statistical analyses were conducted using SAS v9.4 (30). First, we examined the descriptive statistics. Then, we conducted a variable screening process via χ^2 tests or Fisher's exact test (when the χ^2 test assumption was not met) and Student's t tests to compare participant characteristics between those who reported not changing or changing their fertility preferences because of the pandemic.
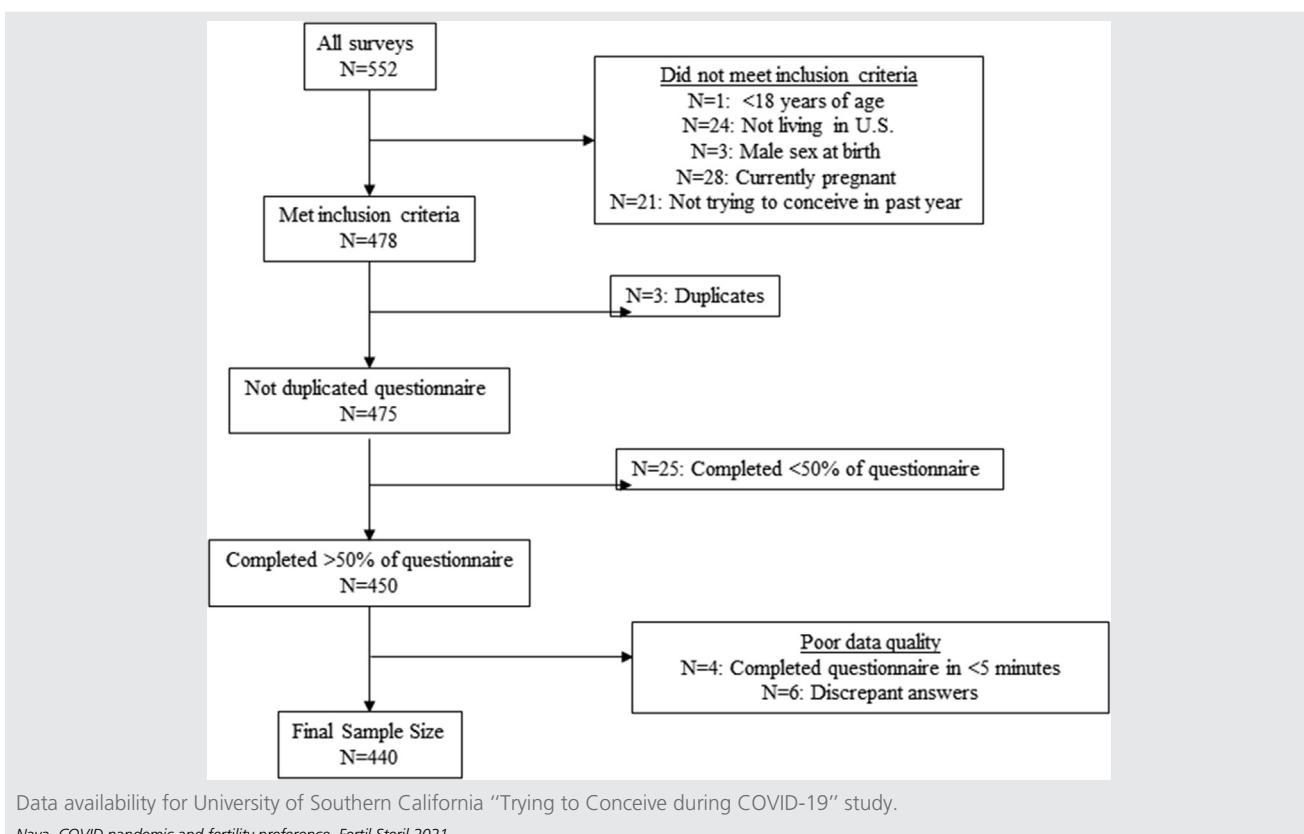
To build the exploratory stepwise logistic regression model, we took a hybrid qualitative and quantitative approach to model building by considering findings from currently available research on the pandemic's disparate impact on fertility preferences and findings from our data-driven variable screening process. We first began with including demographic variables (race, sexual orientation, and income) that have been identified explicitly by Lindberg et al. (6) as key variables that drive the differential effect of the COVID-19 pandemic on fertility preferences in the United States. Then, in a stepwise fashion, we included other variables associated with change in fertility preferences ($P < .1$) that were identified on the basis of the variable screening process. The traditional choice of significance level for variable selection in a stepwise model is either 0.05 or 0.10 (31, 32). Given the exploratory nature of this study, we considered the higher significance level for variable selection so that the potential variables relevant to the outcome were not missed and to avoid eliminating variables that may be less significant but carry practical and clinical implications (33).

We then repeated these steps in the subset of participants that reported changing their fertility preferences to examine differences in the participant characteristics between those who were TTC later than previously intended compared with those TTC earlier.

RESULTS
Data Availability and Participant Characteristics

A total of 552 potential participants clicked on the survey link and began the online screening form. On the basis of the screening, 74 did not meet the inclusion criteria and 478 filled

FIGURE 1

Data availability for University of Southern California "Trying to Conceive during COVID-19" study.

Naya. COVID pandemic and fertility preference. Fertil Steril 2021.

out the questionnaire. We dropped 3 duplicate observations, 25 participants who failed to complete 50% of the questionnaire, and 10 responses with suspected poor data quality, where participants completed the questionnaire in less than 5 minutes (n = 4) or participants reported discrepant answers by marking the first/last answer for the entire questionnaire (n = 6). The final sample for Aims 1 and 2 consisted of 440 participants. For Aim 3, we conducted the analyses in the subset of participants who reported speeding up or pushing back TTC (n = 104).

Of the 440 participants, 368 (83.6%) completed the questionnaire in its entirety on average 13.9 minutes. The full consort diagram can be found in Figure 1.

Descriptive Statistics

Descriptive statistics of the participants can be found in Table 1. The participants in this study ranged from 21–44 years, with an average age of 30.9 years (SD = 3.5). Most of our participants identified as not Hispanic (90.0%), female (98.4%), and heterosexual (85.6%). The majority of our participants identified as white (83.0%); followed by 9.7% Asian, Native Hawaiian, or Pacific Islander; 3.9% black or African American; and 3.5% American Indian, Alaska Native, or Other. This study population reported very high socioeconomic status, with more than half (55.2%) of our participants having attained

a graduate degree and the majority (76.6%) were full-time employees with an annual household income above $100,000 (63.0%). Most of our participants were married (92.7%), currently had no children (79.1%), and lived in a household of two (74.3%). Most also reported having health insurance (98.4%) and parental leave (73.4%).

In this study, the mean score for the State-Trait Anxiety Inventory-6 was 46.9 (SD = 10.1). This score was higher than previously documented averages for adult women, which ranged between 37.1 and 39.9 (34). The average CESD-10 score was 10.8 (SD = 5.9), with more than half (54.8%) of the participants classified as having clinically relevant depression (CESD-10 of ≥10). This score also is above the average CESD-10 score of 4.97 and average 10% prevalence of depression documented in previous large scale studies of adult women in the United States (35). However, a recent study reviewing the impact of COVID-19 pandemic on mental health has found the average prevalence of anxiety-related symptoms to have increased from 6.33% to 50.9% and depressive symptoms to have increased from approximately 14.6% to 48.3% (36). Average PSS-4 score was 6.7 (SD = 2.8), which is comparable to the population norm for the PSS-4 score of 6.11 (SD = 3.14) in an English-speaking sample (37). The average Interpersonal Support Evaluation List score was 40.3 (SD = 5.8), which is comparable to previously reported mean scores ranging from 30–45 (38, 39).

TABLE 1

Descriptive characteristics of 440 participants.

Variables	(n, row %) or (mean, SD)
Demographics	
Age	30.9 (3.5)
Ethnicity	
Hispanic	44 (10.1%)
Not Hispanic	394 (90.0%)
Race	
White	360 (83%)
Black or African American	17 (3.9%)
Asian, Native Hawaiian, or Pacific Islander	42 (9.7%)
American Indian, Alaska Native, or Other	15 (3.5%)
Sex	
Female	433 (98.4%)
Not Female	7 (1.6%)
Sexual orientation	
Heterosexual	376 (85.5%)
Not Heterosexual	64 (14.6%)
Highest education attained	
High school	2 (0.5%)
Some college	30 (6.8%)
Associate degree (2 year)	10 (2.3%)
Bachelor's degree (4 year)	155 (35.2%)
Graduate degree	243 (55.2%)
Marital status	
Married/domestic relationship	408 (92.7%)
Cohabiting, but not married	21 (4.8%)
Single, divorced, separated	11 (2.5%)
Household size	
1	9 (2.1%)
2	326 (74.3%)
3	74 (16.9%)
4	18 (4.1%)
5 or more	12 (2.7%)
No. of children	
None	348 (79.1%)
1	74 (16.8%)
≥2	18 (4.1%)
Financial status/ access to health care resources	
Annual household income	
<$60,000	49 (11.1%)
$60,000–$99,999	114 (25.9%)
$100,000–$149,999	136 (30.9%)
>$150,000	141 (32.1%)
Employment status	
Full-time employee	337 (76.6%)
Part-time employee	17 (3.9%)
Self-employed	19 (4.3%)
Student/trainee	21 (4.8%)
Unemployed	38 (8.6%)
Other	8 (1.8%)
Health insurance	
Currently insured	431 (98.4%)
Not currently insured	7 (1.6%)
Parental leave	
Yes	323 (73.4%)
No	82 (18.6%)
Do not know	35 (8%)
Mental health	
Trait anxiety (Spielberger State-Trait Anxiety Inventory-6 Prorated)	46.9 (10.1)
Depressive symptoms (Center for Epidemiologic Studies Depression-10)	10.8 (5.9)

Naya. COVID pandemic and fertility preference. Fertil Steril 2021.

TABLE 1

Continued.

Variables	(n, row %) or (mean, SD)
Perceived stress (Perceived Stress Scale-4)	6.7 (2.8)
Social support (ISEL)	40.3 (5.8)
Physical health	
Perceived health status	
Good	210 (52.8%)
Fairly good	113 (28.4%)
Average	67 (16.8%)
Fairly poor	8 (2%)
Chronic medical conditions	
None	375 (85.2%)
At least 1	65 (14.8%)
COVID-19-related experiences	
Isolation/quarantine	
Not isolated or quarantined	307 (69.8%)
Isolated or quarantined	133 (30.2%)
Family isolation/quarantine	
Not isolated or quarantined	339 (77.1%)
Isolated or quarantined	101 (23.0%)
Symptoms/tests	
No symptoms or positive test	391 (88.9%)
COVID-19 symptoms or tested positive	49 (11.1%)
Medical/Hospital	
Did not receive medical treatment/ hospitalization	437 (99.3%)
Received medical treatment or hospitalized for COVID-19	3 (0.7%)
Family symptoms/tests	
No symptoms or positive test	342 (82.2%)
COVID-19 symptoms or tested positive	74 (17.8%)
Reproductive health	
Length trying to conceive	
1–6 mo	261 (59.3%)
6–12 mo	108 (24.6%)
1 y	71 (16.1%)

ISEL = Interpersonal Support Evaluation List.

Naya. COVID pandemic and fertility preference. Fertil Steril 2021.

Most of our participants reported good perceived health status (52.8%) and did not have any chronic medical conditions known to increase the risk of COVID-19 infection (85.2%). Approximately 1 in 10 participants had tested positive or reported COVID-19 symptoms, and less than 1% were hospitalized for COVID-19 symptoms. Approximately 30% of the participants had isolated or quarantined themselves because of possible exposure, COVID-19 symptoms, or existing health conditions. Approximately 1 in 4 participants reported that their close family member was isolated or quarantined due to the pandemic, and 17.8% reported that their close family member tested positive or showed COVID-19 symptoms.

More than half of our participants (59.3%) had been TTC for 1–6 months, 24.6% had been TTC for 6–12 months, and 16.1% had been TTC for >1 year. Most of our participants were TTC naturally before the pandemic (72.2%), and this rate increased during the pandemic (82.1%). The prevalence of ART did not change from before the pandemic (12.3%) to

TABLE 2

Stepwise logistic regression model predicting change in fertility preferences in 440 participants.

Dependent variable:
Fertility preferences have changed due to the pandemic (1)
Fertility preferences have not changed due to the pandemic (ref:0)

Variables	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)
Demographics				
Age	1.05 (0.98, 1.12)	1.05 (0.99, 1.12)	1.04 (0.97, 1.12)	1.05 (0.98, 1.13)
Race (ref: White)				
Black or African American	3.51 (1.23, 10.03)[a]	3.59 (1.25, 10.26)[a]	4.76 (1.40, 16.19)[a]	5.45 (1.50, 19.90)[a]
Asian, Native Hawaiian, or Pacific Islander	1.08 (0.52, 2.22)	1.10 (0.53, 2.27)	1.21 (0.56, 2.62)	1.27 (0.57, 2.82)
American Indian, Alaska Native, or Other	1.85 (0.61, 5.59)	2.18 (0.70, 6.78)	2.73 (0.82, 9.07)	2.88 (0.86, 9.69)
Sexual Orientation (ref: Heterosexual)				
Not heterosexual	1.63 (0.92, 2.9)	1.59 (0.89, 2.85)	2.32 (1.22, 4.40)[a]	2.76 (1.41, 5.42)[a]
Marital status (ref: Married/ domestic relationship)				
Cohabiting, but not married	2.00 (0.81, 4.97)	1.74 (0.68, 4.44)	1.31 (0.47, 3.59)	1.41 (0.50, 3.98)
Single, divorced, separated	0.88 (0.22, 3.51)	0.90 (0.23, 3.62)	0.83 (0.19, 3.67)	0.91 (0.19, 4.40)
Financial status/access to health care resources				
Annual household income				
<$60,000	0.83 (0.38, 1.85)	0.84 (0.37, 1.9)	0.92 (0.38, 2.26)	0.8 (0.32, 2.01)
$60,000–$99,999	0.89 (0.50, 1.56)	0.84 (0.47, 1.49)	0.90 (0.49, 1.68)	0.87 (0.46, 1.65)
$100,000–$149,999	0.81 (0.47, 1.38)	0.78 (0.46, 1.34)	0.86 (0.48, 1.54)	0.90 (0.50, 1.63)
Health insurance (ref: Currently insured)				
Not currently insured		6.00 (1.09, 33.05)[a]	5.96 (0.58, 61.18)	10.26 (0.91, 115.28)
Physical health				
Perceived health status (ref: Good)				
Fairly good			0.91 (0.54, 1.56)	0.88 (0.51, 1.52)
Average			0.63 (0.32, 1.25)	0.69 (0.35, 1.39)
Fairly poor				
COVID-19-related experiences				
Family isolation/quarantined (ref: Not isolated or quarantined)				
Isolated or quarantined			0.59 (0.33, 1.06)	0.54 (0.30, 0.98)
Reproductive health				
Length trying to conceive (ref: 1–6 mo)				
6–12 mo				0.28 (0.14, 0.55)
>1 y				0.67 (0.34, 1.3)

CI = confidence interval.
[a] $P < .05$.

Naya. COVID pandemic and fertility preference. Fertil Steril 2021.

during the pandemic (12.7%); 12 participants reported having to stop their ART because of the pandemic.

Approximately 1 in 3 (29.6%) participants reported changing their fertility preferences because of the COVID-19 pandemic. Of those that reported changing their fertility preferences, 23.9% reported TTC earlier than previously intended, 61.6% reported TTC later than previously intended, 3.9% reported trying an alternative plan (e.g., stopped ART and now trying to conceive naturally), and 0.8% reported permanently choosing to stop TTC.

Aim 1: Differences in Demographic Characteristics, Financial Status/Access to Health Care, COVID-19-Related Experiences, and Physical, Reproductive, and Mental Health Among Those Who Changed Their Fertility Preferences Because of the Pandemic

We compared demographic characteristics, financial status/access to health care, COVID-19-related experiences, and physical, reproductive, and mental health according to whether the participants reported changing or not changing their fertility preferences because of the pandemic. Results of these bivariate analyses can be found in Supplemental Tables 1–3 (available online). We found that the participants who reported changing their fertility preferences were on average older (t = −2.45, P=.01) and more likely to be cohabiting or single, divorced, or separated (χ^2 = 7.57, P=.02). We also found nonheterosexual women, compared with heterosexual women (χ^2 = 6.51, P=.01), and black or African American women, compared with white or Asian/Native Hawaiian/Pacific Islander women (χ^2 = 11.0, P=.01) were more likely to change their fertility preferences. Those without health insurance also were more likely to change their fertility preference compared with those with health insurance (P=.03). The participants who perceived their health status to be good or fairly good were more likely to change their TTC plan than those who perceived their health to be average or poor (χ^2 = 11.68, P=.01). Women whose family had been quarantined were less likely to change their fertility

preferences than those whose family had not been quarantined ($\chi^2 = 4.21$, $P = .04$). Lastly, those who had been trying for 1–6 months were more likely to change their fertility preferences than those who had been trying for 6–12 months ($\chi^2 = 20.94$, $P < .01$).

On the basis of these results, demographic variables identified in the literature (race, sexual orientation, and income) and/or associated with change in fertility preferences (age or marital status) were added first (model 1), then current health insurance status (model 2), perceived health status and family isolation/quarantine status (model 3), and lastly length of TTC (final model, model 4).

Results from the stepwise logistic regression model can be found in Table 2. In the final model, we found that the odds of changing fertility preferences in nonheterosexual women were 2.76 (95% confidence interval [CI], 1.41–5.42) times that of heterosexual women. Furthermore, across all the models, we consistently found that the odds of changing fertility preferences because of the COVID-19 pandemic in black or African American women were 5.45 (95% CI, 1.50–19.90) times that of white women.

Aim 2: Differences in Demographic Characteristics, Financial Status/Access to Health Care, COVID-19–Related Experiences, and Physical, Reproductive, and Mental Health Among Those Who Chose to Try for a Child Later and Those Who Chose to Try for a Child Sooner Because of the COVID-19 Pandemic

Among the subset of participants who reported changing their fertility preferences, we also examined differences in participant characteristics by whether participants sped up or pushed back their TTC plan because of the COVID-19 pandemic. Results of these bivariate analyses can be found in Supplemental Tables 4–6 (available online). The participants who pushed back their TTC plan were older compared with those who sped up their plan (t = −2.31, P = .03). In addition, the participants who pushed back their TTC plan reported significantly worse mental health such as higher state anxiety (t = −2.21, P = .03), depressive symptoms (t = −3.37, P < .01), and lower social support (t = 2.07, P = .04) compared with those who sped up their TTC plan. Perceived stress was not associated with pushing back TTC plans (t = −1.63, P = .11). Lastly, women who had been TTC for 6–12 months or >1 year were more likely to push back their TTC plan than those who had been trying for <6 months ($\chi^2 = 10.64$, P < .01).

On the basis of these results, demographic variables that were identified in the literature (race, sexual orientation, and income) and/or associated with change in timing (age or number of children) were added first (model 1). We did not include household size because of collinearity issues with the number of children. Then, we added the length of TTC (model 2). In the final models (models 3a, 3b, and 3c), we included each state anxiety, depressive symptoms, and social support separately as a predictor, to address multicollinearity issues.

Results from the stepwise logistic regression model can be found in Table 3. Model 3a showed that every 1 unit increase in the state anxiety was associated with 26% (95% CI, 3%–54%) increase in the odds of pushing back TTC. Model 3b showed that every 1 unit increase in depressive symptoms was associated with 17% (95% CI, 5%–31%) increase in the odds of pushing back TTC.

DISCUSSION

This study examined the COVID-19 pandemic's impact on fertility preferences of people who were TTC in the past year or currently TTC. Overall, approximately 1 in 3 participants reported a change in fertility preference because of the pandemic, among which the majority reported that they were now TTC later than previously intended. This finding is consistent with other recent studies reporting that approximately a third of their respondents had altered their fertility preference, mostly abandoning or pushing back TTC (8, 9).

In our study, black or African American women reported higher odds of changing fertility preferences compared with white women. Given the small sample of black or African American women in our study, these findings must be interpreted with caution. However, these findings are in line with another recent study conducted in the United States that found that black and Hispanic women, in comparison to white women, were more likely to report wanting to have children later or wanting fewer children because of the pandemic (6). This may be because of the fact that black and African American communities experienced disproportionately high COVID-19 infection and death rates in the United States (40). It also must be acknowledged that the cultural, social, and political climate of the time of data collection may also have influenced the black and African American participants' fertility preferences.

Our study also found that queer women, compared with heterosexual women, reported higher odds of changing fertility preferences. These results also are supported by another similar study and may be because of the various ways the reproductive health of sexual minorities was affected by the pandemic (6). For example, the "TTC process" for queer women often requires involved interactions with multiple parties and institutions (e.g., donors and cryobanks) (41), during which many report experiencing heterosexist comments and a general lack of support for their "TTC process" (42, 43). These experiences of discrimination make queer-friendly reproductive health providers important (42), but they may have been less accessible during the early stages of the pandemic because of reduced appointment times and closures of some doctor offices and fertility clinics. Therefore, in the face of the COVID-19 pandemic, queer people already experiencing sociocultural barriers to receiving adequate reproductive care may have been motivated or forced to change their fertility preference.

Among those who reported changing fertility preferences, we found that the participants with higher anxiety and depressive symptoms reported higher odds of pushing back TTC instead of TTC earlier. Because of the cross-sectional nature of this analysis, we were unable to elucidate whether people with increased anxiety and depressive symptoms due to the pandemic were more likely to push back TTC, or whether

TABLE 3

Stepwise logistic regression model predicting how fertility preferences changed in 104 participants.

Dependent variable:
TTC later (1)
TTC earlier (ref:0)

Variables	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3a OR (95% CI)	Model 3b OR (95% CI)	Model 3c OR (95% CI)
Demographics					
Age	1.13 (0.98, 1.31)	1.11 (0.95, 1.28)	1.10 (0.94, 1.28)	1.08 (0.92, 1.26)	1.10 (0.94, 1.29)
Race (ref: White)					
Black or African American	0.65 (0.12, 3.52)	0.77 (0.11, 5.44)	0.51 (0.06, 4.46)	0.62 (0.07, 5.77)	0.59 (0.07, 4.95)
Asian, Native Hawaiian, or Pacific Islander	4.14 (0.44, 38.59)	3.5 (0.31, 38.91)	1.98 (0.17, 23.23)	1.33 (0.10, 18.06)	3.3 (0.29, 37.02)
American Indian, Alaska Native, or Other	2.41 (0.21, 28.27)	2.93 (0.23, 36.92)	2.06 (0.16, 26.38)	2.65 (0.20, 35.71)	3.78 (0.28, 50.94)
Sexual orientation (ref: Heterosexual)					
Not heterosexual	5.1 (1.03, 25.31)[a]	5.25 (1.02, 27.12)[a]	3.46 (0.65, 18.58)	2.86 (0.53, 15.28)	3.7 (0.73, 18.83)
No. of children (ref: No child)					
1	4.13 (0.81, 21.03)	5.45 (1.04, 28.48)[a]	9.77 (1.00, 95.83)[a]	10.45 (1.07, 102.33)[a]	7.81 (0.84, 73.01)
≥2	1.65 (0.13, 20.84)	2.1 (0.15, 28.64)	1.25 (0.09, 18.37)	1.13 (0.07, 18.51)	2.05 (0.14, 30.11)
Financial status/access to health care resources					
Annual household income					
<$60,000	0.46 (0.09, 2.36)	0.54 (0.10, 2.83)	1.00 (0.17, 5.97)	1.07 (0.17, 6.69)	0.66 (0.11, 4.01)
$60,000–$99,999	0.99 (0.27, 3.58)	0.69 (0.16, 2.96)	0.88 (0.18, 4.21)	1.01 (0.21, 4.9)	0.85 (0.19, 3.88)
$100,000–$149,999	1.01 (0.30, 3.39)	1.00 (0.27, 3.67)	0.63 (0.14, 2.87)	1.02 (0.23, 4.45)	0.74 (0.18, 3.12)
Reproductive health					
Length TTC (ref: 1–6 mo)					
6–12 mo		10.65 (1.23, 92.39)[a]	9.39 (0.97, 91.03)	8.29 (0.89, 77.52)	7.82 (0.82, 74.2)
>1 y		NA	NA	NA	NA
Mental health					
Trait anxiety (STAI-6)			1.26 (1.02, 1.57)[a]		
Depressive symptoms (CESD-10)				1.16 (1.03, 1.3)[a]	
Social support (ISEL)					0.95 (0.84, 1.06)

CESD = Center for Epidemiologic Studies Depression; CI = confidence interval; ISEL = Interpersonal Support Evaluation List; NA = not applicable; OR = odds ratio; STAI = Spielberger State-Trait Anxiety Inventory; TTC= trying to conceive.
[a] $P<.05$.

Naya. COVID pandemic and fertility preference. Fertil Steril 2021.

having to push back TTC due to the pandemic led to increased symptoms. Although there is evidence of increased prevalence of mental health issues among those receiving fertility treatment (44, 45), there are very few studies examining these outcomes among the broader population of people TTC (42), and no literature has explored how changes in fertility preferences may affect mental health. Nevertheless, the reciprocal relationship between reproductive and mental health is well documented (46). The pandemic has significantly increased the prevalence of symptoms of anxiety, depression, and stress in the general population (36) and may have especially exacerbated these symptoms among those TTC because of sudden alterations in plans around fertility preferences. This may especially be true for those receiving fertility treatments as in the early stages of the pandemic (March 2020), the American Society for Reproductive Medicine recommended the suspension of initiation of new treatment cycles and minimization of in-person interactions (7). It should be noted that we conducted post hoc analyses exploring interactions of demographic and mental health variables, but the results were not significant. Our findings support the need to better

understand how the pandemic may be influencing mental health outcomes and fertility preferences.

Although our study provides preliminary findings on the COVID-19 pandemic's influence on fertility preferences of those TTC, the study is not without limitations. First, although our study asked whether the pandemic affected the participants' fertility preferences and if so, whether the participants wanted to try to conceive later or earlier because of the pandemic, we did not explicitly ask why the participants were motivated to change their fertility preferences. Future studies examining specific reasons behind changes in fertility preferences could help identify possible social and political issues (e.g., unemployment and access to reproductive care) that are leading to these disparities. In addition, since the participants were recruited via convenience sampling of the "TTC community," the pool of potential participants was more likely to be currently actively TTC. Therefore, our study underrepresents people who stopped TTC before the study initiation or those who are not a part of these online forums. Furthermore, our study population is majority white, well educated, high-income, insured, and employed full-time.

Given the skewed nature of our sample population, our findings must be interpreted with caution, and future research with more diverse representative populations is needed to further examine the disparate effect of the pandemic on fertility preferences. It also should be noted that compared with COVID-19 case prevalence in the United States during May 2020 to July 2020, a higher-than-expected number of participants reported experiencing symptoms and quarantine of self or family members because of possible COVID-19 exposure. Therefore, our study participants' COVID-19-related health factors are not representative of the US population. In addition, our average scores for anxiety and depressive symptoms were higher than previously documented; it is unclear whether this is due to selection bias in our sample or an overall effect of the COVID-19 pandemic (36). Lastly, it should be noted that we did not see an increase in perceived stress scores in this sample, unlike anxiety and depression, even though systematic reviews have found significant heightened stress (8.1% prepandemic to 81.9% during the pandemic) in various international studies (36). We are unsure why we saw an increase in anxiety and depression, but not stress, in this sample. We speculate that it may have been influenced by the nature of the PSS, which focuses on one's ability to handle/control problems and important things in life, and the relatively high socioeconomic status of our sample.

CONCLUSION

Results from the current study, although preliminary, suggest that the COVID-19 pandemic may be deepening the disparities in reproductive health and family planning. Future research is needed to examine how COVID-19 is amplifying the existing reproductive health inequalities by disproportionately impacting socially disadvantaged groups.

F&S

DIALOG: You can discuss this article with its authors and other readers at https://www.fertstertdialog.com/posts/32184

REFERENCES

1. Speier AR. Brokers, consumers and the internet: how North American consumers navigate their infertility journeys. Reprod Biomed Online 2011;23:592–9.
2. Hagewen KJ, Morgan SP. Intended and ideal family size in the United States, 1970–2002. Popul Dev Rev 2005;31:507–27.
3. Kedzior SGE, Bianco-Miotto T, Breen J, Diener KR, Donnelley M, Dunning KR, et al. It takes a community to conceive: an analysis of the scope, nature and accuracy of online sources of health information for couples trying to conceive. Reprod Biomed Soc Online 2019;9:48–63.
4. Schuettge A. My husband and I want to have another baby. The pandemic has disrupted our plans. Time. Available at: https://time.com/5825663/coronavirus-getting-pregnant/. Accessed August 22, 2020.
5. Micelli E, Cito G, Cocci A, Polloni G, Russo GI, Minervini A, et al. Desire for parenthood at the time of COVID-19 pandemic: an insight into the Italian situation. J Psychosom Obstet Gynaecol 2020;41:183–90.
6. Lindberg LD, VandeVusse A, Mueller J, Kirstein M. Early impacts of the COVID-19 pandemic: findings from the 2020 Guttmacher Survey of Reproductive Health Experiences. Available at: https://www.guttmacher.org/sites/default/files/report_pdf/early-impacts-covid-19-pandemic-findings-2020-guttmacher-survey-reproductive-health.pdf. Accessed July 26, 2020.
7. American Society for Reproductive Medicine. Patient management and clinical recommendations during the coronavirus (COVID-19) pandemic. Available at: https://www.asrm.org/globalassets/asrm/asrm-content/news-and-publications/covid-19/covidtaskforce.pdf. Accessed July 21, 2020.
8. Lawson AK, McQueen DB, Swanson AC, Confino R, Feinberg EC, Pavone ME. Psychological distress and postponed fertility care during the COVID-19 pandemic. J Assist Reprod Genet 2021;38:333–41.
9. United States Agency International Development. Demographic and Health Surveys comparative reports, chapter 7. Fertility Preferences. Available at: https://dhsprogram.com/pubs/pdf/FR183/07Chapter07.pdf. Accessed January 8, 2020.
10. Castro Martín T. Women's education and fertility: results from 26 Demographic and Health Surveys. Stud Fam Plann 1995;26:187–202.
11. Higgins JA, Carpenter E, Everett BG, Greene MZ, Haider S, Hendrick CE. Sexual minority women and contraceptive use: complex pathways between sexual orientation and health outcomes. Am J Public Health 2019;109:1680–6.
12. Smith JF, Eisenberg ML, Glidden D, Millstein SG, Cedars M, Walsh TJ, et al. Socioeconomic disparities in the use and success of fertility treatments: analysis of data from a prospective cohort in the United States. Fertil Steril 2011;96:95–101.
13. Dieke AC, Zhang Y, Kissin DM, Barfield WD, Boulet SL. Disparities in assisted reproductive technology utilization by race and ethnicity, United States, 2014: a commentary. J Womens Health (Larchmt) 2017;26:605–8.
14. Culwell KR, Feinglass J. The association of health insurance with use of prescription contraceptives. Perspect Sex Reprod Health 2007;39:226–30.
15. Bassford M, Fisher H. Bonus babies? The impact of paid parental leave on fertility intentions. Life Course Centre Working Paper Series; 2016:2016–02.
16. Li CC, Huang SM, Lai JCY, Hsiung Y, Chen YH, Lee CF. Development and validation of a fertility intention scale in breast cancer survivors. J Nurs Res 2018;26:177–84.
17. Huang SM, Tseng LM, Lai JCY, Tsai YF, Lien PJ, Chen PH. Impact of symptom and social support on fertility intention in reproductive-age women with breast cancer. Clin Nurs Res 2020;29:411–8.
18. Utomo A, McDonald P, Utomo I, Hull T. Do individuals with higher education prefer smaller families? Education, fertility preference and the value of children in greater Jakarta. Child Indic Res 2021;14:139–61.
19. Spielberger CD. State-Trait Anxiety Inventory: a comprehensive bibliography. Palo Alto, CA: Consulting Psychologists Press; 1983.
20. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. Appl Psychol Meas 1977;1:385–401.
21. Andresen EM, Malmgren JA, Carter WB, Patrick DL. Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). Am J Prev Med 1994;10:77–84.
22. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health Soc Behav 1983;24:385–96.
23. Cohen S, Williamson G. Perceived stress in a probability sample of the United States. In: Spacapan S, Oskamp S, editors. The social psychology of health. Newbury Park, CA: Sage Publications; 1988.
24. Miilunpalo S, Vuori I, Oja P, Pasanen M, Urponen H. Self-rated health status as a health measure: the predictive value of self-reported health status on the use of physician services and on mortality in the working-age population. J Clin Epidemiol 1997;50:517–28.
25. Kodzi IA, Johnson DR, Casterline JB. To have or not to have another child: life cycle, health and cost considerations of Ghanaian women. Soc Sci Med 2012;74:966–72.
26. Alemayehu B, Aregay A. Desire to procreate among people living with HIV/AIDS: determinants in Ethiopia: a cross-sectional study. J AIDS HIV Res 2012;4:128–35.
27. Finocchario-Kessler S, Sweat MD, Dariotis JK, Trent ME, Kerrigan DL, Keller JM, et al. Understanding high fertility desires and intentions among a sample of urban women living with HIV in the united states. AIDS Behav 2010;14:1106–14.
28. CDC. Coronavirus disease 2019 (COVID-19): people who are at higher risk for severe illness. Available at: https://www.cdc.gov/coronavirus/2019-ncov/

need-extra-precautions/people-with-medical-conditions.html. Accessed December 20, 2020.

29. Grasso DJ, Briggs-Gowan MJ, Ford JD, Carter AS. The Epidemic–Pandemic Impacts Inventory (EPII). University of Connecticut School of Medicine; 2020.

30. SAS Institute Inc. SAS® 9.4 Statements: Reference. Cary, NC: SAS Institute Inc; 2013.

31. Hosmer DW Jr, Lemeshow S, Sturdivant RX, editors. Applied logistic regression. New York: John Wiley & Sons; 2013.

32. Harrell FE Jr, editor. Regression modeling strategies: with applications to linear models, logistic and ordinal regression, and survival analysis. New York: Springer; 2015.

33. Chowdhury MZI, Turin TC. Variable selection strategies and its importance in clinical prediction modelling. Fam Med Community Health 2020;8:e000262.

34. Marteau TM, Bekker H. The development of a six-item short-form of the state scale of the Spielberger State—Trait Anxiety Inventory (STAI). Br J Clin Psychol 1992;31:301–6.

35. Li Y, Mirzaei F, O'Reilly EJ, Winkelman J, Malhotra A, Okereke OI, et al. Prospective study of restless legs syndrome and risk of depression in women. Am J Epidemiol 2012;176:279–88.

36. Xiong J, Lipsitz O, Nasri F, Lui LMW, Gill H, Phan L, et al. Impact of COVID-19 pandemic on mental health in the general population: a systematic review. J Affect Disord 2020;277:55–64.

37. Warttig SL, Forshaw MJ, South J, White AK. New, normative, English-sample data for the Short Form Perceived Stress Scale (PSS-4). J Health Psychol 2013; 18:1617–28.

38. Cooper DC, Ziegler MG, Nelesen RA, Dimsdale JE. Racial differences in the impact of social support on nocturnal blood pressure. Psychosom Med 2009;71:524–31.

39. Tittman SM, Harteau C, Beyer KMM. The effects of geographic isolation and social support on the health of Wisconsin women. WMJ 2016;115:65–9.

40. Laurencin CT, McClinton A. The COVID-19 pandemic: a call to action to identify and address racial and ethnic disparities. J Racial Ethn Heal Disparities 2020;7:398–402.

41. Karpman HE, Ruppel EH, Torres M. "It wasn't feasible for us": queer women of color navigating family formation. Fam Relat 2018;67:118–31.

42. Yager C, Brennan D, Steele LS, Epstein R, Ross LE. Challenges and mental health experiences of lesbian and bisexual women who are trying to conceive. Health Soc Work 2010;35:191–200.

43. Wingo E, Ingraham N, Roberts SCM. Reproductive health care priorities and barriers to effective care for LGBTQ people assigned female at birth: a qualitative study. Womens Health Issues 2018;28:350–7.

44. Pasch LA, Holley SR, Bleil ME, Shehab D, Katz PP, Adler NE. Addressing the needs of fertility treatment patients and their partners: are they informed of and do they receive mental health services? Fertil Steril 2016;106:209–15.e2.

45. Raguz N, McDonald SW, Metcalfe A, O'Quinn C, Tough SC. Mental health outcomes of mothers who conceived using fertility treatment. Reprod Health 2014;11:19.

46. Fischer J, Astbury J, de Mello MC, Saxena S, editors. Mental health aspects of women's reproductive health: a global review of the literature. Geneva, Switzerland: World Health Organization; 2009.

Efectos tempranos de la pandemia de COVID-19 pandemia en las preferencias de fertilidad en Estados Unidos: un estudio exploratorio.

Objetivo: Explorar los primeros impactos dispares de la pandemia de COVID-19 en las preferencias de fertilidad.

Diseño: Estudio transversal.

Entorno: Cuestionario de encuesta en línea.

Pacientes: Un total de 440 participantes femeninas que estaban intentando concebir (TTC) en el último año o que actualmente están TTC.

Intervención(es): No se administraron intervenciones.

Medida(s) de resultado principal(es): Cambio en la preferencia de fertilidad.

Resultado(s): Aproximadamente 1 de cada 3 participantes informó haber cambiado sus preferencias de fertilidad debido a la pandemia de COVID-19. De los que informaron de un cambio en sus preferencias de fertilidad, el 23,9% informaron que habían iniciado el embarazo antes y el 61,6% informaron que habían iniciado el embarazo más tarde. Los resultados preliminares muestran que las probabilidades de cambiar las preferencias de fertilidad en las mujeres negras o afroamericanas eran 5,45 (intervalo de confianza [IC] del 95%, 1,50-19,90) veces la de las mujeres blancas y en las mujeres no heterosexuales era de 2,76 (IC 95%, 1,41-5,42) veces la de las mujeres heterosexuales. Además, cada aumento de 1 unidad en los estados de ansiedad y síntomas depresivos, se asoció con un 26% (IC del 95%, 3%-54%) o un 17% (IC 95%, 5%-31%) en las probabilidades de retrasar el TTC, respectivamente.

Conclusiones: Este estudio exploratorio destaca cómo las preferencias de fertilidad de las minorías raciales y étnicas, las minorías sexuales y las personas con problemas de salud mental pueden verse influidas de forma dispar por la pandemia. Es necesario investigar más a fondo el efecto dispar de la pandemia de COVID-19 en las preferencias de fertilidad.