Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

GYNECOLOGY

Attempts to conceive and the COVID-19 pandemic: data from the Apple Women's Health Study

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BACKGROUND: Previous studies have suggested that emergent events may affect pregnancy planning decisions. However, few have investigated the effect of factors related to the COVID-19 pandemic on pregnancy planning, measured by attempting conception, and how attempting conception status may differ by individual-level factors, such as social status or educational level.

OBJECTIVE: This study aimed to examine the effects of factors related to the COVID-19 pandemic, until March 2021, on attempting conception status and to assess the effect measure modification by educational level and subjective social status.

STUDY DESIGN: We conducted a longitudinal analysis within a subgroup of 21,616 participants in the Apple Women's Health Study who enrolled from November 2019 to March 2021, who met the inclusion criteria, and who responded to the monthly status menstrual update question on attempting conception status (yes or no). Participants reporting hysterectomy, pregnancy, lactation, or menopause were excluded. We used generalized estimating equation methodology to fit logistic regression models that estimate odds ratios and 95% confidence intervals for the association between the proportion of participants attempting conception and the month of response (compared with a prepandemic reference month of February 2020) while accounting for longitudinal correlation and adjusting for age, race and ethnicity, and marital status. We stratified the analysis by social status and educational level.

RESULTS: We observed a trend of reduced odds of attempting conception, with an 18% reduction in the odds of attempting conception in August 2020 and October 2020 compared with the prepandemic month of February 2020 (August odds ratio: 0.82 [95% confidence interval, 0.70—0.97]; October odds ratio: 0.82 [95% confidence interval, 0.69—0.97). The participants with lower educational level (no college education) experienced a sustained reduction in the odds of attempting to conceive from June 2020 to March 2021 compared with February 2020, with up to a 24% reduction in the odds of attempting to conceive in October 2020 (odds ratio, 0.76; 95% confidence interval, 0.59—0.96). Among participants that were college educated, we observed an initial reduction in the odds of attempting to conceive starting in July 2020 (odds ratio 0.73; 95% confidence interval, 0.54—0.99) that returned near prepandemic odds. Moreover, we observed a reduction in the odds of attempting to conceive among those with low subjective social status, with a decline in the odds of attempting to conceive beginning in July 2020 (odds ratio, 0.83; 95% confidence interval, 0.63—1.10) and continuing until March 2021 (odds ratio, 0.79; 95% confidence interval, 0.59—1.06), with the greatest reduction in odds in October 2020 (odds ratio, 0.67; 95% confidence interval, 0.50—0.91).

CONCLUSION: Among women in the Apple Women's Health Study cohort, our findings suggested a reduction in the odds of attempting to conceive during the COVID-19 pandemic, until March 2021, particularly among women of lower educational level and lower perceived social status.

Key words: desire to conceive, educational level, health-related decision-making, pandemic social and environmental factors, perceived social status, pregnancy planning, women's health

Introduction

Many factors influence pregnancy planning and the desire to conceive, including economic stability, education, and access to public services.[1,2] During the COVID-19 pandemic, these factors may affect individual pregnancy decisions more acutely.[3–6] However, empirical data describing the effect of the pandemic on personal decisions, such as attempting to conceive, are limited.

Recent research has focused more on "pregnancy planning" during the COVID-19 pandemic. For instance, 1 UK study found that approximately half of women reported that COVID-19 had modified their pregnancy plans, with most deliberately postponing pregnancy.[7] Other studies from Italy and Shanghai demonstrated similar changes in pregnancy plans during the pandemic.[4,8] Furthermore, a Guttmacher Institute survey reported that >40% of women changed their pregnancy plans during the COVID-19 pandemic.[9] Alternatively, a US study observed that almost half of the cohort had an increased desire to have children since the pandemic onset but that a quarter of the cohort's desire to have children decreased.[5] However, no published study has longitudinally assessed "monthly attempts to conceive" throughout the COVID-19 pandemic or has evaluated variations related to individual factors, such as education.

This study aimed to examine the proportion of women attempting pregnancy in the United States during the COVID-19 pandemic among Apple Women's Health Study (AWHS) participants who enrolled from November 2019 to March 2021. AWHS participants

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AJOG at a Glance

Why was this study conducted?

Longitudinal studies investigating the effect of circumstances related to the COVID-19 pandemic on pregnancy planning, measured by attempting conception, are limited, especially when examining variations by individual-level factors, such as educational level.

Key findings

Among Apple Women's Health Study participants, we observed a slight increase in the odds of attempting to conceive among women as the pandemic began in May 2020, followed by a decline starting in July 2020, compared with prepandemic levels. Our findings suggested a reduction in the odds of attempting to conceive during the COVID-19 pandemic to March 2021.

What does this add to what is known?

The findings indicated a noteworthy trend in the decline in attempts to conceive related to factors associated with the COVID-19 pandemic, especially among participants with lower educational levels, and demonstrated environmental and social factors influencing health-related decision-making.

used a smartphone-based research application to report attempting to conceive monthly. In addition, we investigated whether educational level or perceived social status modified the monthly trends in attempting conception during the COVID-19 pandemic.

Methods

Study population

AWHS is an ongoing longitudinal study of women's health. The study launched recruitment in November 2019, as previously described.[10] Eligibility for enrollment included women who had menstruated at least once, had a compatible iPhone iOS, downloaded the Research app, lived in the United States, were at least 18 years old, communicated through English, were the exclusive user of an iPhone or iCloud account, and provided informed consent. The study focused on digital recruitment and raising awareness through media engagement to reach potential participants. Primary methods of recruitment included sharing materials through digital and social media, increasing awareness of the study through press and media engagement, and executing recruitment campaigns with organizations focused on research or health (eg, PCOS Challenge [pcoschallenge.org] and Trialfacts [trialfacts.com]). The primary methods of retention included app notifications as a reminder of survey availability and study updates. The study was approved by the institutional review boards at Advarra (CIRB #PRO00037562) and was registered to ClinicalTrials.gov (NCT04196595). After enrollment, participants completed surveys monthly regarding their conception attempts through the Monthly Survey: Menstrual Update (MSMU). Starting in January 2020, the MSMU was available on the Research app on the first Sunday of each month, after at least 4 weeks since enrollment. We assigned February 2020 as a baseline month (the month before the United States declared a COVID-19 national emergency) and evaluated data through March 2021. We included 21,616 participants who met the eligibility criteria, enrolled before March 31, 2021, and responded to at least 1 MSMU. We excluded participants who self-reported hysterectomy at baseline, menopause, current pregnancy, or lactation.

Apple Women's Health Study surveys and covariates

Survey questions for the AWHS were derived and administered through the Research app as described previously.[10] At enrollment, participants provided their year of birth, race and ethnicity, gender identity, marital status, and educational level. Participants were able to update demographic information during the study. We categorized education into 3 groups: (1) no college education, (2) college education, and (3) graduate degree. The MacArthur Scale of Subjective Social Status (SSS) was assessed at enrollment.[11] The SSS measures relative social status based on the participant's perceptions of their educational level, socioeconomic status (SES), opportunity, and current life circumstances.[11,12] The SSS instructs participants to rate themselves on a "social ladder," with corresponding numbered social status scale rungs of 0 (lowest) to 9 (highest).[11] We categorized SSS scores as low (score of 0–3), moderate (score of 4–5), and high (score of 6–9).

Outcome assessment: attempting conception status

Participants were asked their attempt to conceive status as part of the MSMU with the question: "Did you actively try to get pregnant in the previous calendar month?" Responding participants selected from one of the following responses: (1) Yes, I tried to conceive naturally; (2) Yes, with the help of methods, such as artificial insemination or in vitro fertilization; (3) No; and (4) I prefer not to answer. We defined attempting to conceive as a dichotomous variable. We categorized participants selecting either response 1 or 2 above as attempting to conceive. Apart from that, we designated participants as not attempting to conceive (Supplemental Table 1).

Of 97,052 total MSMU responses from active participants during the follow-up period, 14,543 (15.0%) were missing responses for one or more months. We singly imputed those missing responses with concordant survey responses before and after the response gap (n=14,020 [14.4%]). Supplemental Table 2 summarizes response concordance among these participants (Supplemental Table 2).

Statistical analysis

We used generalized estimating equations (GEEs) to fit logistic regression models for the association between the proportion of participants attempting conception and the month of response while accounting for longitudinal correlation.[13–16] We computed month-specific odds ratios (ORs) and 95% confidence intervals (CIs) for the dichotomous outcome of attempting to conceive (yes vs no), about the prepandemic month of February 2020. All models were adjusted for age, race and ethnicity, and marital status. GEEs allow for missing nonconcordant responses before and after the response gap (n=523), with the assumption of missing completely at random. We specified an autoregressive covariance structure. Within the main models, we assessed the effect modification by education status, as education may indicate personal agency vs physical risks of exposure and lifestyle associated with the ability to work remotely during the pandemic. We stratified using the SSS as a secondary analysis. We used deidentified data for all analyses and described aggregate results.

We performed a sensitivity analysis to adjust for seasonal trends modeled by sine and cosine functions, as previously described as an applicable test for seasonality.[17,18] We performed a second sensitivity analysis that was independent of cluster size by assigning AWHS participants to closed subcohorts by quarter. For these models, we restricted the analysis of participants to the first quarter in which they responded to MSMU and assessed whether the participant attempted conception at least once within that quarter. We performed logistic regression and test for trend analysis. Moreover, we stratified by education and SSS separately. We performed data engineering in Python (version 3.6.5; Python Software Foundation, Wilmington, DE) and statistical analyses in R (version 4.0.4; R Core Team, Vienna, Austria).

Results

The mean (standard deviation) age at enrollment of participants was 32.1 (8.6) years. Most participants were White (71.6%) (Table 1). Moreover, 45% of participants had no college education, 33.0% of participants were college educated, and 22.1% of participants had a graduate school degree. Participants attempting conception were more likely to be married (66% vs 36%) and were less likely to be in school (4% vs 12%) than those not attempting conception.

A range of 2144 to 13,673 participants responded to the attempts to conceive question, as recruitment increased over time (Table 2). Of the 2144 subjects enrolled in February 2020, 937 (43.7%) were still responding to the MSMU at the end of the study period, March 2021. Generally, 15% to 20% of each month's participants were new enrollees, and 80% to 85% were retained participants (Table 2). There were 7.6% of participants attempting conception at least once during the study (Supplemental Table 3). Participants attempted conception for an average of 4.4 months (Supplemental Table 4). Among those not previously attempting conception at their study entry, 1.0% to 5.9% of responding participants newly attempted conception during the study (Supplemental Table 5). Educational level was generally consistent across months (Supplemental Table 6).

In February 2020, 6.3% of participants were attempting conception (Figure 1). We observed stability in the odds of attempting to conceive as the pandemic began in March 2020 (OR, 1.01; 95% CI, 0.94–1.08) and May 2020 (OR, 1.02; 95% CI, 0.89–1.15), followed by a sustained decrease starting in August 2020 (OR, 0.82; 95% CI, 0.70–0.97) to March 2021 (OR, 0.88; 95% CI, 0.74–1.04), compared with the reference month of February 2020 (Figure 2, A; Supplemental Table 7). The strongest negative association was observed for August 2020 (OR, 0.82; 95% CI, 0.70–0.97) and October 2020 (OR, 0.82; 95% CI, 0.69–0.97), with the odds of attempting to conceive decreasing by 18% in these months compared with February 2020.

When we stratified by education status, we observed a more sustained reduction in the odds of attempting to conceive among the non–college-educated participants, with a decline in the odds of attempting to conceive beginning in September 2020 (OR, 0.79; 95% CI, 0.63–1.00) and continuing until March 2021 (OR, 0.80; 95% CI, 0.64–1.01). We found the strongest reduction in the odds of attempting to conceive in October 2020, with the odds decreasing by 24% (OR, 0.76; 95% CI, 0.59–0.96) compared with February 2020 (Figure 2, B; Supplemental Table 7).

Among participants that were college educated, we observed a greater reduction in the odds of attempting to conceive in August 2020 (OR, 0.71; 95% CI, 0.51–0.99) compared with February 2020. By March 2021, the odds of attempting to conceive among college-educated participants rose slightly and were closer to prepandemic levels (OR, 0.91; 95% CI, 0.64–1.31) (Figure 2, C; Supplemental Table 7). For those participants with a graduate school degree, we observed monthly odds of attempting conception that were elevated throughout the study period compared with February 2020. ORs ranged from 1.04 (95% CI, 0.73–1.48) for July 2020 to 1.21 (95% CI, 0.83–1.77) for September 2020, although the CIs were wide. The odds of attempting to conceive continued to be elevated until March 2021 (OR, 1.16; 95% CI, 0.80–1.69) (Figure 2, D) among participants with a graduate school degree.

Within our secondary analysis, stratifying using the SSS, we observed a sustained reduction in the odds of attempting to conceive among those with low SSS (SSS score of 0–3), with a notable decline in the odds of attempting to conceive from July 2020 (OR, 0.83; 95% CI, 0.63–1.10) to March 2021 (OR, 0.79; 95% CI, 0.59–1.06). We found the strongest reduction in the odds of attempting to conceive in October 2020, with a 33% reduction in odds compared with February 2020 (OR, 0.67; 95% CI, 0.50–0.91) (Supplemental Table 8). Among participants with moderate SSS (SSS score of 4–5), the effect estimates were more stable and were closer to the null. Trends among participants with high SSS (SSS score of 6–9) were generally similar to those with low SSS (Supplemental Table 8). The sensitivity analysis adjusting for seasonality yielded similar results to those unadjusted for

TABLE 1
Characteristics of participants at baseline

Characteristic	All participants (N=21,616)	Participants attempting conception at least once during the study period (n=1647)	Participants never attempting conception during the study period (n=19,969)
Age, mean (SD)	32.1 (8.6)	31.4 (5.7)	32.1 (8.8)
Race and ethnicity			
White	15,468 (71.6)	1142 (69.3)	14,326 (71.7)
Hispanic, Latina, Spanish, or other Hispanic	2684 (12.4)	222 (13.5)	2462 (12.3)
Black	1140 (5.3)	128 (7.8)	1012 (5.1)
Asian	812 (3.8)	47 (2.9)	765 (3.8)
More than 1 race	1044 (4.8)	71 (4.3)	973 (4.9)
Other	431 (2.0)	33 (2.0)	398 (2.0)
I prefer not to answer	37 (0.2)	4 (0.2)	33 (0.2)
Education			
Not college educated	9689 (44.8)	795 (48.3)	8894 (44.5)
College educated	7141 (33.0)	460 (27.9)	6681 (33.5)
Graduate school degree	4786 (22.1)	392 (23.8)	4394 (22.0)
Employment status			
Employed for pay (part-timer, full-timer, self-employed)	16,037 (74.2)	1319 (80.1)	14,718 (73.7)
Unemployed	1117 (5.2)	92 (5.6)	1025 (5.1)
Unable to work (ie, disability, illness, or other circumstances)	637 (2.9)	54 (3.3)	583 (2.9)
In school	2532 (11.7)	60 (3.6)	2472 (12.4)
Taking care of house or family	1128 (5.2)	116 (7.0)	1012 (5.1)
In retirement	69 (0.3)	1 (0.1)	68 (0.3)
I prefer not to answer	96 (0.4)	5 (0.3)	91 (0.5)
Marital status			
Married	8324 (38.5)	1078 (65.5)	7246 (36.3)
Divorced	1559 (7.2)	88 (5.3)	1471 (7.4)
Widowed	90 (0.4)	2 (0.1)	88 (0.4)
Separated	377 (1.7)	24 (1.5)	353 (1.8)
Never married	7677 (35.5)	222 (13.5)	7455 (37.3)
A member of an unmarried couple	3456 (16.0)	223 (13.5)	3233 (16.2)
Skip or missing	133 (0.6)	10 (0.6)	123 (0.6)
MacArthur Scale of Subjective Social Status			
Low (0–3)	5478 (25.3)	425 (25.8)	5053 (25.3)
Moderate (4–6)	9454 (43.7)	763 (46.3)	8691 (43.5)
High (7–9)	6684 (30.9)	459 (27.9)	6225 (31.2)

Data are presented as number (percentage), unless otherwise specified.

SD, standard deviation.

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sine and cosine functions (Supplemental Table 9).

Within the additional sensitivity analysis, the effect estimates for quarter cohort models were often less precise than GEE models and were closer to the null following quarter 2 2020 (Supplemental Tables 10 and 11). For education-stratified models, the odds of attempting to conceive within the quarter continued to be elevated among participants with graduate degrees until March 2021 (Supplemental Table 10), similar to main models (Supplemental Table 7). Results were more attenuated among non−college-educated participants. Among college-educated participants, we observed a reduction in the odds of attempts to conceive in quarter 4 2020 (OR, 0.75; 95% CI, 0.54−1.04) compared with quarter 1 2020 (*P* trend=.06) (Supplemental Table 10), although the findings were imprecise. The trends for SSS-stratified models were generally consistent with the main models (Supplemental Table 11). The trends among participants with high SSS were generally comparable with those with low SSS following quarter 2 2020.

TABLE 2
Sample size by month—participants responding to the Monthly Survey: Menstrual Update

Month	Total (N)	Attempting conception (n)	% attempting	New participants	Retained participants	Lost to follow-up[a]
February 2020	2144	136	6.3	2144	0	0
March 2020	2890	161	5.6	931	1959	185
April 2020	3642	208	5.7	959	2683	207
May 2020	4039	247	6.1	658	3381	261
June 2020	4676	268	5.7	960	3716	323
July 2020	5080	272	5.4	765	4315	361
August 2020	5526	286	5.2	831	4695	385
September 2020	6013	313	5.2	943	5070	456
October 2020	6128	301	4.9	614	5514	499
November 2020	8711	443	5.1	3079	5632	496
December 2020	10,050	497	4.9	2498	7552	1159
January 2021	11,314	569	5.0	2170	9144	906
February 2021	12,643	639	5.1	2608	10,035	1279
March 2021	13,673	684	5.0	2281	11,392	1251

MSMU, Monthly Survey: Menstrual Update.

[a] Participants who replied to the MSMU in the previous month but not this month, that is, the number of total participants at time t_{i-1} minus the number of retained enrollees at time t_i. Moreover, lost to follow-up includes some participants who replied to the pregnancy survey at time t_i but did not return to the MSMU after the pregnancy.

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Comment

Principal findings

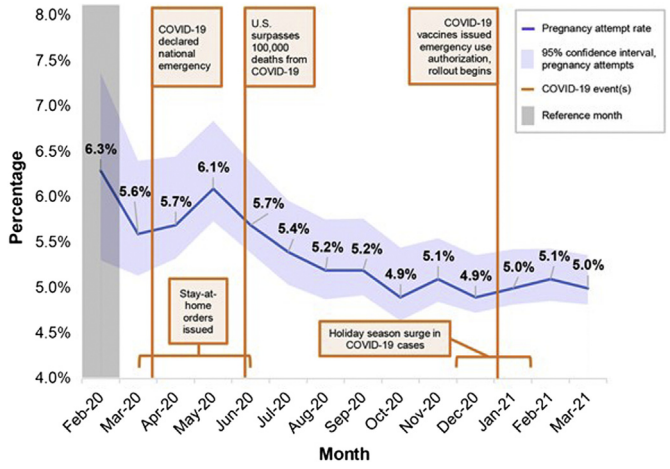
Among AWHS participants, we evaluated the relationship between the duration of the COVID-19 pandemic and the participants' attempts to conceive a child. We observed a slight increase in the odds of attempting to conceive as the pandemic began in May 2020, followed by a decline starting in July 2020, compared with prepandemic levels. Our findings suggested a reduction in the odds of attempting to conceive during the pandemic. In March 2021, we observed that the reduction in the odds was the strongest among participants that were not college educated compared with prepandemic levels. Moreover, our results suggested an increase in the odds of attempting to conceive among participants with a graduate degree.

Results in the context of what is known

Our findings were concordant with other studies performed within the context of the pandemic. A previous study from the United Kingdom found that the COVID-19 pandemic affected pregnancy plans for 53% of women, with 72% of those women reporting postponement of pregnancy.[7] However, this study was based on surveys administered at 1 time point during the pandemic (July 2020). Although our results were not directly comparable with the Guttmacher Survey design, the 2020 Guttmacher Survey also reported that 34% of women desired to delay pregnancy or have fewer children because of the COVID-19 pandemic, indicating that women of lower income were slightly more likely to change their plans.[9]

Our primary research question and the focus of this study were based on measuring attempts to conceive, to understand the intent to conceive during the pandemic. Although fertility and birth rates do not exclusively indicate intent to conceive, we can compare these rates with our findings to assess general trends. Our results have comparable trends with publicly available fertility rate data and birth rate data. For example, the US National Center for Health Statistics from the National Vital Statistics System reported some reduction in fertility rates during the pandemic, from the third quarter of 2020 to the third quarter of 2021.[19] In

FIGURE 1
Percentage of participants attempting conception, February 2020 to March 2021



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addition, the National Vital Statistics System reported greater reductions in births in the latter half of 2020 compared with the beginning of 2020 (before June),[20] although we found that data for the rest of 2021 and 2022 were not currently available.

Clinical and research implications

Our results may potentially be attributed to increased financial security and flexibility to work from home among advanced-degree workers.[21] Working from home may reduce the potential for exposure to COVID-19[21] and enable participants to focus on pregnancy planning rather than daily concern about virus exposure at work.[22–24] In this way, education may serve as a proxy for financial security and personal agency vs physical risks of exposure associated with the ability to work remotely and thereby act as a potential mitigatory factor for the effect of the pandemic. In contrast to our study, other research studies found that the desire for children is generally higher among those of lower educational levels[23] and that women of higher SES had lower net fertility,[22–24] potentially because those of higher SES respond faster to changing family norms.[24] However, these analyses were performed with data collected from a nonpandemic period.

When comparing results stratified by SSS vs educational level, we observed a trend of reduced odds in attempting conception among those participants with the lowest SSS score (Supplemental Table 8), which was similar to the trend among those participants with no college education. Low SSS and no college education may each indicate factors, such as financial insecurity.[25–27] Attempts to conceive among those participants with a high SSS were similar to those participants with a low SSS, which was notably different from the findings that we observed for attempts to conceive among participants with the highest educational level. This variation may likely be related to the contextual differences in the SSS, which incorporates measures of relative social status based on current life circumstances, rather than being an indication of objective education or income alone. This distinction between SSS and educational attainment is demonstrated by the matrix in Supplemental Table 12.

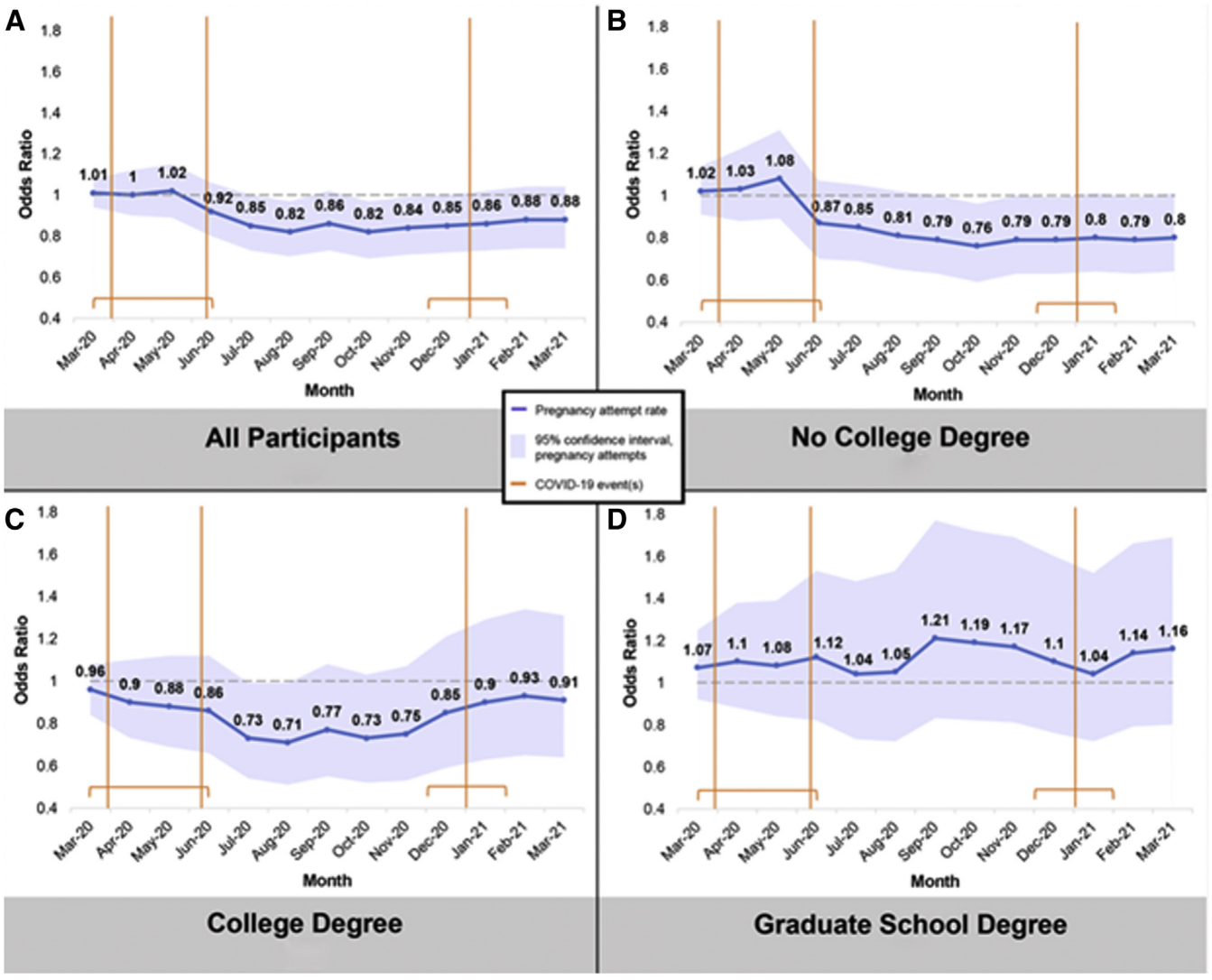
Strengths and limitations

Our study has many strengths. Our analysis allowed for a more microscopic, monthly view of the changes in attempts to conceive. Previous studies have had challenges in gathering population-level data on monthly pregnancy attempts in that they occur approximately ≥10 months before birth. As our digital study was launched before the pandemic, we were able to follow pregnancy attempts during the pandemic. In contrast to existing studies that are cross-sectional and rely on respective reports, as described previously, our study was prospective. In addition, we collected sufficient demographic information to understand the trends in conception attempts stratified by educational level. Our study focused on combining frequently collected survey data and menstrual health indicators to study women's health.

Our study has several limitations. The generalizability of this study may be limited as the AWHS cohort was restricted to iPhone users and demographic characteristics from this cohort of participants from the AWHS may not be representative of the US population. The AWHS cohort included more White participants (71.6% in the AWHS vs 60.1% in the United States) and fewer Black participants (5.3% in the AWHS vs 13.4% in the United States)[28,29] than the US population, per the US census. Because of the racial homogeneity of participants in the study population, we were not able to evaluate racial disparities in COVID-19 burden and attempts to conceive.[30,31] In addition, women who are attempting conception may be more likely to enroll in the AWHS study. However, pregnancy planners were not likely to be oversampled as they were not targeted in recruitment efforts. Moreover, the study was an open cohort, with changes in the study population over time, as demonstrated in Table 2.

Furthermore, we did not confirm self-reported conception attempts with sexual activity logging. However, the purpose of our investigation did not focus on outcomes, such as time to pregnancy. Another potential concern was attrition bias because of the potential effect of COVID-19 and pandemic-related factors on fertility. If these factors did reduce fertility, we would likely not see a bias because of attrition. However, we might find increases in the level of the month-specific pool of participants reporting yes to attempting conception that may potentially inflate the

FIGURE 2
Monthly odds ratios of attempting conception (referent: February 2020), stratified by education



The data have been adjusted for age, race, and marital status. **A,** All participants. **B,** No college degree. **C,** College degree. **D,** Graduate school degree.

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proportion of those attempting in any given month during the pandemic.

Because of the timing of the study, we were unable to account for seasonality based on historic data before COVID-19, but we incorporated sine and cosine functions to account for seasonality and did not find varying results. Moreover, although we did not collect data on the type of employment, income, or work-from-home status, we were able to evaluate educational level. Although education may be a poor proxy for SES, education is an objective measure and may in its way predict some behavioral factors related to lifestyle, such as work-from-home status. As the SSS was a subjective measure of social status and did not objectively measure education, SES, or income status, we included this assessment as part of a secondary analysis.

Another potential limitation may be related to informative clustering. The longer a participant has attempted to conceive at any point within the study, and stays within the study, the more likely the participant may be to attempt to conceive in any month thereafter. To assess findings independent of cluster size, we performed a sensitivity analysis assigning participants to quarter cohorts and found similar results, although less precise (Supplemental Tables 10 and 11). Finally, we experienced loss to follow-up in this cohort, although we did not observe changes in demographics among participants who were vs were not lost to follow-up.

Conclusions

Overall, these findings indicated a potentially noteworthy trend in the decline in the attempts to conceive related to factors associated with the COVID-19 pandemic, especially among participants with lower educational levels. Barriers to

healthcare and loss of financial security have disproportionally affected low-income communities during the pandemic. This research demonstrated the importance of collecting such detailed and granular data for women's health studies to better understand environmental and social factors that influence health-related decision-making. ■

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References

1. Comolli CL. Resources, aspirations and first births during the Great Recession. Adv Life Course Res 2021;48:100405.

2. Livingston G, Cohn D. U.S. birth rate decline linked to recession. Pew Research Center. 2010. Available at: https://www.pewresearch.org/social-trends/2010/04/06/us-birth-rate-decline-linked-to-recession/. Accessed January 25, 2022.

3. Malicka I, Mynarska M, Świderska J. Perceived consequences of the COVID-19 pandemic and childbearing intentions in Poland. J Fam Res 2021;33:674–702.

4. Micelli E, Cito G, Cocci 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.

5. Lin TK, Law R, Beaman J, Foster DG. The impact of the COVID-19 pandemic on economic security and pregnancy intentions among people at risk of pregnancy. Contraception 2021;103:380–5.

6. Zhou XH, Eckert GJ, Tierney WM. Multiple imputation in public health research. Stat Med 2001;20:1541–9.

7. Flynn AC, Kavanagh K, Smith AD, Poston L, White SL. The impact of the COVID-19 pandemic on pregnancy planning behaviors. Womens Health Rep (New Rochelle) 2021;2:71–7.

8. Zhu C, Wu J, Liang Y, et al. Fertility intentions among couples in Shanghai under COVID-19: a cross-sectional study. Int J Gynaecol Obstet 2020;151:399–406.

9. 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; 2020. Available at: https://www.guttmacher.org/report/early-impacts-covid-19-pandemic-findings-2020-guttmacher-survey-reproductive-health. Accessed January 25, 2022.

10. Mahalingaiah S, Fruh V, Rodriguez E, et al. Design and methods of the Apple women's health study: a digital longitudinal cohort study. Am J Obstet Gynecol 2022;226:545.e1–29.

11. Adler NE, Epel ES, Castellazzo G, Ickovics JR. Relationship of subjective and objective social status with psychological and physiological functioning: preliminary data in healthy white women. Health Psychol 2000;19:586–92.

12. Ghaed SG, Gallo LC. Subjective social status, objective socioeconomic status, and cardiovascular risk in women. Health Psychol 2007;26:668–74.

13. Lucero A, Sokol K, Hyun J, et al. Worsening of emergency department length of stay during the COVID-19 pandemic. J Am Coll Emerg Physicians Open 2021;2:e12489.

14. Jedrychowski W, Perera F, Jankowski J, et al. Gender specific differences in neurodevelopmental effects of prenatal exposure to very low-lead levels: the prospective cohort study in three-year olds. Early Hum Dev 2009;85:503–10.

15. Zeger SL, Liang KY. Longitudinal data analysis for discrete and continuous outcomes. Biometrics 1986;42:121–30.

16. Hanley JA, Negassa A, Edwardes MD, Forrester JE. Statistical analysis of correlated data using generalized estimating equations: an orientation. Am J Epidemiol 2003;157:364–75.

17. Sordillo JE, Switkowski KM, Coull BA, et al. Relation of prenatal air pollutant and nutritional exposures with biomarkers of allergic disease in adolescence. Sci Rep 2018;8:10578.

18. Stolwijk AM, Straatman H, Zielhuis GA. Studying seasonality by using sine and cosine functions in regression analysis. J Epidemiol Community Health 1999;53:23–238.

19. Driscoll AK, Osterman MJK, Hamilton BE, Valenzuela C, Martin JA. Quarterly provisional estimates for selected birth indicators, Quarter 1, 2019-Quarter 4, 2021. National Center for Health Statistics. National Vital Statistics System, Vital Statistics Rapid Release Program. 2022. Available at: https://www.cdc.gov/nchs/nvss/vsrr/natality-dashboard.htm. Accessed January 25, 2022.

20. Hamilton BE, Osterman MJK, Martin JA. Declines in births by month: United States, 2020. National Vital Statistics System, Vital Statistics Rapid Release Program. 2021. Available at: https://www.cdc.gov/nchs/data/vsrr/vsrr014-508.pdf. Accessed January 25, 2022.

21. US Bureau of Labor Statistics. Workers with advanced degrees were more likely to work at home than those without in 2018: the Economics Daily. 2019. Available at: https://www.bls.gov/opub/ted/2019/workers-with-advanced-degrees-were-more-likely-to-work-at-home-than-those-without-in-2018.htm?view_full. Accessed January 25, 2022.

22. Dribe M, Breschi M, Gagnon A, et al. Socioeconomic status and fertility decline: insights from historical transitions in Europe and North America. Popul Stud (Camb) 2017;71:3–21.

23. Ahinkorah BO, Seidu AA, Armah-Ansah EK, Ameyaw EK, Budu E, Yaya S. Socio-economic and demographic factors associated with fertility preferences among women of reproductive age in Ghana: evidence from the 2014 Demographic and Health Survey. Reprod Health 2021;18:2.

24. Dribe M, Hacker JD, Scalone F. The impact of socio-economic status on net fertility during the historical fertility decline: a comparative analysis of Canada, Iceland, Sweden, Norway, and the USA. Popul Stud (Camb) 2014;68:135–49.

25. Singh-Manoux A, Adler NE, Marmot MG. Subjective social status: its determinants and its association with measures of ill-health in the Whitehall II study. Soc Sci Med 2003;56:1321–33.

26. Manuck SB, Phillips JE, Gianaros PJ, Flory JD, Muldoon MF. Subjective socioeconomic status and presence of the metabolic syndrome in midlife community volunteers. Psychosom Med 2010;72:35–45.

27. Tamborini CR, Kim C, Sakamoto A. Education and lifetime earnings in the United States. Demography 2015;52:1383–407.

28. United States Census Bureau. Educational attainment in the United States: 2020. 2021. Available at: *Census.gov*. Available at: https://www.census.gov/data/tables/2020/demo/educational-attainment/cps-detailed-tables.html. Accessed January 25, 2022.

29. United States Census Bureau. QuickFacts: United States. Available at: https://www.census.gov/quickfacts/US. Accessed January 25, 2022.

30. Centers for Disease Control and Prevention. Quarantine and isolation. 2022. Available at: https://www.cdc.gov/coronavirus/2019-ncov/php/public-health-recommendations.html; 2020. Accessed January 25, 2022.

31. Centers for Disease Control and Prevention. Health equity considerations and racial and ethnic minority groups. 2022. Available at: https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/race-ethnicity.html. Accessed January 25, 2022.

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SUPPLEMENTAL TABLE 1
Raw responses to the Monthly Survey: Menstrual Update, by month

Month	No	Prefer not to answer	Yes, I tried to conceive naturally	Yes, with the help of methods, such as artificial insemination or in vitro fertilization
February 2020	2051 (93.2)	10 (0.5)	127 (5.8)	12 (0.5)
March 2020	2781 (93.9)	15 (0.5)	155 (5.2)	12 (0.4)
April 2020	3499 (93.8)	16 (0.4)	207 (5.5)	8 (0.2)
May 2020	3880 (93.6)	14 (0.3)	246 (5.9)	6 (0.1)
June 2020	4502 (93.9)	18 (0.4)	262 (5.5)	12 (0.3)
July 2020	4924 (94.3)	18 (0.3)	266 (5.1)	12 (0.2)
August 2020	5378 (94.5)	17 (0.3)	284 (5)	11 (0.2)
September 2020	5864 (94.6)	14 (0.2)	311 (5)	9 (0.1)
October 2020	5976 (94.9)	15 (0.2)	294 (4.7)	13 (0.2)
November 2020	8459 (94.7)	21 (0.2)	430 (4.8)	23 (0.3)
December 2020	9795 (94.9)	17 (0.2)	488 (4.7)	20 (0.2)
January 2021	11,027 (94.8)	19 (0.2)	569 (4.9)	17 (0.1)
February 2021	12,357 (94.9)	14 (0.1)	624 (4.8)	28 (0.2)
March 2021	13,358 (94.9)	19 (0.1)	661 (4.7)	36 (0.3)

Data are presented as number (percentage).

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SUPPLEMENTAL TABLE 2
Transition matrix of survey month gaps

Response before missed survey (t_0)	Response after missed survey (t_{k+1})				
	Attempting	Lactation	Menopause	Not attempting	Pregnant
Attempting	356 (69.7)	2 (0.4)	1 (0.2)	82 (16)	70 (13.7)
Lactation	3 (1.7)	148 (83.6)	0 (0)	25 (14.1)	1 (0.6)
Menopause	0 (0)	0 (0)	1 (4.2)	23 (95.8)	0 (0)
Not attempting	102 (1.2)	2 (0.0)	34 (0.4)	8038 (97.4)	79 (1.0)
Pregnant	62 (19.4)	73 (22.9)	0 (0)	126 (39.5)	58 (18.2)

Data are presented as number (percentage of total at t_0).

If the subject responded to a survey at t_0, missed $k \geq 1$ surveys, and then responding to a survey at t_{k+1}.

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SUPPLEMENTAL TABLE 3
Number of subjects attempting conception

Category	n (%)
Participants attempting conception at least once during the study period	1647 (7.6)
Participants attempting conception at baseline	1308 (6.1)
Women attempting conception at baseline, who later stopped attempting, excluding those who achieved pregnancy	228 (1.1)
Women not attempting conception at baseline, who attempted for the first time during follow-up	339 (1.6)

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SUPPLEMENTAL TABLE 4
Number of months attempting conception

Category	Mean (SD)
Number of months attempting	3.1 (2.7)
Number of months attempting, for continuous attempts	4.4 (2.8)

SD, standard deviation.
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SUPPLEMENTAL TABLE 5

Participants attempting conception in the current month and previous month and conceiving the following month

Month	Total responses	Attempting conception in the current and previous months[a]	Newly attempting conception in the current month[b]	Conceiving in the following month[c]
February 2020	2144 (93.5)	0 (0)	136 (5.9)	12 (0.5)
March 2020	2890 (94.4)	104 (3.4)	57 (1.9)	9 (0.3)
April 2020	3642 (94.4)	132 (3.4)	76 (2.0)	8 (0.2)
May 2020	4039 (93.8)	186 (4.3)	61 (1.4)	20 (0.5)
June 2020	4676 (94.1)	192 (3.9)	76 (1.5)	25 (0.5)
July 2020	5080 (94.6)	206 (3.8)	66 (1.2)	20 (0.4)
August 2020	5526 (94.7)	212 (3.6)	74 (1.3)	26 (0.4)
September 2020	6013 (94.6)	210 (3.3)	103 (1.6)	32 (0.5)
October 2020	6128 (95)	237 (3.7)	64 (1.0)	20 (0.3)
November 2020	8711 (94.7)	240 (2.6)	203 (2.2)	40 (0.4)
December 2020	10,050 (94.9)	321 (3.0)	176 (1.7)	38 (0.4)
January 2021	11,314 (94.8)	390 (3.3)	179 (1.5)	47 (0.4)
February 2021	12,643 (94.9)	404 (3.0)	235 (1.8)	47 (0.4)
March 2021	13,673 (95)	479 (3.3)	205 (1.4)	43 (0.3)

Data are presented as number (percentage).

[a] Includes participants who attempted conception in both the current month and the previous month; for example, the March 2020 row indicates participants who attempted conception in both February and March 2020; [b] Includes participants who attempted conception in the current month but not the previous month; for example, the March 2020 row indicates participants who attempted conception in March 2020 but not in February 2020; [c] Includes participants who attempted conception in the current month and reported that they conceived in the following month; for example, the March 2020 row indicates participants who attempted conception in March 2020 and reported that they were pregnant in April 2020.

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SUPPLEMENTAL TABLE 6
Educational attainment of participants by month

Month	Total	Not college educated	College educated	Graduate school degree
	N (%)			
February 2020	2144	806 (37.6)	481 (22.4)	857 (40.0)
March 2020	2890	1036 (35.8)	656 (22.7)	1198 (41.5)
April 2020	3642	1293 (25.5)	806 (22.1)	1543 (42.4)
May 2020	4039	1411 (34.9)	897 (22.2)	1731 (42.9)
June 2020	4676	1631 (34.9)	1061 (22.7)	1984 (42.4)
July 2020	5080	1767 (34.8)	1176 (23.1)	2137 (42.1)
August 2020	5526	1921 (34.8)	1292 (23.4)	2313 (41.9)
September 2020	6013	2081 (34.5)	1407 (23.4)	2525 (42.0)
October 2020	6128	2114 (34.2)	1456 (23.8)	2558 (41.7)
November 2020	8711	2981 (34.0)	1956 (22.5)	3774 (43.3)
December 2020	10,050	3418 (34.0)	2302 (22.9)	4330 (43.1)
January 2021	11,314	3844 (34.0)	2694 (23.8)	4776 (42.2)
February 2021	12,643	4354 (34.4)	3085 (24.4)	5204 (41.2)
March 2021	13,673	4714 (34.5)	3394 (24.8)	5565 (40.7)

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SUPPLEMENTAL TABLE 7

OR of attempting conception by month, overall and stratified by education

Month	Total	Not college educated	College educated	Graduate school degree
	OR (95% CI)			
February 2020	Ref	Ref	Ref	Ref
March 2020	1.01 (0.94–1.08)	1.02 (0.91–1.14)	0.96 (0.84–1.08)	1.07 (0.92–1.25)
April 2020	1.00 (0.90–1.12)	1.03 (0.88–1.22)	0.90 (0.73–1.10)	1.10 (0.88–1.38)
May 2020	1.02 (0.89–1.15)	1.08 (0.89–1.31)	0.88 (0.69–1.12)	1.08 (0.84–1.39)
June 2020	0.92 (0.80–1.06)	0.87 (0.70–1.07)	0.86 (0.66–1.12)	1.12 (0.82–1.53)
July 2020	0.85 (0.73–1.00)	0.85 (0.69–1.05)	0.73 (0.54–0.99)	1.04 (0.73–1.48)
August 2020	0.82 (0.70–0.97)	0.81 (0.65–1.02)	0.71 (0.51–0.99)	1.05 (0.72–1.53)
September 2020	0.86 (0.73–1.02)	0.79 (0.63–1.00)	0.77 (0.55–1.08)	1.21 (0.83–1.77)
October 2020	0.82 (0.69–0.97)	0.76 (0.59–0.96)	0.73 (0.52–1.03)	1.19 (0.82–1.72)
November 2020	0.84 (0.71–0.99)	0.79 (0.63–1.00)	0.75 (0.53–1.07)	1.17 (0.81–1.69)
December 2020	0.85 (0.72–1.00)	0.79 (0.63–0.99)	0.85 (0.59–1.21)	1.10 (0.76–1.60)
January 2021	0.86 (0.73–1.02)	0.80 (0.64–1.01)	0.90 (0.63–1.29)	1.04 (0.72–1.52)
February 2021	0.88 (0.74–1.04)	0.79 (0.63–0.99)	0.93 (0.65–1.34)	1.14 (0.79–1.66)
March 2021	0.88 (0.74–1.04)	0.80 (0.64–1.01)	0.91 (0.64–1.31)	1.16 (0.80–1.69)

The data have been adjusted for age, race, and marital status.

CI, confidence interval; *OR*, odds ratio; *Ref*, reference.

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SUPPLEMENTAL TABLE 8

Odds ratio of attempting conception by month, overall and stratified by the MacArthur Scale of Subjective Social Status

Month	Total	Low SSS	Moderate SSS	High SSS
	OR (95% CI)			
February 2020	Ref	Ref	Ref	Ref
March 2020	1.01 (0.94–1.08)	0.92 (0.78–1.09)	1.06 (0.93–1.21)	1.00 (0.91–1.10)
April 2020	1.00 (0.90–1.12)	0.93 (0.72–1.19)	1.06 (0.88–1.27)	0.99 (0.83–1.17)
May 2020	1.02 (0.89–1.15)	1.01 (0.77–1.34)	1.04 (0.84–1.30)	0.97 (0.80–1.17)
June 2020	0.92 (0.80–1.06)	0.86 (0.64–1.15)	0.95 (0.75–1.21)	0.91 (0.72–1.14)
July 2020	0.85 (0.73–1.00)	0.83 (0.63–1.10)	0.93 (0.72–1.20)	0.74 (0.56–0.98)
August 2020	0.82 (0.70–0.97)	0.80 (0.60–1.06)	0.93 (0.71–1.21)	0.70 (0.52–0.95)
September 2020	0.86 (0.73–1.02)	0.77 (0.58–1.01)	0.97 (0.74–1.28)	0.81 (0.60–1.09)
October 2020	0.82 (0.69–0.97)	0.67 (0.50–0.91)	0.97 (0.74–1.29)	0.76 (0.56–1.02)
November 2020	0.84 (0.71–0.99)	0.75 (0.56–1.01)	0.98 (0.75–1.29)	0.74 (0.55–1.00)
December 2020	0.85 (0.72–1.00)	0.76 (0.57–1.01)	1.05 (0.80–1.38)	0.69 (0.51–0.93)
January 2021	0.86 (0.73–1.02)	0.81 (0.60–1.08)	1.02 (0.78–1.35)	0.71 (0.53–0.95)
February 2021	0.88 (0.74–1.04)	0.77 (0.57–1.03)	1.06 (0.80–1.39)	0.75 (0.56–1.00)
March 2021	0.88 (0.74–1.04)	0.79 (0.59–1.06)	1.03 (0.78–1.35)	0.76 (0.57–1.02)

Data have been adjusted for age, race and marital status. The MacArthur Scale of SSS scores as low SSS (SSS score of 0–3), moderate SSS (SSS score of 4–5), and high SSS (SSS score of 6–9).

CI, confidence interval; *OR*, odds ratio; *Ref*, reference; *SSS*, Subjective Social Status.

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SUPPLEMENTAL TABLE 9

Odds ratio of attempting conception during COVID-19 vs pre–COVID-19

Variable	OR (95% CI)	
	Model 1[a]	Model 2[b]
Pre–COVID-19 (February 2020)	Ref	Ref
During COVID-19	0.99 (0.91–1.07)	0.98 (0.90–1.06)

CI, confidence interval; *OR*, odds ratio; *Ref*, reference.

[a] Adjusted for age, race, and marital status; [b] Adjusted for age, race, marital status, sine, and cosine terms.

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SUPPLEMENTAL TABLE 10

Odds ratio of attempting conception at least once in quarter, closed cohort, including only first quarter of response to the Monthly Survey: Menstrual Update, overall and stratified by educational attainment

Quarters[a]	Total	Not college educated	College educated	Graduate school degree
	OR (95% CI)			
Q1 2020	Ref	Ref	Ref	Ref
Q2 2020	1.16 (0.95–1.43)	1.12 (0.83–1.51)	1.06 (0.72–1.55)	1.48 (0.95–2.32)
Q3 2020	0.98 (0.79–1.22)	1.00 (0.74–1.37)	0.79 (0.52–1.18)	1.22 (0.77–1.93)
Q4 2020	0.90 (0.75–1.07)	0.94 (0.73–1.22)	0.75 (0.54–1.04)	1.05 (0.71–1.56)
Q1 2021	0.97 (0.81–1.15)	0.97 (0.75–1.26)	0.80 (0.59–1.09)	1.25 (0.87–1.81)
Trend test	*P*=.13	*P*=.43	*P*=.06	*P*=.71

Data have been adjusted for age, race, and marital status. Data have been restricted to the first quarter of the response to assess conception attempts at least once within each quarter. Participants were removed from all subsequent quarters to create 5 closed cohorts.

CI, confidence interval; *OR*, odds ratio; *Ref*, reference.

[a] Q1 2020 = quarter 1 2020 (January 2020 to March 2020); Q2 2020 = quarter 2 2020 (April 2020 to June 2020); Q3 2020 = quarter 3 2020 (July 2020 to September 2020); Q4 2020 (October 2020 to December 2020); Q1 2021 (January 2021 to March 2021).

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SUPPLEMENTAL TABLE 11

Odds ratio of attempting conception at least once in quarter, closed cohort, including only first quarter of response to the Monthly Survey: Menstrual Update, overall and stratified by the MacArthur Scale of Subjective Social Status

Quarters[a]	Total	Low SSS	Moderate SSS	High SSS
	OR (95% CI)			
Q1 2020	Ref	Ref	Ref	Ref
Q2 2020	1.16 (0.95–1.43)	1.00 (0.67–1.51)	1.27 (0.94–1.74)	1.14 (0.77–1.68)
Q3 2020	0.98 (0.79–1.22)	0.97 (0.63–1.47)	0.99 (0.71–1.38)	0.96 (0.65–1.42)
Q4 2020	0.90 (0.75–1.07)	0.84 (0.59–1.19)	1.00 (0.76–1.31)	0.78 (0.56–1.09)
Q1 2021	0.97 (0.81–1.15)	0.92 (0.65–1.15)	1.07 (0.82–1.39)	0.86 (0.63–1.18)
Trend test	*P*=.13	*P*=.43	*P*=.78	*P*=.11

The data have been adjusted for age, race, and marital status. The data have been restricted to the first quarter of the response to assess conception attempts at least once within each quarter. Participants were removed from all subsequent quarters to create 5 closed cohorts. The MacArthur Scale of SSS scores as low SSS (SSS score of 0–3), moderate SSS (SSS score of 4–5), and high SSS (SSS score of 6–9).

Ref, reference; *SSS*, Subjective Social Status.

[a] Q1 2020 = quarter 1 2020 (January 2020 to March 2020); Q2 2020 = quarter 2 2020 (April 2020 to June 2020); Q3 2020 = quarter 3 2020 (July 2020 to September 2020); Q4 2020 (October 2020 to December 2020); Q1 2021 (January 2021 to March 2021).

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SUPPLEMENTAL TABLE 12

Comparison matrix between educational attainment and MacArthur Scale of Subjective Social Status

MacArthur Scale of SSS	Not college educated (n=9689)	College educated (n=7141)	Graduate school degree (n=4786)
	n (%)		
Low	3765 (38.9)	1310 (18.3)	403 (8.4)
Moderate	4328 (44.7)	3296 (46.2)	1830 (38.2)
High	1596 (16.5)	2535 (35.5)	2553 (53.5)

The MacArthur Scale of SSS scores as low SSS (SSS score of 0–3), moderate SSS (SSS score of 4–5), and high SSS (SSS score of 6–9).

SSS, Subjective Social Status.

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