Associations between the COVID-19 pandemic and women's fertility intentions: a multi-country, cross-sectional (I-SHARE) study

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ABSTRACT

Introduction The COVID-19 pandemic, together with the subsequent social distancing measures, could lead to shifts in family and fertility planning. This study aimed to explore the associations between the COVID-19 pandemic and changes in fertility intentions among an international sample of reproductive-aged women.

Methods A multi-country, cross-sectional study based on data from 10 672 women aged 18–49 years who participated in the International Sexual Health And REproductive Health (I-SHARE) study, which organised an international online survey between July 2020 and February 2021. Factors associated with changes in fertility intentions were explored using multinomial probit regression models. Cluster-robust standard errors were used to calculate model parameters.

Results Of 10 672 included reproductive-aged women, 14.4% reported changing their fertility intentions due to the pandemic, with 10.2% postponement and 4.2% acceleration. Women who had ever been isolated/quarantined were more likely to postpone their fertility intentions (adjusted odds ratio (AOR)=1.41; 95% CI 1.18 to 1.69) compared with those who had not; women who lived with a steady partner were more likely to want children sooner (AOR=1.57; 95% CI 1.10 to 2.23) compared with those who did not; and those who reported a higher frequency of getting angry, feeling frustrated, or worrying about their finances were more likely to postpone their fertility intentions. The main findings were robust in the sensitivity analyses.

Conclusions Most women who changed fertility intentions because of the pandemic have postponed intentions to expand their families. The pandemic-induced exposures were associated with these postponements.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Studies in individual countries have suggested that the COVID-19 pandemic has contributed to the change in people's fertility intentions.

WHAT THIS STUDY ADDS

⇒ Pandemic-induced isolation/quarantine and deteriorating mental health were associated with postponed fertility intentions, while living with a steady partner during social distancing measures was associated with accelerated women's fertility intentions.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Changes in women's fertility intentions could cause uncertainty in fertility rates over the long term. Authorities should respond to the reproductive health needs of women during public health crises.

INTRODUCTION

The COVID-19 (coronavirus disease 2019) pandemic, together with the subsequent social distancing measures, caused drastic changes in the global economy as well as individual lifestyles, health and well-being.[1] These shifts have been accompanied by changes in family planning, including fertility plans.[2] Fertility intentions refer to the desire to have a

child, which is influenced by an individual's current situation.[3] Fertility intentions have been recognised as a fairly reliable predictor of individual fertility-related behaviour.[4] Given that shifting fertility intentions manifest as changes in fertility patterns,[5] the changes in fertility intentions as a result of the pandemic would impact society at large through shifts in social and economic stability as well as population and migration policy.

Thus far, studies have shown conflicting evidence regarding changes in fertility intentions related to COVID-19. Some studies in European countries (Italy, Poland, Germany, France, Spain), the UK and the United States (US) reported that 20% to 57.8% of respondents postponed fertility intentions, and 14.2% to 36.5% of respondents even abandoned their previous fertility plans because of the COVID-19 pandemic.[6–9] However, in the Italian and US studies, 10–20% of participants who did not previously intend to have children wanted a child sooner during the pandemic.[7 8]

Previous studies have provided clear evidence regarding the impact of living with a partner on fertility intentions, demonstrating that living with a partner is a prerequisite for having children.[10 11] Economic recessions are often accompanied by a decline in fertility, as income reductions lead to a postponement of fertility intentions among women until their financial situation improves.[12 13] Additionally, women with better mental well-being are unlikely to postpone their desire to have children and are more likely to have children sooner.[14] Recent studies have further examined the impact of COVID-19-induced changes in family relationships, financial status and mental health on fertility intentions,[8 9 15–17] highlighting the associations between COVID-19-related experiences and fertility intention shifts. Moreover, the COVID-19 pandemic, with its infections and associated isolation measures, may also contribute to changes in women's fertility intentions.

The International Sexual Health And REproductive Health (I-SHARE) consortium, comprising researchers from 30 countries worldwide, used a standardised survey instrument to investigate the effects of the first wave of COVID-19 on sexual and reproductive health (SRH).[18] This multi-country, cross-sectional study aimed to explore how fertility intentions have changed due to the COVID-19 pandemic, and identify factors associated with changes in fertility intentions among an international sample of women aged 18–49 years, with the hope of informing global health and demographic policy.

METHODS

Study design

This cross-sectional study was conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.[19] The I-SHARE consortium convened a group of SRH researchers to administer a common survey instrument in their respective countries as an online survey.[18] The online survey used social media, partner organisations, paid social media advertising, university websites, telephone interviews, and television or newspapers to recruit participants.[20] Individuals who agreed to answer the online questionnaire participated in the specific survey.

A more detailed description of the study methods, including the study protocol, questionnaire development, participant recruitment and data collection, is available elsewhere.[18] In summary, a total of 30 countries participated in the survey, which was distributed through local, regional and national networks between 20 July 2020 and 15 February 2021.[20] The majority of countries employed convenience sampling, while two countries (Denmark, Czech Republic) used representative samples, and six countries (Sweden, Botswana, Uganda, Lebanon, Kenya and Argentina) utilised online panels. This study examines the associations between the COVID-19 pandemic and fertility intentions, and therefore focuses on the subsample of 18–49-year-old women.

Participants

Participants had to be aged 18 years or older, live in their respective participating countries, be able to read and understand questionnaires, have access to online surveys, and be willing to provide informed consent. Overall, 23 067 participants from 30 countries completed the survey. Based on the prespecified plan and considering the potential for greater heterogeneity, the I-SHARE group advised conducting multi-country studies with sample sizes of at least 200 participants (online supplemental table 1).[18] The eligibility criteria for participants included in this analysis were as follows: aged between 18 and 49 years, assigned female at birth, and answered the question regarding fertility intentions. The inclusion and exclusion processes are outlined in figure 1. Eventually, the

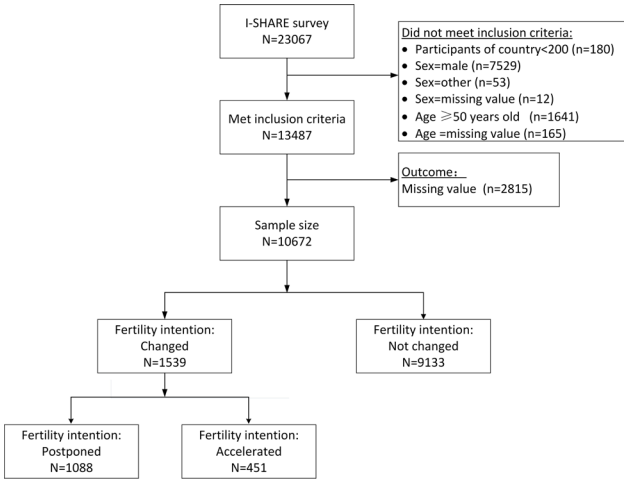

Figure 1 Flowchart of participants.

study included a total of 10 672 women of reproductive age from 24 countries.

Measures

Dependent variable

The dependent variable for this study was fertility intentions, and participants were asked specifically about the pandemic-related changes to their fertility intentions with the question "Have you recently changed your mind about having a child soon because of COVID-19?". The answer options were: (1) Yes, I have decided to postpone my decision to have a child in the near future (postponed); (2) Yes, I have decided I want to have a child sooner (accelerated); and (3) No, I have not changed my plans (not changed).

Independent variables

Key explanatory variables of interest included COVID-19 pandemic-induced exposures such as testing for COVID-19, isolation/quarantine, personal income loss, living together with a steady partner, and mental health during the pandemic.

Testing for COVID-19, assessed by the question "Were you ever tested for COVID-19?" with the following answer options: 1=no; 2=yes, always negative; 3=yes, positive at least once. Isolation/quarantine was assessed by the question "Were you ever in (self-)isolation/quarantine because of symptoms or because you were in close contact with someone with COVID-19 or because you returned from a country that had a large number of cases?" with the following answer options: 1=yes; 2=no. Personal income loss was assessed by the question "Have you personally experienced a loss of income? " with answer options: 1=yes; 2=no. Living together with a steady partner was assessed by the question "During the COVID-19 social distancing measures is/was your steady partner living with you in the same place?" with the following answer options: 1=no, s/he stays elsewhere; 2=yes, the whole time/part of the time.

The questionnaire covered four different mental health items: frequency of getting angry, frequency of feeling frustrated, frequency of feeling bored, and frequency of worrying about finances. Participants were asked about their mental health status during the COVID-19 social distancing measures compared with 3 months before the COVID-19 pandemic, assessed by the same question asked four times: "Does this happen more or less since the start of the COVID-19 social distancing measures?". Response options for the four questions were the same: 1=same; 2=more (a lot more/more); 3=less (less/a lot less). The response options were redivided into two categories: 1=same or less; 2=more.

Confounding variables

Age was measured as a continuous variable in the questionnaire and was divided into two categories in this study: 18–32 years old; 33–49 years old. Education was measured as: no formal education; some/completed primary education; some/completed secondary education; some college/university; completed college/university. These were combined into three categories for regression analysis: no formal education–secondary education; some college/university; completed college/university. Marital status was classified into four categories: single, no partner; not married, have a partner; legally married; widowed/divorced/other. Number of children was measured as a continuous variable in the questionnaire and was divided into three categories in this study: 0; 1; ≥2. When asked about their religion, participants selected their religion from a list of country-specific options and then were classified into two groups: has no religious belief; has a religious belief.

In terms of country-level variables, the participating countries were recoded as[21]: sub-Saharan Africa (SSA); Latin America and the Caribbean (LAC); North America (NA); East Asia and the Pacific (EAP); Europe and Central Asia (ECA). Following the classification of World Bank income levels, participating countries were recoded as[21]: high-income countries; upper-middle-income countries; low- or low-middle-income countries. The minimum and maximum number of participants by country were reported.

Statistical analysis

Descriptive statistics were used to summarise the participating countries and participants' sociodemographic characteristics. Due to significant variation among the participating countries, the analysis was performed at the individual level. The Bonferroni correction was applied to account for multiple hypothesis testing. The comparison of sociodemographic characteristics between participants in this study and all reproductive-aged women from the I-SHARE survey is shown in online supplemental table 2. The distribution of fertility intentions across country regions, country income levels and participants' sociodemographic characteristics are also described (online supplemental table 3).

In the multivariable analysis, multinomial probit regression was performed to examine the associations between fertility intentions and pandemic-induced exposures at the individual level.[22] For each independent variable we calculated the crude OR, the adjusted OR after controlling for all confounders, and the adjusted OR (AOR) after controlling for both confounders and independent variables (online supplemental table 4). Given the multi-country data used in this study, we adjusted the estimates to account for clustering of individuals within their respective countries.[23] The sensitivity analyses, which utilised country-cluster robust bootstrap estimation, are presented in online supplemental table 5, and countries or the country income level with more than 100 participants

are shown in online supplemental table 6. The associations between pandemic-induced exposures and fertility intentions for participants at different country income levels are shown in online supplemental table 7 and online supplemental table 8. All tests were two-tailed, the significance level was set at 0.05, and the analyses were performed using Stata 16.

RESULTS

According to the flowchart of participants (figure 1), 10 672 women were enrolled in the study, with 10.2% having postponed fertility intention, 4.2% having accelerated fertility intention and 85.6% having not changed their fertility intention due to the COVID-19 pandemic.

The participants in this study had a mean age of 29.9 years and a median age of 28 years (IQR: 24–35); 47.2% were not married but had a steady partner; most of the participants (60.1%) had completed their college or university; more than half (52.0%) had a religious belief; and the majority of the participants (72.9%) had no children (table 1).

Table 2 shows the distribution of fertility intentions by pandemic-induced exposures. Participants with negative COVID-19 test results had a lower proportion of postponing fertility intention (9.4% vs 10.3%)

Table 1 Characteristics of participating countries (n=24) and participants (n=10 672)

Parameter	n	%
Characteristics of participating countries		
Participating counties by region		
Sub-Saharan Africa (SSA)	3	15.4
Latin America and the Caribbean (LAC)	5	19.2
North America (NA)	2	7.7
East Asia and the Pacific (EAP)	3	15.4
Europe and Central Asia (ECA)	11	42.3
Participating counties by income level		
High-income countries	15	57.7
Upper-middle-income countries	8	30.8
Low- or low-middle-income countries	1	11.5
Number of participants by country (minimum–maximum)	13–2209	
Characteristics of participants		
Age (years)		
Mean (SD)	29.9 (7.8)	
Median (IQR)	28.0 (24.0–35.0)	
Marital status		
Single, no partner	2918	27.4
Not married, have a partner	5030	47.2
Legally married	2467	23.2
Widowed/divorced/other	239	2.2
Education		
No formal education	20	0.2
Some/completed primary education	599	5.8
Some/completed secondary education	1850	17.9
Some college/university	1662	16.0
Completed college/university	6217	60.1
Religion		
Has no religious belief	4211	48.0
Has a religious belief	4558	52.0
Number of children		
0	7779	72.9
1	1294	12.1
≥2	1597	15.0

Table 2 Distribution of fertility intentions by pandemic-induced exposures (n=10 672)

	Fertility intentions				
	Total	Postponed	Accelerated	Not changed	
Parameter	n (column %)	n (row %)	n (row %)	n (row %)	P value*
Testing for COVID-19					<0.05
No	7092 (66.5)	732 (10.3)	275 (3.9)	6085 (85.8)	
Yes, always negative	3122 (29.3)	294 (9.4)	150 (4.8)	2678 (85.8)	
Yes, at least positive once	446 (4.2)	61 (13.7)	26 (5.8)	359 (80.5)	
Isolation/quarantine					<0.001
No	7968 (74.7)	744 (9.3)	316 (4.0)	6908 (86.7)	
Yes	2694 (25.3)	342 (12.7)	134 (5.0)	2218 (82.3)	
Personal income loss					<0.001
No	7180 (68.0)	605 (8.4)	274 (3.8)	6301 (87.8)	
Yes	3385 (32.0)	462 (13.6)	171 (5.1)	2752 (81.3)	
Living together with a steady partner					<0.001
No, s/he stays elsewhere	2443 (35.2)	225 (9.2)	79 (3.2)	2139 (87.6)	
Yes, the whole time/part of the time	4500 (64.8)	567 (12.6)	231 (5.1)	3702 (82.3)	
Mental health compared with 3 months before COVID-19 measures					
Frequency of getting angry					<0.001
Same or less	5930 (57.5)	487 (8.2)	244 (4.1)	5199 (87.7)	
More	4390 (42.5)	564 (12.8)	188 (4.3)	3638 (82.9)	
Frequency of feeling frustrated					<0.001
Same or less	4505 (43.6)	347 (7.7)	192 (4.3)	3966 (88.0)	
More	5828 (56.4)	704 (12.1)	244 (4.2)	4880 (83.7)	
Frequency of feeling bored					<0.001
Same or less	4728 (45.8)	406 (8.6)	193 (4.1)	4129 (87.3)	
More	5592 (54.2)	647 (11.6)	242 (4.3)	4703 (84.1)	
Frequency of worrying about finances					<0.001
Same or less	4993 (48.3)	352 (7.1)	190 (3.8)	4451 (89.1)	
More	5341 (51.7)	700 (13.1)	243 (4.5)	4398 (82.4)	

*Compared using Bonferroni correction.

whereas those with positive test results had greater proportions of both postponing (13.7% vs 10.3%) and accelerating (5.8% vs 3.9%) fertility intention. A higher proportion of participants who had been isolated/quarantined reported postponed fertility intention (12.7% vs 9.3%) or accelerated fertility intention (5.0% vs 4.0%). Participants who experienced personal income loss were more likely to report both postponed (13.6% vs 8.4%) and accelerated fertility intentions (5.1% vs 3.8%). Participants who lived together with their steady partner were more likely to report both accelerated fertility intention (12.6% vs 9.2%) and postponed fertility intention (5.1% vs 3.2%).

Compared with participants with equal or fewer mental health issues, those who had more frequency of getting angry (12.8% vs 8.2%), more frequency of feeling frustrated (12.1% vs 7.7%), more frequency of feeling bored (11.6% vs 8.6%) and more frequency of worrying about their financial situation (13.1% vs 7.1%) during the COVID-19 social distancing measures were more likely to postpone fertility intentions.

In the multinomial probit regression analysis (table 3), after all variables are adjusted, the results show that participants who tested negative for COVID-19 were less likely to postpone fertility intentions (AOR=0.79; 95% CI 0.64 to 0.97) compared with those who did not test for COVID-19. Participants who had ever been isolated/quarantined were more likely to postpone fertility intentions (AOR=1.41; 95% CI 1.18 to 1.69) compared with those who had never been isolated or quarantined. When compared with those who did not experience a loss in personal income, the likelihood of postponing (AOR=1.29; 95% CI 1.12 to 1.49) or accelerating (AOR=1.22; 95% CI 1.06 to 1.40) fertility intentions increased among those who did. Participants who lived with their partner during the COVID-19 social distancing measures were more likely to accelerate (AOR=1.57; 95% CI 1.10 to 2.23)

Table 3 Multinomial probit regression analysis of pandemic-induced exposures on fertility intentions compared with not changed (n=10 672)

	Fertility intentions	
	Postponed	Accelerated
Parameter	**AOR (95% CI)**	**AOR (95% CI)**
Age (years)	1.53 (1.31 to 1.80)***	1.34 (1.18 to 1.53)***
Age^2 (years)	0.99 (0.99 to 1.00)***	1.00 (0.99 to 1.00)***
Marital status		
Single†	1	1
Not married, have a partner	0.94 (0.71 to 1.25)	1.03 (0.74 to 1.42)
Legally married	1.27 (0.95 to 1.70)	0.98 (0.70 to 1.39)
Education		
No formal education–secondary education	1	1
Some college/university	1.17 (0.81 to 1.69)	1.11 (0.61 to 2.01)
Completed college/university	1.08 (0.88 to 1.32)	1.26 (0.84 to 1.88)
Religion		
Has no religious belief	1	1
Has a religious belief	1.38 (1.16 to 1.63)***	1.53 (1.16 to 2.02)**
Number of children		
0	1	1
1	1.25 (0.86 to 1.80)	0.75 (0.56 to 1.00)*
≥2	0.67 (0.53 to 0.85)***	0.39 (0.29 to 0.52)***
Testing for COVID-19		
No	1	1
Yes, always negative	0.79 (0.64 to 0.97)*	1.11 (0.92 to 1.33)
Yes, at least positive once	1.05 (0.47 to 2.35)	1.45 (0.74 to 2.83)
Isolation/quarantine		
No	1	1
Yes	1.41 (1.18 to 1.69)***	1.20 (0.99 to 1.46)
Personal income loss		
No	1	1
Yes	1.29 (1.12 to 1.49)***	1.22 (1.06 to 1.40)**
Living together with a steady partner		
No, s/he stay elsewhere	1	1
Yes, the whole time/part of the time	1.20 (0.83 to 1.72)	1.57 (1.10 to 2.23)*
Mental health compared with 3 months before COVID-19 measures		
Frequency of getting angry		
Same or less		
More	1.30 (1.18 to 1.43)***	0.98 (0.87 to 1.09)
Frequency of feeling frustrated		
Same or less	1	1
More	1.21 (1.04 to 1.41)*	0.99 (0.83 to 1.18)
Frequency of feeling bored		
Same or less	1	1
More	1.09 (0.99 to 1.19)	1.10 (0.87 to 1.39)
Frequency of worrying about finances		
Same or less	1	1
More	1.43 (1.16 to 1.75)***	1.20 (0.98 to 1.47)

Adjusted for all variables; 95% CI in parentheses.
*p<0.05, **p<0.01, ***p<0.001.
†Single: including no partner, widowed, divorced, other.
AOR, adjusted odds ratio.

their fertility intentions compared with those who did not.

In terms of mental health, participants who reported increased frequency of getting angry (AOR=1.30; 95% CI 1.18 to 1.43), increased frequency of feeling frustrated (AOR=1.21; 95% CI 1.04 to 1.41) or increased frequency of worrying about their financial situation (AOR=1.43; 95% CI 1.16 to 1.75) were more likely to postpone their fertility intentions. The associations between pandemic-induced exposures and fertility intentions were robust in the sensitivity analyses (online supplemental tables 5 and 6).

DISCUSSION

The associations between the COVID-19 pandemic and reproductive-aged women's fertility intentions are investigated in this multi-country, cross-sectional study. Fewer than a third of those who changed their fertility intentions decided they wanted a child sooner, implying that many women may be postponing plans to expand their families, with long-term implications for the total fertility rate. This study expands the literature by using a multi-country approach to explore pandemic-related factors that contributed to the postponement or acceleration in women's fertility intentions.

A relationship between COVID-19-related experiences and changes in fertility intentions is observed in this study. Women who received negative COVID-19 test results were less likely to postpone their fertility intentions. Similarly, women who were quarantined due to COVID-19 were more likely to postpone their fertility intentions. Underlying reasons explaining this trend may be the fear of the effect of COVID-19 infection on complications during pregnancy, as women may avoid conceiving in such circumstances.[2] In addition, women who lived with their partners during COVID-19 social distancing measures were more likely to accelerate their fertility intentions compared with women who did not change their fertility intentions. This may be due to the fact that the COVID-19 social distancing measures allowed women to spend more time with their partners, improving the quality of their relationships and encouraging them to expand their families.[15 24]

The economic recession brought on by the COVID-19 pandemic was a crucial factor for fertility intentions among our respondents. Women in our study who lost personal income during the pandemic were more likely to postpone their desire to have children. This is consistent with the findings of Italian and Polish studies in which women who postponed or even abandoned their intention to have children cited reduced income as a major concern.[8 9] In contrast, a US study showed that women who were financially insecure reported newly considering pregnancy.[25] The current study also found that women who lost personal income were significantly more likely to want a child sooner. This may be explained by such women using this period to have children, as the barriers to childbearing diminished, and the available time for childbearing and childcaring increased.[26] Evidently a loss in personal income may influence fertility intentions bidirectionally.

Another important topic was the mental health deterioration in association with pandemic-related social distancing measures. Our findings are in favour of the mental health burden produced by the COVID-19 pandemic having negative associations with fertility decisions.[27 28] Women who had a higher frequency of getting angry, frustrated, or worried about finances during the pandemic were more likely to postpone their desire to have children. This study supports the need to learn more about how the pandemic affects mental health and fertility decisions concomitantly.

This study is not without shortcomings. Because the participants were mostly recruited through convenience sampling with no quota set, and those individuals who did not have access to or could not use electronic devices were also not represented, this study was deficient in representativeness. Additionally, the study's findings may be primarily driven by high-income countries, given that only a small number of participants were from low- or low-middle-income countries, and the majority were from high-income countries, resulting in limited generalisability. Furthermore, the number of participants varied widely between countries or regions, making it impractical to conduct inter-country or inter-regional comparisons for this study.

CONCLUSIONS

In this large, diverse, cross-sectional study of reproductive-aged women, few women wanted a child sooner following the outbreak of COVID-19 and there was substantial uncertainty about whether their intentions would change as the crisis continued. In the context of the pandemic, the COVID-19-related experiences, personal income loss, living together with a steady partner, and mental health among women might influence the fertility rate over the long term. Future research could further investigate specific factors related to the pandemic that influence the decision to postpone or accelerate fertility plans, as well as whether fertility intention patterns differ across countries and regional groups.

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Contributors W-HZ was the guarantor of the study. W-HZ designed the study and supervised the data analysis. MZ performed the data analysis. CAO'H, NBS and JDT provided input on the statistical analyses. MZ and CAO'H prepared the draft of the manuscript. NBS, OI, ECL, KP, SS, HL, EK, AC and W-HZ revised drafts of the manuscript and provided advice. KM and JDT were the coordinators for the multi-county survey. The I-SHARE consortium conducted field testing, translation, ethical review applications and survey implementation in 30 countries. All contributing authors reviewed, provided input and approved the final manuscript.

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Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and ethical approval was obtained from Ghent University (BC-07988) and the University of North Carolina at Chapel Hill (295989) for secondary data analysis. Participants gave informed consent to participate in the study before taking part.

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Data availability statement Data are available upon reasonable request. The authors have affirmed their willingness to provide all anonymized participant data that form the foundation of the analysis, results, and conclusions presented in this paper. Data are available from Prof. Wei-Hong Zhang who can be contacted on Weihong.zhang@ugent.be. The survey protocol and final survey instrument are available at https://sti.bmj.com/content/97/2/88.longhttps://sti.bmj.com/content/97/2/88.long.

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REFERENCES

1 Aassve A, Cavalli N, Mencarini L, *et al*. The COVID-19 pandemic and human fertility. *Science* 2020;369:370–1.
2 Ullah MdA, Moin AT, Araf Y, *et al*. Potential effects of the COVID-19 pandemic on future birth rate. *Front Public Health* 2020;8:893.
3 Vignoli D, Rinesi F. Fertility plans/intentions. In: Michalos AC, ed. *Encyclopedia of quality of life and well-being research*. Dordrecht, Netherlands: Springer, 2014: 2267–8.
4 Westoff CF, Ryder NB. The predictive validity of reproductive intentions. *Demography* 1977;14:431–53.
5 Reher DS. Economic and social implications of the demographic transition. *Popul Dev Rev* 2011;37:11–33.
6 Luppi F, Arpino B, Rosina A. The impact of COVID-19 on fertility plans in Italy, Germany, France, Spain, and the United Kingdom. *Dem Res* 2020;43:1399–412.
7 Lindberg LD, Vusse AV, Mueller J, *et al*. *Early impacts of the COVID-19 pandemic: findings from the 2020 Guttmacher survey of reproductive health experiences*. New York: Guttmacher Institute, 2020.
8 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.
9 Malicka I, Mynarska M, Świderska J. Perceived consequences of the COVID-19 pandemic and childbearing intentions in Poland. *JFamRes* 2021;33:674–702.
10 Hiekel N, Castro-Martín T. Grasping the diversity of cohabitation: fertility intentions among cohabiters across Europe. *Fam Relat* 2014;76:489–505.
11 Fiori F, Rinesi F, Graham E. Choosing to remain childless? A comparative study of fertility intentions among women and men in Italy and Britain. *Eur J Popul* 2017;33:319–50.
12 Cherlin A, Cumberworth E, Morgan SP, *et al*. The effects of the great recession on family structure and fertility. Ann Am Acad Pol Soc Sci 2013;650:214–31.
13 Cazzola A, Pasquini L, Angeli A. The relationship between unemployment and fertility in Italy: a time-series analysis. *Dem Res* 2016;34:1–38.
14 Philipov D, Spéder Z, Billari FC. Soon, later, or ever? The impact of anomie and social capital on fertility intentions in Bulgaria. Popul Stud (Camb) 2006;60:289–308.
15 Ahmed D, Buheji M, Merza Fardan S. Re-emphasising the future family role in 'care economy' as a result of COVID-19 pandemic spillovers. *Economics* 2020;10:332–8.
16 Luppi F, Arpino B, Rosina A. Fertility plans in the early times of the COVID-19 pandemic: the role of occupational and financial uncertainty in Italy. *PLoS One* 2022;17:e0271384.
17 Guetto R, Bazzani G, Vignoli D. Narratives of the future and fertility decision-making in uncertain times. An application to the COVID-19 pandemic. Vienna Yearbook of Population Research 2022;20:223–260.
18 Michielsen K, Larrson EC, Kågesten A, *et al*. International sexual health And REproductive health (I-SHARE) survey during COVID-19: study protocol for online national surveys and global comparative analyses. *Sex Transm Infect* 2021;97:88–92.
19 Cuschieri S. The STROBE guidelines. *Saudi J Anaesth* 2019;13:S31–4.

20 Toller Erausquin J, Tan RKJ, Uhlich M, *et al*. The International Sexual Health And REproductive health survey (I-SHARE-1): a multi-country analysis of adults from 30 countries prior to and during the initial COVID-19 wave. *Clin Infect Dis* 2022;75:e991–9.
21 The World Bank. Countries and economies. Available: https://data.worldbank.org/country [Accessed 20 Mar 2022].
22 Kwak C, Clayton-Matthews A. Multinomial logistic regression. *Nurs Res* 2002;51:404–10.
23 Prajogo D, Mena C, Cooper B, *et al*. The roles of national culture in affecting quality management practices and quality performance - multilevel and multi-country analysis. International Journal of Operations & Production Management, 2022;42:877–97.
24 Szabo TG, Richling S, Embry DD, *et al*. From helpless to hero: promoting values-based behavior and positive family interaction in the midst of COVID-19. *Behav Anal Pract* 2020;13:568–76.
25 Kahn LG, Trasande L, Liu M, *et al*. Factors associated with changes in pregnancy intention among women who were mothers of young children in New York City following the COVID-19 outbreak. *JAMA Netw Open* 2021;4:e2124273.
26 Fostik A. COVID-19 and fertility in Canada: a commentary. *Can Stud Popul* 2021;48:217–24.
27 Lebel C, MacKinnon A, Bagshawe M, *et al*. Elevated depression and anxiety symptoms among pregnant individuals during the COVID-19 pandemic. *J Affect Disord* 2020;277:5–13.
28 Naya CH, Saxbe DE, Dunton GF. Early effects of the COVID-19 pandemic on fertility preferences in the United States: an exploratory study. *Fertil Steril* 2021;116:1128–38.