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Family Values and Fear of Childbirth as Psychosocial Barriers to Fertility Intentions among Chinese University Students: A Theory of Planned Behavior-Guided Cross-Sectional Study

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Abstract

Background

China's total fertility rate has fallen to 1.09, one of the lowest rates worldwide. Despite successive policy relaxations, fertility intentions remain low, particularly among university students. Previous studies have focused predominantly on cognitive knowledge deficits, leaving psychological and attitudinal antecedents, especially family values and fear of childbirth, largely unexplored in mainland China. This study examined the extent to which family values and fear of childbirth predict fertility intentions among Chinese university students and whether these associations differ by gender and relationship status, guided by the Theory of Planned Behavior.

Methods

A cross-sectional survey was conducted at a public university in Wuhan, China, from January to April 2024. Undergraduate and postgraduate students aged 18 years and older were recruited via convenience sampling. Validated scales measure family values, fear of childbirth, and fertility intentions (willing, uncertain, or unwilling). Multivariable multinomial logistic regression identified predictors, with adjusted odds ratios and 95% confidence intervals reported. Sample size adequacy was assessed via the events-per-variable principle.

Results

Of the 233 valid questionnaires, only 57 (24.5%) participants reported a clear willingness to have children; 77 (33.0%) were unwilling and 99 (42.5%) were uncertain. Female gender and being single without actively seeking a partner were strong predictors of unwillingness (adjusted odds ratio = 0.21, 95% confidence interval: 0.07–0.64; and 15.54, 95% confidence interval: 4.33–55.79, respectively). Each 1-point increase in fear of childbirth increased the odds of unwillingness by 8% (adjusted odds ratio = 1.08, 95% confidence interval: 1.02–1.14), whereas more open family values reduced uncertainty (adjusted odds ratio = 0.95, 95% confidence interval: 0.90-1.00). Among willing participants, higher fear of childbirth was associated with a later intended age at first birth (adjusted odds ratio = 1.37, 95% confidence interval: 1.09–1.71, for 30–35 versus < 25 years).

Conclusions

Family values and fear of childbirth are modifiable psychosocial barriers to fertility intentions among Chinese university students. Fear of childbirth operates through a dual pathway of avoidance and delay. University-based reproductive health education should address childbirth fear and family values, whereas broader policies should reduce the structural costs of childbearing for women.

Background

China is experiencing a sustained decline in fertility despite successive policy relaxation. The total fertility rate fell to 1.09 in 2022, placing China among the countries with the lowest fertility levels worldwide[1]. Although the one-child policy was replaced by the universal two-child policy in 2016 and further relaxed to the three-child policy in 2021, evidence suggests that policy permissiveness alone has not translated into substantially greater fertility intentions[1, 2]. In a national survey conducted shortly after the three-child policy announcement, Yan et al. reported that only 12.2% of childbearing-aged adults reported third-birth intentions, with busy work, age, education, income, gender, and existing family structure all shaping reproductive decisions[3]. These findings indicate that low fertility in China is not simply a response to formal birth restrictions, but rather a complex psychosocial and structural phenomenon embedded in family organizations, gendered life-course expectations, and the perceived costs of childbearing.

In 2019, China's gross enrollment ratio in higher education reached 51.6%, marking its transition to universal tertiary education, with projections approaching 67% by 2030 [4]. University students therefore represent a growing segment of the future reproductive-age population and are at a formative life stage in which educational aspirations, career planning, intimate relationships, and expectations about marriage and parenthood are being negotiated simultaneously. From a clinical standpoint, delayed childbearing, a key driver of low fertility, is associated with increased rates of infertility, greater reliance on assisted reproductive technology (ART), and elevated risks of adverse maternal, fetal, and neonatal outcomes [5, 6]. Understanding the early psychosocial predictors of fertility intentions among university students is therefore relevant not only to demographic policy, but also to reproductive health planning and preventive education.

Previous studies in Western and Asian university populations have documented strong desires for parenthood alongside significant gaps in fertility awareness. In a Swedish sample, Lampic et al. reported that more than 95% of university students intended to have children, but planned childbearing at ages when female fertility was already declining [7]. Peterson et al. reported similar patterns among American undergraduates, with nearly 90% expressing fertility intentions but vastly overestimating the ages at which fertility declines and the success rates of in vitro fertilization [8]. More relevant to the Chinese context, Chan et al. examined Hong Kong university students and found that 20% were unwilling to have children [9]—substantially higher than in Western samples—and that students presented poor fertility knowledge, which was largely obtained from informal media sources rather than formal education [10]. In mainland China, Qiao et al. reported that female university students' fertility intentions were generally low, with more than half (53.55%) having no clear desire to have children, and psychosocial factors such as feminist identity, perceived fertility hindrances, and perceived fertility support exerting important effects[11]. This pattern is consistent with studies in other regions. However, these prior studies focused predominantly on cognitive knowledge deficits (e.g., awareness of age-related fertility decline), leaving psychological and attitudinal antecedents—particularly those rooted in cultural values and emotional barriers—largely unexplored [10, 12]. Together, these studies suggest that the key problem is not limited

to a lack of biological knowledge; rather, fertility intentions among Chinese students appear to be shaped by perceived constraints, gendered risks, family expectations, and emotional responses to childbirth.

Two psychosocial factors are particularly relevant yet insufficiently examined together in mainland Chinese university students: family values and fear of childbirth. Family values represent sociocultural beliefs about marriage, gender roles, and reproductive obligations. In traditional Chinese families, childbearing is viewed as a filial duty to "continue the family line" and ensure patrilineal continuity, with strong gendered expectations placed on women [13, 14]. However, rapid economic development and increasing educational attainment have fostered more egalitarian family values among younger generations, emphasizing gender equality and personal choice over familial duty [15–17]. These shifting values may reduce the normative pressure to have children, potentially lowering fertility intentions among those with more traditional attitudes [18]. Fear of childbirth (FOC), also known as tokophobia, is characterized by intense fear of pregnancy and delivery that can precede any reproductive experience [19]. Among nulliparous university students, FOC is more prevalent and consistently higher in women than men, driven by concerns about physical pain, bodily changes, and loss of control during delivery [20–22]. Importantly, FOC is not merely a psychological state but has demonstrated behavioral consequences: recent evidence from Chinese college students indicates a negative correlation between FOC and fertility intentions, with higher fear associated with greater likelihood of delaying or forgoing childbearing [23, 24]. However, the joint contribution of family values and FOC, as distinct cultural and psychological antecedents, has not been systematically examined in mainland Chinese university students.

To address this gap, we draw conceptually on the theory of planned behavior (TPB), a robust framework widely used to predict health-related behavioral intentions[25]. The TPB posits that behavioral intention is determined by three core constructs: attitudes toward the behavior, subjective norms, and perceived behavioral control. Applied to fertility decisions, fertility intentions are shaped by one's attitudes toward childbearing (e.g., its personal value and desirability), perceived social expectations regarding parenthood, and confidence in one's ability to manage the physical and social consequences of childbirth. In this study, we interpret family values as conceptually aligned with attitudes toward childbearing, in that values shape cognitive evaluations of the desirability and personal relevance of having children, and FOC as conceptually aligned with perceived behavioral control, given that fear directly reflects individuals' sense of mastery of childbirth-related risks and consequences. We acknowledge that we did not directly measure the TPB constructs of attitudes and perceived behavioral control via standard TPB instruments; our application of the TPB is therefore conceptual and heuristic, intended to organize our investigation and guide interpretation, rather than an operational test of the full TPB model. Gender and relationship status are examined as key stratifying variables that may shape how these factors operate, given the documented gender differences in reproductive attitudes [8, 9] and the fundamental role of partnership status in family formation [26].

Specifically, this study aims to (1) describe the levels of fertility intentions, family values, and FOC among university students in Wuhan, China; (2) examine whether family values and FOC are associated with

fertility intentions, drawing on the TPB as a conceptual guide; and (3) explore whether these associations differ by gender and relationship status.

Methods

Design

This cross-sectional study was conducted at a public university in Wuhan, China, from January to April 2024, and all participants were voluntary.

Sample and setting

A convenience sampling method was used to recruit undergraduate and postgraduate students enrolled at the university. The inclusion criteria were as follows: (1) aged ≥ 18 years, and (2) current enrollment as a full-time or part-time student at the university. The exclusion criteria were: (1) apparent contradictions in responses, and (2) incomplete questionnaires (defined as missing > 10% of items, determined a priori).

To reduce information bias, the survey was anonymous, the eligibility and exclusion criteria were specified before data cleaning, and incomplete or logically inconsistent questionnaires were excluded before analysis. Because participants were recruited from a single university by convenience sampling, the study was positioned as an exploratory single-center study.

The sample size was estimated based on the events-per-variable (EPV) principle for logistic regression, which recommends at least 10 outcome events per predictor variable[27]. Six predictors were planned for the main multivariable multinomial logistic regression model: age, gender, relationship status, attention to negative childbirth-related information, family values, and FOC. In the final sample, 77 participants were unwilling to have children and 99 were uncertain, corresponding to EPV values of 12.8 and 16.5, respectively, for the two nonreference outcome categories. These values exceeded the minimum EPV threshold of 10. A total of 245 questionnaires were collected; after excluding 12 incomplete or inconsistent responses, 233 valid questionnaires were retained (effective response rate: 95.1%).

Questionnaires

The survey instrument used in this study comprised four parts: a self-developed sociodemographic questionnaire, fertility intention items adapted from previous literature[7–9], the Marriage and Family Values Scale[16, 28], and the Childbirth Fear Prior to Pregnancy scale[20, 29]. The English translation of the full questionnaire is provided in Additional file 1.

Sociodemographic characteristics

A self-developed questionnaire collected data on age, grade, gender, household registration (urban vs. rural), only-child status, major, marital status, relationship status, monthly household income, frequency of attention to negative childbirth-related information, and channels through which negative childbirth information is obtained.

Fertility intentions

Fertility intentions were assessed using five items adapted from previous literature[7–9]: (1) "Do you want to have children in the future?" (yes/no/uncertain); (2) "If yes, how many children do you want?" (one/two/three or more/no specific preference); (3) "What gender of children would you prefer?" (boy only/girl only/both boys and girls/no specific preference); (4) "At what age would you like to have your first child?" (< 25/25–30/30–35/>35 years); and (5) "At what age would you like to have your last child?" (< 25/25–30/30–35/>35 years). The primary outcome, fertility intention, was derived from the first question, with the original responses ("yes," "no," and "uncertain") recoded as "willing," "unwilling," and "uncertain" for analysis.

Family values

Family values were measured using the Marriage and Family Values Scale, originally developed by the Korean Women's Development Institute for the Korean Longitudinal Survey of Women and Families[28]and adapted for Chinese university students by Zhu [16]. The scale comprises 29 items across three subscales: family concepts (14 items), attitudes toward role division within the family (8 items), and attitudes toward gender roles (7 items). Each item is rated on a 4-point Likert scale from 1 (strongly disagree) to 4 (strongly agree), with selected items reverse-coded. Higher total scores indicate more open family values, characterized by egalitarian gender role attitudes, flexible family role division, and autonomous views on marriage and childbearing; lower scores indicate more traditional values, reflecting patriarchal norms, rigid role expectations, and familism-oriented reproductive obligations. In this study, the Cronbach's α for the total scale was 0.71.

Fear of childbirth

FOC was measured using the Childbirth Fear Prior to Pregnancy scale, developed by Stoll et al. [20] and validated in Chinese university students by Qiao et al. [29]. The scale comprises 10 items across three subscales: fear of pain and loss of control (items 1–4, 6), fear of complications (items 5, 7, 8), and fear of body changes (items 9, 10). Each item is rated on a 6-point Likert scale from 1 (strongly disagree) to 6 (strongly agree), with total scores ranging from 10 to 60; higher scores indicate greater FOC. In this study, the Cronbach's α for the total scale was 0.92.

Statistical analysis

Data were analyzed using SPSS version 27.0. Descriptive statistics (means, standard deviations, frequencies, and percentages) were calculated for participants' demographic characteristics, family values, FOC, and fertility intentions. One-way analysis of variance, chi-square tests, and Fisher's exact tests were used to compare fertility intentions across different demographic groups in univariate analyses, with 13 variables examined.

Multivariable multinomial logistic regression was then performed to identify factors associated with fertility intentions, with the "willing to have children" group serving as the reference category. Variables that reached statistical significance in univariate analyses or were deemed theoretically important were entered into the multivariable model; the following variables were retained as predictors: age, gender, relationship status, attention to negative childbirth information, family values (total score), and FOC (total score). The results are reported as adjusted odds ratios (aOR) with 95% confidence intervals (CI). Model fit was assessed using the Nagelkerke R^2 test and the likelihood ratio chi-square test. Given the exploratory design and limited sample size, we did not conduct formal tests of interaction effects; gender and relationship status were therefore examined as stratifying variables rather than as statistical moderators. In line with the STROBE reporting principles, both univariate findings and adjusted estimates are reported, and the limitations section discusses the likely direction of potential selection and information biases.

Ethical considerations

This study was approved by the Ethics Committee of Wuhan University (approval number: 2020YF0084). All participants provided electronic informed consent.

Results

Participant characteristics and scale scores

A total of 233 valid questionnaires were included in the analysis. Participants had a mean age of 21.2 years (SD = 1.87, range 18–28), and the majority were female (64.8%, n = 151). Most participants were undergraduates (87.1%, n = 203) and from non-medical majors (77.7%, n = 181). Over half were from rural areas (56.2%, n = 131), and 70.4% (n = 164) were not only children. Regarding relationship status, 35.6% (n = 83) were single and actively seeking a partner, 37.3% (n = 87) were single and not seeking a partner, and 26.2% (n = 61) were in a relationship. Marital status was not included in the multivariable analysis due to the very small number of married participants (n = 2, 0.9%). The detailed demographic characteristics are presented in Table 1. The mean family values score was 68.98 (SD = 7.51), indicating relatively open family values. The mean FOC score was 48.77 (SD = 9.55), reflecting a moderate-to-high level of fear (Table 1).

Table 1
Participants' demographic characteristics, scale scores and fertility intentions (n = 233)

Variable	Category	n (%) / Mean ± SD
Demographics		
Age (years)		21.17 ± 1.87
Gender	Male	82 (35.20)
	Female	151 (64.80)
Grade	Undergraduate	203 (87.10)
	Graduate	30 (12.90)
Major	Non-medical	181 (77.70)
	Medical	52 (22.30)
Household registration	Urban	102 (43.80)
	Rural	131 (56.20)
Only child	Yes	69 (29.60)
	No	164 (70.40)
Monthly household income (RMB)	≤ 5000	70 (30.04)
	5001–10000	96 (41.20)
	>10000	67 (28.76)
Relationship status	Single, actively seeking a partner	83 (35.60)
	Single, not seeking	87 (37.30)
	In a relationship	61 (26.20)
Attention to negative birth information	Never	18 (7.70)
	Occasionally	88 (37.80)
	Sometimes	91 (39.10)
	Frequently	36 (15.50)
Scale Scores		
Family Values (range: 29–116)		68.98 ± 7.51

Note: Values are presented as n (%) for categorical variables and mean ± SD for continuous variables. The total score of family values ranges from 29–116 (subscale ranges: family concept 14–56, family role division 8–32, and gender role attitude 7–28); higher scores indicate more open/egalitarian values. The total score for fear of childbirth ranges from 10–60; higher scores indicate greater fear.

Variable	Category	n (%) / Mean ± SD
Demographics		
Fear of Childbirth (range: 10–60)		48.77 ± 9.55

Note: Values are presented as n (%) for categorical variables and mean ± SD for continuous variables. The total score of family values ranges from 29–116 (subscale ranges: family concept 14–56, family role division 8–32, and gender role attitude 7–28); higher scores indicate more open/egalitarian values. The total score for fear of childbirth ranges from 10–60; higher scores indicate greater fear.

Only 57 participants (24.5%) reported a clear willingness to have children in the future; 77 participants (33.0%) were unwilling, and 99 participants (42.5%) were uncertain. Among the 57 participants who were willing to have children, most had no specific preference regarding the number of children (45.6%) or child gender (49.1%). Regarding the intended age at first birth, the majority preferred 25–30 years (77.2%). Detailed fertility intention and preference data are presented in Table 2.

Table 2
Fertility intentions and preferences (n = 233)

Variable	Category	n (%)
Fertility intention	Willing	57 (24.5)
	Unwilling	77 (33.0)
	Uncertain	99 (42.5)
Preferred number of children (n = 57)	One child	12 (21.05)
	Two children	19 (33.33)
	Three or more	0 (0.00)
	Go with the flow	26 (45.62)
Preferred gender of child (n = 57)	Boy only	2 (3.51)
	Girl only	4 (7.02)
	Both boys and girls	23 (40.35)
	Go with the flow	28 (49.12)
Preferred age at first birth (n = 57)	< 25 years	2 (3.51)
	25–30 years	44 (77.19)
	30–35 years	11 (19.30)
	> 35 years	0 (0.00)
Preferred age at last birth (n = 57)	< 25 years	19 (33.33)
	25–30 years	37 (64.91)
	30–35 years	1 (1.75)
	> 35 years	0 (0.00)

Note: Data on the preferred number of children, sex of the child, and age at first/last birth are shown only for participants who expressed a willingness to have children (n = 57).

Univariate analyses

Univariate analyses revealed that age, gender, relationship status, attention to negative birth information, family values, and FOC were significantly associated with fertility intentions (all $P < 0.05$; see Supplementary Table S1 for the full results). Grade, major, household registration, only-child status, and monthly household income were not significantly associated with fertility intentions.

Multivariate multinomial logistic regression

A multivariate multinomial logistic regression was performed to identify factors associated with fertility intentions, with the "willing to have children" group as the reference category. The model included age, gender, relationship status, attention to negative birth information, family values, and FOC as predictors. The model showed good fit ($\chi^2 = 129.40$, df = 24, $P < 0.001$; Nagelkerke $R^2 = 0.44$).

As shown in Table 3, when comparing participants who were unwilling to have children with those who were willing, three factors were significant. Students who were single and not seeking a partner had substantially higher odds of being unwilling to have children (aOR = 15.54, 95% CI: 4.33–55.79, P < 0.001). Female students had significantly lower odds of being willing to have children (aOR = 0.21, 95% CI: 0.07–0.64, P = 0.006). Additionally, each 1-point increase in the FOC score was associated with an 8% increase in the odds of being unwilling to have children (aOR = 1.08, 95% CI: 1.02–1.14, P = 0.007).

Table 3
Multivariate multinomial logistic regression: factors associated with fertility intentions (reference: willing)

Predictor	**Unwilling vs. Willing**		**Uncertain vs. Willing**	
	aOR (95% CI)	**p-value**	**aOR (95% CI)**	**p-value**
Gender (Ref.: Male)				
Female	0.21 (0.07–0.64)	0.006	0.28 (0.11–0.69)	0.006
Relationship Status (Ref.: In a relationship)				
Single, actively seeking a partner	0.77 (0.26–2.27)	0.638	1.22 (0.50–2.98)	0.664
Single, not seeking a partner	15.54 (4.33–55.79)	< 0.001	4.51 (1.40–14.61)	0.011
Age (per year increase)	1.09 (0.84–1.41)	0.540	0.94 (0.76–1.16)	0.570
Fear of Childbirth (per point)	1.08 (1.02–1.14)	0.007	1.03 (0.98–1.08)	0.218
Family Values (per point)	0.97 (0.91–1.04)	0.353	0.95 (0.90–1.00)	0.03
Model Fit	$\chi^2 = 129.40$, df = 24, $p < .001$, Nagelkerke $R^2 = 0.44$			

Note: aOR=adjusted odds ratio; CI=confidence interval; Ref.=reference group. Model adjusted for age, gender, relationship status, attention to negative birth information, family values, and fear of childbirth. The full results including attention to negative birth information are provided in Supplementary Table S2.

When comparing participants who were uncertain with those who were willing, female gender (aOR = 0.28, 95% CI: 0.11–0.69, P = 0.006) and being single without seeking a partner (aOR = 4.51, 95% CI: 1.40–

14.61, P = 0.011) were also associated with higher odds of being uncertain. Furthermore, more open family values were associated with lower odds of being uncertain (aOR = 0.95, 95% CI: 0.90–1.00, P = 0.03). Age and attention to negative birth information were not significant predictors in the multivariable model.The full results including attention to negative birth information are provided in Supplementary Table S2.

Exploratory analysis: factors associated with age at first birth among willing participants

Among participants who expressed a willingness to have children (n = 57), we explored factors associated with the intended age at first birth. Owing to the small sample size, these results should be interpreted with caution. A multivariate multinomial logistic regression was performed with the intended age at first birth as the dependent variable (< 25 years as the reference category; 25–30 years and 30–35 years as comparison groups). The model included family values and FOC as predictors, adjusting for age and other demographic covariates.

Higher FOC was significantly associated with a later intended age at first birth. Each 1-point increase in fear score was associated with 1.20 times the odds of preferring 25–30 years versus < 25 years (aOR = 1.20, 95% CI: 1.01–1.43, P = 0.04), and 1.37 times the odds of preferring 30–35 years versus < 25 years (aOR = 1.37, 95% CI: 1.09–1.71, P = 0.006). Family values were not significantly associated with age at first birth. The full results are provided in Supplementary Table S3.

Discussion

In this cross-sectional study of 233 Chinese university students, only 24.5% of participants reported a clear willingness to have children, while 33.0% were unwilling and 42.5% were uncertain. Using a conceptual framework informed by the TPB, we identified family values and FOC as two distinct psychosocial correlates of fertility intentions. More open family values were associated with lower uncertainty about childbearing, whereas higher FOC was associated with both greater unwillingness to have children and, among those still willing, a later intended age at first birth. Female gender and being single without actively seeking a partner emerged as the strongest predictors of childlessness. These findings extend prior research by shifting the focus from cognitive knowledge deficits to modifiable psychological and cultural barriers.

Comparison with previous studies in university students

The low proportion of students with clear fertility intentions in our sample is consistent with the broader low-fertility context in China, but it appears to be even more pronounced than in many previous university samples. Western studies reported substantially higher intentions: nearly 90% of American undergraduates [8] and more than 95% of Swedish university students[7] intended to have children. In Hong Kong, Chan et al. found that 20% of students were explicitly unwilling to have children [9], whereas in our mainland Chinese sample 33.0% were unwilling and 42.5% were uncertain. Similarly, Qiao et al.

reported low fertility intentions among female university students in mainland China, with 53.55% having no clear desire to have children[11]. The convergence of these findings suggests that low and uncertain fertility intentions are becoming salient among highly educated young Chinese individuals.This stark contrast may reflect the combined effect of mainland China's unique sociocultural context, including intense academic and career competition, high housing costs, limited workplace support for working mothers, and the lingering psychological impact of the now-repealed one-child policy on family norms. The higher proportion of uncertain students in our sample (42.5%) is particularly noteworthy, suggesting that many mainland Chinese students have not yet formed clear reproductive plans, potentially leaving them vulnerable to further postponement.

Family values and the TPB framework

Consistent with previous studies in Shanghai [16] and across China [30], our participants exhibited relatively open family values (mean score of 68.98 ± 7.51, with a possible range of 29–116), endorsing gender equality in domestic roles and rejecting traditional stereotypes such as "men dominate outside, women dominate inside". Within our TPB-informed framework, we interpreted family values as conceptually aligned with attitudes toward childbearing, and our finding that more open values were associated with lower odds of being uncertain about childbearing (aOR = 0.95, 95% CI: 0.90–1.00) is consistent with this interpretation. Students with more open family values may view childbearing as a personal choice to be actively decided upon rather than a familial obligation to be passively accepted or rejected, thereby reducing ambivalence.

Notably, open values reduced uncertainty but did not significantly increase willingness (aOR = 0.97 for unwilling vs. willing, P = 0.353). This asymmetry suggests that while open values help students clarify their reproductive stance, moving them from "uncertain" to either "willing" or "unwilling," they do not necessarily promote willingness. This pattern aligns with the TPB prediction that attitudes alone are insufficient to drive behavioral intentions; subjective norms and perceived behavioral control also play critical roles. In the Chinese context, even students with egalitarian family values may still perceive strong normative pressure from parents or structural barriers (e.g., housing costs, career penalties) that dampen the translation of open values into positive fertility intentions [31].

Fear of childbirth as perceived behavioral control

The mean FOC score in our sample was 48.77 ± 9.55, indicating a moderate-to-high level of fear. Nearly 90% of participants agreed with the statement "I am afraid of labor and delivery," and over 80% perceived childbirth as "unpredictable and risky." Previous studies have also reported elevated childbirth fear in young female populations; for example, a study among Turkish female university students found a mean score of 40.14 ± 11.35, and Güleç Şatır similarly documented above-moderate fear levels in nursing students[32, 33]. Although our mean is somewhat higher than those figures, the consistency across samples suggests that childbirth fear is a common concern. Within our TPB-informed framework, we interpreted FOC as conceptually aligned with perceived behavioral control, reflecting individuals' confidence in their ability to manage the childbirth process and its outcomes. Our findings support this

interpretation: higher fear scores were associated with significantly increased odds of being unwilling to have children (aOR = 1.08 per point, 95% CI: 1.02–1.14).

More importantly, among participants who remained willing to have children, fear was associated with delayed childbearing. Each 1-point increase in the fear score increased the odds of preferring first birth at 30–35 years (vs. <25 years) by 37% (aOR = 1.37, 95% CI: 1.09–1.71). This dual effect, driving both avoidance and delay, illustrates how low perceived behavioral control can manifest in two distinct behavioral intentions: complete avoidance (opting out entirely) or temporal postponement (regaining a sense of control by pushing the event to a future point when one imagines being better prepared). This latter pathway is particularly concerning from a clinical standpoint, as delayed childbearing is a well-established risk factor for infertility, greater reliance on ART, and adverse obstetric outcomes[6]. For students who are already fearful, postponement may paradoxically increase the very risks they fear, creating a self-reinforcing cycle of delay and heightened anxiety.

Gender and relationship status as key stratifying variables

Consistent with previous studies [8, 9, 24], female students in our sample had significantly lower fertility intentions than males. Only 11.9% of female participants expressed willingness to have children, compared to 47.6% of male participants. Qiao et al. indicated that female college students in China currently exhibit low fertility intentions, with over half (53.55%) reporting no clear intention [11]. According to the multivariable model, female gender was associated with 79% lower odds of being willing to have children (aOR = 0.21, 95% CI: 0.07–0.64). This gender gap likely reflects the greater physical, emotional, and career-related costs that childbearing imposes on women, who bear the primary burden of pregnancy, childbirth, and often childcare [34]. The burden is particularly pronounced among highly educated women: studies indicate that those with higher educational attainment are more likely to postpone childbearing [24],and a systematic review of fertility intentions among highly educated women revealed that approximately one in eight reported no intention to have children [10, 35, 36]. In the Chinese context, where workplace discrimination against mothers remains widespread and childcare support is limited, these costs are particularly salient. Males tend to report higher fertility intentions than females, possibly due to the normative influence of traditional family values that emphasize lineage continuity [37, 38].

The exceptionally strong associations between being single and not seeking a partner and unwillingness to have children (aOR = 15.54, 95% CI: 4.33–55.79) deserves particular attention. This finding suggests that for many young people, the normative expectation of "partnered childbearing" is so fundamental that its absence effectively removes childbearing from consideration. Duan et al. indicated that having a partner and receiving partner support are beneficial to positive fertility intentions among Chinese graduate students [39]. Notably, students who were single but actively seeking a partner did not differ significantly from those in relationships (aOR = 0.77, P = 0.638), indicating that it is not the current absence of a partner, but the active rejection of partnership, that matters. This pattern resonates with Chan et al.'s [9] finding that Hong Kong students rated having a stable partner as one of the most important conditions for childbearing, but extends it by showing that among mainland Chinese students,

some individuals appear to have disengaged from both partnership and parenthood simultaneously, a phenomenon that may reflect a broader "retreat" from traditional adult milestones in response to economic and social pressures.

Clinical and public health implications

These findings have several implications for reproductive health education and public health policy. First, the identification of FOC as a modifiable psychological barrier, operating through both avoidance and delay, suggests that fear-reduction psychoeducation should be integrated into university-based reproductive health programs. Such programs could include evidence-based information about obstetric pain management, realistic risk communication, and exposure to positive birth narratives, which have been shown to reduce childbirth-related anxiety in other contexts [40, 41]. The dual pathway finding is particularly important: interventions aimed at reducing fear may not only increase willingness among the most fearful but also encourage timely childbearing among those who would otherwise postpone, potentially reducing future reliance on ART.

Second, the association between open family values and reduced uncertainty suggests that educational efforts to promote egalitarian gender role attitudes and flexible family arrangements may help students clarify their reproductive intentions, even if such clarification sometimes leads to choosing not to have children. Rather than aiming to increase fertility rates directly, these efforts should support informed, autonomous decision-making.

Third, the strong association between relationship disengagement and childlessness suggests that interventions may need to address not only individual attitudes and fears, but also the broader social context in which partnership formation occurs. University-based programs that facilitate healthy relationship skills and address barriers to partnership formation may have indirect effects on fertility intentions.

Finally, the gender gap in fertility intentions underscores the need for policies that reduce the structural costs of childbearing for women, including workplace anti-discrimination protections, affordable childcare, and shared parental leave, to make parenthood a more feasible and attractive option for female students.

Limitations

Several limitations should be noted. First, the use of convenience sampling from a single university limits the generalizability of our findings to the broader Chinese student population; students at other universities or in other regions may hold different values and intentions. This study was designed as an exploratory single-center analysis of associations, but the modest sample size limited precision, widened confidence intervals, and prevented formal interaction testing. Second, the cross-sectional design precludes causal inferences regarding the observed associations; we cannot determine whether FOC precedes low fertility intentions or vice versa. Third, we did not directly measure the TPB constructs

of attitudes, subjective norms, and perceived behavioral control using standard TPB instruments; our application of the TPB is therefore conceptual and heuristic. Fourth, self-reported data may be subject to social desirability bias, particularly concerning sensitive topics such as fertility intentions and childbirth fear. Fifth, the small number of married participants (n = 2) precluded meaningful analysis of marital status; future studies with larger and more diverse samples should examine how marital and relationship status interact with other predictors. Finally, the exploratory analysis of age at first birth among willing participants (n = 57) had limited statistical power; these findings require replication in larger samples.

Conclusion

This study revealed that only 24.5% of Chinese university students had a clear intention to have children. Within a TPB-informed conceptual framework, more open family values were associated with lower childbearing uncertainty, while higher FOC was associated with both unwillingness to have children and, among those still willing, a later intended age at first birth. Female students and those who were single and not actively seeking a partner were most likely to be childless. These findings highlight family values and FOC as modifiable psychosocial barriers warranting targeted early interventions. Addressing childbirth fear through psychoeducation and promoting open family values through educational programs may help university students make more informed and timely reproductive decisions, potentially mitigating future fertility decline and reducing reliance on assisted reproductive technologies.

Abbreviations

aOR Adjusted odds ratio

ART Assisted reproductive technology

CI Confidence interval

EPV Events per variable

FOC Fear of childbirth

SD Standard deviation

TPB Theory of Planned Behavior

Declarations

Ethics approval and consent to participate

This study was conducted in accordance with the Declaration of Helsinki. Approval was obtained from the Ethics Committee of Wuhan University (approval number: 2020YF0084). All participants provided electronic informed consent via the online survey platform prior to completing the questionnaire. The

study information and consent form were presented on the first page of the survey; participants could proceed only after actively selecting "I have read and understood the study information and agree to participate." Participants were informed that their responses would be used solely for research purposes, that all data would be anonymized, and that they could withdraw at any time without penalty.

Clinical trial number

Not applicable.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due to privacy restrictions and the informed consent terms under which data were collected, but are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

LY, YW, and LXY contributed equally as joint first authors. LY was responsible for study conception and design, framework development, survey design, ethical approval, participant recruitment, and data collection. YW was responsible for participant recruitment, data collection, data management, statistical analysis, and manuscript drafting. LXY contributed to data management, statistical analysis, and manuscript revision.YQ OY contributed to literature review, data interpretation, and manuscript revision. XLC, FD and ZJZ co-supervised the research throughout, managed the project, and critically revised the manuscript. All authors read and approved the final manuscript.

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