

Changing social patterns of induced abortion in China, 1971–2020: a cohort-period analysis and latent class typology

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Abstract

Background

China has reported a large number of induced abortions over the past half-century, yet how its social distribution has changed across the fertility transition remains poorly understood. We examined period trends, cohort differences, and behavioral typologies of induced abortion among Chinese women born in the 1950s–1990s, and tested whether the sociodemographic gradient of abortion risk shifted across cohorts.

Methods

Using three national fertility surveys (1997, 2001, 2017; N = 193,607 married women), we characterized period and cohort trends in abortion prevalence and applied latent class analysis to identify behavioral typologies and their sociodemographic predictors, using multinomial logistic regression to estimate odds ratios with 95% confidence intervals.

Results

Abortion risk expanded bidirectionally with age: the age at first abortion declined while risk among women of advanced maternal age rose. The sociodemographic gradient of abortion appears to have reversed across cohorts: in earlier cohorts, abortion was concentrated among urban, higher-educated, and higher-income women, but this gradient weakened markedly in later cohorts and, for education, reversed direction. Latent class analysis identified four typologies: Urban One-Child Compliance (16.9%), Rural One-and-a-Half Policy Compliance (51.8%), Premarital Unintended Pregnancy (7.8%, with odds of membership rising eightfold across cohorts), and Chronic Repeat Abortion (23.6%), the last distinguished from Rural Compliance by birth cohort and fertility desire rather than by education or income.

Conclusions

Abortion risk in China has shifted from institutionally assigned, policy-driven patterning toward mechanisms tied to life-course timing and fertility desire. Reproductive health services organized around marriage and policy compliance may need to be restructured around the life-course and fertility circumstances that now drive this risk.

Plain English summary

Induced abortion has long played a major role in family planning in China, but who is most affected by it has changed a great deal over the past fifty years. Using data from three large national surveys, we studied women born between the 1950s and the 1990s to see how patterns of abortion have shifted across generations. We found that women's age at their first abortion has become younger over time, while abortion among women in their late 30s and beyond has become more common. We also found that in earlier generations, abortion was more common among educated, urban, and wealthier women, but this pattern has weakened and, for education, even reversed in more recent generations. Using a statistical method that groups women by shared characteristics, we identified four distinct patterns of abortion, reflecting China's differing urban and rural family planning rules, a growing pattern of unplanned pregnancy before marriage

among younger women across all backgrounds, and a pattern of repeated abortion linked to wanting more children than policies allowed rather than to income or education. These findings suggest that reproductive health services, which have traditionally been designed for married couples, may need to be redesigned to better reach unmarried women and those who want larger families.

Background

Induced abortion is a major component of reproductive behavior in China. Between 2010 and 2014, China recorded an average of 8.21 million induced abortions per year, approximately 15% of the global total¹ and in 2020 the induced abortion rate stood at 27.8 per 1,000 women of reproductive age, substantially above comparable figures in the United States (11.2‰), the United Kingdom (18.2‰), and Sweden (18.3‰) [1–4]. Yet volume alone does not capture what is most consequential about abortion in China. The social logic governing who undergoes abortion, and why, has changed fundamentally across the half-century of the country's fertility transition. Understanding this redistribution, rather than merely documenting aggregate trends is essential for designing contemporary reproductive health policy.

Three bodies of evidence have informed our current understanding. Descriptive research has characterized the aggregate trajectory of abortion rates from the onset of the One-Child Policy through subsequent relaxation, with induced abortions remaining at around 9 million annually in recent years [5–8]. Studies of determinants have identified cross-sectional correlates at specific time points, including socioeconomic factors such as economic pressure, insufficient contraception, and son preference [9, 10, 11], as well as sociodemographic factors including age, education, residence, and migrant status [12–15]. Policy-oriented analyses have linked fertility restriction to elevated rates and policy relaxation to shifting abortion profiles [16, 17]. Together, these contributions establish that China's abortion landscape is large, policy-sensitive, and socially stratified. What they leave unresolved is whether and how the social patterning of abortion has shifted across China's fertility transition. There is a question that requires cohort-period analysis rather than cross-sectional snapshots, and that demands a formal behavioral typology to capture the heterogeneity that aggregate analyses necessarily obscure.

This study identifies three specific gaps. First, the direction of the sociodemographic gradient of abortion risk across cohorts has not been formally tested. Existing research documents gradients at single time points but does not examine whether education, urban residence, and income predicted higher or lower abortion in earlier versus later cohorts. This distinction carries substantial interpretive weight: if policy-era abortion was concentrated among some social groups because of institutional enforcement pressure, then the dismantling of that pressure should produce a redistribution of risk. Whether such a redistribution occurred and across which dimensions of stratification remains an open empirical question.

Second, China's family planning policy operated through two structurally distinct regimes that should have produced qualitatively different abortion patterns, but no study has formally distinguished these trajectories within the same analytic framework. In urban areas, the one-child policy (1979–2015) was enforced primarily through formal institutions (state-owned enterprises, government agencies, and universities) that linked reproductive compliance to career advancement, housing allocation, and wage bonuses [18, 19, 20]. In rural

areas, the one-and-a-half child policy in 19 provinces permitted a second birth when the first child was female, allowing women to complete a two-child allocation before any subsequent pregnancy required termination [21, 22]. These two regimes produced mirror-image social gradients. Treating policy-era abortion as a single population-level phenomenon necessarily obscures this structural duality.

Third, the behavioral heterogeneity of abortion has not been formally typologized using population-representative data. The diversity of reproductive contexts under which women terminate pregnancies cannot be captured by aggregate measures [23, 24]. A formal behavioral typology is needed both to characterize how abortion patterns differ across women's life-course contexts, and to assess how the relative prevalence of these contexts has changed across cohorts and policy eras.

Taken as a whole, this study integrated data from three nationally representative fertility surveys (1997, 2001, 2017), pursue three aims: (i) to characterize period trends and birth cohort differences in induced abortion from 1971 to 2020; (ii) to examine whether and how the sociodemographic gradient of abortion risk shifted across cohorts; and (iii) to apply latent class analysis to identify dominant behavioral typologies of abortion and examine their social predictors.

Data and Methods

Data

This study integrates data from three waves of China's National Fertility Survey: 1997, 2001, and 2017. All three surveys adopted a stratified, multistage cluster sampling design, used similar questionnaire designs, and covered 31 provinces in China, ensuring a high degree of consistency across datasets. The surveys collected respondents' reproductive histories up to the survey year (e.g., year of first marriage, year of each pregnancy and abortion, number of children, contraceptive use) and sociodemographic characteristics (e.g., age, ethnicity, residence, education, marriage, household income). Known differences in questionnaire phrasing for income and education across surveys are addressed by harmonizing variables to the lowest common categorical denominator.

The analytic sample is restricted to ever-married women aged 15–49 years. Exclusion criteria included women with missing reproductive histories or logical inconsistencies (e.g., reported age at first abortion younger than age at first pregnancy). Variables were harmonized across surveys including age group, educational attainment, and household income, and the three waves were merged into a single pooled dataset. The final sample comprises 193,607 women: 11,704 from 1997, 33,128 from 2001, and 148,775 from 2017. The social demographic details of the sample can be found in Appendix Table A1. The LCA is conducted exclusively on the 37,132 women who reported at least one induced abortion, drawn from the 2017 survey where the indicator variables required are available in full.

Supplementary data for period analysis were drawn from four rounds of the National Population Census (1990, 2000, 2010, and 2020), the China Population Statistical Yearbook, the China Health Statistics Yearbook, and the China Family Planning Yearbook.

Measures

Indicators for period and cohort analyses. Three key indicators are computed for each survey wave and birth cohort: (i) Abortion proportion (P), the percentage of women who have ever experienced at least one induced abortion; (ii) Repeat abortion rate (RAR), the percentage of women with two or more induced abortions; and (iii) The mean age at first abortion (AFA), the average age at which women experienced their first termination.

Latent indicators of latent class analysis. Six behavioral indicators were constructed for the latent class analysis, covering the dimensions of abortion intentionality, life-course timing, abortion frequency, and family-building context:

- Experienced unintended-pregnancy-related abortion (binary, Yes / No): whether the respondent had at least one induced abortion arising from an unintended conception.
- Premarital abortion (binary, Yes / No): whether the respondent's induced abortion occurred before her first marriage, operationalized as first abortion age < age at first marriage.
- Age at first induced abortion (ordinal, ≤ 24 years / 25–29 years / ≥ 30 years): capturing the life-course timing of first induced abortion onset.
- Number of induced abortions (ordinal, 1 / 2 / ≥ 3 times): distinguishing single-episode from chronic patterns.
- Parity at survey date (ordinal, 0 / 1 / ≥ 2 living children): used as a contextual indicator of family-building status. Because parity is measured at the time of the survey rather than at the time of each abortion, it serves as an approximate indicator of the family-building stage in which abortion occurred.
- Has a son (binary, Yes / No): whether the respondent had at least one male child at survey date, capturing son-preference context.

Sociodemographic predictors for multinomial logistic regression. Birth cohort (1950s, 1960s, 1970s, 1980s and 1990s), educational attainment (primary or below; junior high; senior high; college or above), residence (rural; urban), and household income (low; lower-middle; upper-middle; high) are used as predictors of LCA class membership.

More than 90% of respondents had their reproductive period—from first to last pregnancy—between ages 20 and 35, which we define as the main reproductive period (Fig. 1). For the 1950s cohort, approximately two-thirds of their main reproductive period coincided with the One-child Policy; for the 1960s and 1970s cohorts, the overlap was complete; for the 1980s cohort, about half; and for the 1990s cohort, the overlap was minimal. Based on this, we grouped cohorts into the earlier policy cohort (1950s, 1960s, 1970s) and the later policy cohort (1980s, 1990s).

Analytical strategy

The analysis proceeds in three steps.

Period and cohort trend analysis. We compute abortion proportion, repeat abortion rate, and mean age at first abortion by age group across the three survey waves (period perspective) and by birth cohort (cohort perspective). For period perspective, to minimize age-related accumulation effects of induced abortion and potential recall bias, only abortions occurring within five years before each survey were included in the

analysis [8]. Cohort-specific proportions are further stratified by education, residence, and income to examine sociodemographic gradients. All computations use weighted estimation (Stata 17.0).

Latent class analysis. LCA is applied to the 37,132 women with abortion experience from the 2017 survey, using Mplus 8.11 with maximum likelihood estimation with robust standard errors (MLR). All six LCA indicators are treated as categorical variables. Models with two to five latent classes were estimated; model selection was based on four criteria: the Bayesian Information Criterion (BIC), the sample-size adjusted BIC (SABIC), relative entropy, and the parametric bootstrapped likelihood ratio test. Classification quality is assessed using the average latent class posterior probability matrix, with diagonal elements above 0.70 indicating acceptable classification certainty [25, 26].

Multinomial logistic regression. We estimate a multinomial logistic regression predicting class membership from birth cohort, education, residence, income, and desired number of children, with C3 (largest class, 51.8%) as the reference category. Results are reported as relative risk ratios with 95% confidence intervals and robust standard errors. A model with cohort-by-education interactions tests the C1-versus-C3 gradient reversal. As a robustness check, we further add ethnicity and current employment status to the model: ethnicity accounts for the historically more permissive fertility policies applied to ethnic minority populations, while employment status provides a direct test of the institutional-compliance mechanism proposed for C1, since compliance pressure under the strict urban one-child policy is hypothesized to operate specifically through formal, non-agricultural employment.

Results

Period trends and birth cohort differences in induced abortion

Induced abortion in China followed a four-phase trajectory between 1971 and 2020 (Figure 2). During the pre-policy phase (1971–1978), the induced abortion rate (IAR) averaged 22.1 per 1,000 women annually. The strict enforcement phase (1979–1991) brought a rapid escalation: the IAR averaged 41.4 per 1,000 women, with the annual number of induced abortions rising from 4.9 million to 11.2 million. From 1992 to 2013, the IAR declined substantially as contraceptive prevalence rate (CPR) above 80%, stabilizing at around 23.0 per 1,000 women. Following policy relaxation after 2013, the IAR partially rebounded, reaching 27.5 per 1,000 women in 2020.

Data sources: The number of induced abortions is obtained from the China Health Statistics Yearbook. The population of women of childbearing age is obtained from the China Population Statistical Yearbook (1988–2006), the China Population and Employment Statistical Yearbook (2007–2020), and national population censuses (1990, 2000, 2010, 2020); population for other years is estimated from annual population sample surveys. Contraceptive prevalence rates come from Huang and Duan (1998) [27] (1971–1988), the China Family Planning Yearbook (1989–2002), and the China Health Statistics Yearbook (2006–2018).

Survey-based period analysis reveals both the decline in overall burden and a structural shift in its age distribution across years (Figure 3, panels A–C). The proportion of women reporting abortion experience (P) was highest among those aged 25–29 in 1997 (23.2%), declining sharply by 2001 (13.6%) and remaining at 14.0% in 2017. However, women aged 35–39 showed an increase in 2017 (9.3%) compared with 1997 (7.9%),

while women aged 40–44 also showed higher proportions in 2017 than in 1997 (Panel A). Repeat abortion rates (RAR) followed a similar pattern: the highest rates remained concentrated at 25–29 years (4.9% in 1997; 2.2% in 2017), but the 35–39 and 40–44 age groups showed rising rates in 2017 (Panel B). The age-at-first-abortion distribution shifted toward both ends of the distribution between 1997 and 2017: the proportion of first abortions occurring at age 35–39 more than doubled from 3.0% to 6.8%, while the proportion at age 20–24 also increased slightly (30.0% to 33.6%) (Panel C).

These period patterns reflect a bidirectional expansion of the age risk structure: declining age at first abortion alongside rising risk at advanced maternal age. The mean age at first abortion (AFA) declined from 28.2 years in the 1950s cohort to 22.0 years in the 1990s cohort (Figure 3, panel F), indicating a downward shift at the younger end. Simultaneously, the increasing share of first abortions at age 35 and above (most prominent in the 2017 survey) indicates rising risk at the older end. These two trends operated through distinct mechanisms. The downward shift may have accompanied the growing prevalence of premarital abortion in younger cohorts, while the upward shift coincided with the onset of compensatory second births following policy relaxation.

Cohort analysis (Figure 3, panels D–F) reveals a sustained but non-linear decline across birth cohorts. The earlier policy cohorts (1950s–1970s) consistently had higher proportions than the later policy cohorts (1980s–1990s). Abortion proportion peaked at 27.6% for the 1950s cohort, remained comparably high at 25.9% and 26.5% for the 1960s and 1970s cohorts, then declined to 23.3% for the 1980s cohort and fell markedly to 15.2% for the 1990s cohort (Panel D). The repeat abortion rate followed a similar pattern: 9.2% (1950s), 8.3% (1960s), 8.4% (1970s), 6.2% (1980s), and 3.0% (1990s) (Panel E). The 1970s cohort showed a modest uptick in both metrics relative to the 1960s cohort before the marked decline in the 1980s and 1990s cohorts. The mean age at first abortion declined progressively: 28.2 years (1950s), 26.8 years (1960s), 27.4 years (1970s), 25.9 years (1980s), and 22.0 years (1990s) (Panel F). It should be noted that the 1990s cohort was still largely in the early stages of its main reproductive period at the time of the 2017 survey; the P and RAR for this cohort therefore represent incomplete cumulative measures and are likely to underestimate their eventual lifetime experience.

Sociodemographic differences in induced abortion across cohorts

The urban–rural gradient in abortion proportion (P) narrowed substantially across cohorts (Figure 4, panel A). The gap was larger in the earlier policy cohorts (1950s–1970s) but minimal in the later policy cohorts (1980s–1990s). In the 1950s cohort, urban women showed an abortion proportion of 41.2% compared with 21.8% among rural women — a gap of 19.4 percentage points. This gap narrowed progressively: 14.0 percentage points in the 1960s cohort, 10.1 percentage points in the 1970s cohort, and 1.1 percentage points in both the 1980s and 1990s cohorts. By the 1990s cohort, the urban–rural difference in abortion proportion had virtually disappeared (16.0% vs. 14.9%), compared with a near-twofold differential in the 1950s cohort. This convergence was driven primarily by a decline in urban abortion proportions which fell by 25.2 percentage points from the 1950s to the 1990s cohort, rather than by a rise in rural proportions. The pattern for repeat abortion rates followed a similar trajectory of convergence.

The educational gradient of abortion proportion (P) underwent a reversal in direction across cohorts (Figure 4, panel B). In the 1950s cohort, P increased monotonically with education: 21.6% among women with primary education or below, 34.1% among junior high graduates, 38.6% among senior high graduates, and 46.7% among college or above graduates, with a positive gradient of 25.1 percentage points between the lowest and highest education groups. This positive gradient persisted into the 1960s cohort (primary: 20.1%; college: 41.7%; gap: 21.6 pp) and 1970s cohort (primary: 21.9%; college: 35.1%; gap: 13.2 pp). By the 1980s cohort, the gradient had substantially attenuated (primary: 20.7%; college: 20.4%; gap: -0.3 pp). In the 1990s cohort, the gradient reversed direction: primary-educated women showed the highest abortion proportion (14.5%) while college-educated women showed the lowest (9.6%), a gradient of -4.9 percentage points.

Income gradients showed a similar pattern of attenuation (Figure 4, panel C). In the earlier policy cohorts (1950s–1970s), higher household income was associated with higher abortion proportions, consistent with the concentration of institutional compliance pressure among the formally employed. In the later policy cohorts (1980s–1990s), income differences in abortion proportion were markedly smaller. When residence and income were considered jointly, urban women in all income groups showed higher abortion proportions than rural women within the earlier policy cohorts, but this urban premium reversed for upper-middle-income rural women in the later policy cohorts (Figure 4, panel D).

Identification of typical induced abortion patterns

Table 1 presents LCA model fit statistics for two to five latent classes. The four-class solution was selected on the basis of four criteria. The BIC showed substantial improvement from two to three classes ($\Delta\text{BIC} = -2,720$) and three to four classes ($\Delta\text{BIC} = -905$), but markedly diminishing returns from four to five ($\Delta\text{BIC} = -452$). Relative entropy peaked at $k = 4$ (0.843) and declined at $k = 5$ (0.732), indicating that the four-class solution achieves superior classification certainty [28]. The five-class solution produced a class comprising only 2.4% of the sample, below the threshold of practical interpretability. We therefore selected the four-class solution.

Table 1. Latent Class Model Fit Comparison. (N =37132)

Model	AIC	BIC	SABIC	Entropy	BLRT(P)	VLMR(P)	ΔBIC
2-Class	282,319.1	282481.05	282420.668	0.564	.0000	.0000	/
3-Class	279,513.9	279761.091	279668.929	0.753	.0000	.0000	-2,720.0
4-Class*	278,523.8	278856.141	278732.199	0.843	.0000	.0000	-905.0
5-Class	277,986.5	278404.08	278248.358	0.732	.0000	.0000	-452.0

Note: AIC=Akaike Information Criterion; BIC=Bayesian Information Criterion; SABIC=Sample-size adjusted BIC; BLRT=Bootstrapped Likelihood Ratio Test; VLMR=Vuong-Lo-Mendell-Rubin; / = not applicable; * =Best-fit Model.

Table 2 presents the conditional probability profiles for the four classes. Class 1 (C1, N=6,262, 16.9%) was characterized by high single-child parity (93.9% with only one child) and universally absent son-ownership (probability = 0.00), low premarital abortion (2.9%), and predominantly single-episode abortion experience (82.2% had only one abortion). Class 2 (C2, N=2,892, 7.8%) was uniquely defined by universal premarital abortion (probability = 1.00), near-exclusive first abortion at age 24 or below (94.1%), and the youngest mean age at first abortion in the sample (21.0 years; SD = 2.4). Class 3 (C3, N=19,224, 51.8%) showed near-exclusive single-abortion patterns (99.8%), highest son-ownership (89.6%), and highest parity (60.8% with two or more children), with virtually no premarital abortion (0.9%). Class 4 (C4, N=8,754, 23.6%) was defined by the complete absence of single-abortion experience (0.0% with only one abortion), the highest unintended pregnancy rate (96.7%), the youngest average first-abortion age among the married-and-multiparous group (25.9 years), and the highest mean number of abortions per woman (2.3; SD = 0.7).

Table 2. Conditional Probabilities of LCA Indicators by Class (%)

LCA Indicators	C1	C2	C3	C4	Total
N(%)	N = 6,262 (16.9%)	N = 2,892 (7.8%)	N = 19,224 (51.8%)	N = 8,754 (23.6%)	N = 37,132 (100%)
Experienced unintended pregnancy-related abortion	87.8	92.2	86.0	96.7	89.3
Had premarital abortion	2.9	100.0	0.9	1.0	9.0
Age at first abortion					
≤24 years	21.5	94.1	29.3	44.9	36.7
25-29 years	46.6	5.9	39.2	37.7	37.5
≥30 years	31.9	0.0	31.5	17.5	25.8
Number of abortions					
1 abortion	82.2	55.4	99.8	0.0	69.8
2 abortions	16.5	33.0	0.2	76.5	23.5
≥3 abortions	1.2	11.6	0.0	23.5	6.7
Parity (number of living children)					
No children	6.1	3.3	0.0	0.0	1.3
1 child	93.9	52.9	39.2	43.4	50.5
≥2 children	0.0	43.8	60.8	56.6	48.2
Has a son	0.0	68.4	89.6	81.0	70.8

Table 3 presents the sociodemographic profiles of each class. C1 was disproportionately composed of women born in the 1970s (51.2%) and 1980s (28.0%), urban residents (68.9%), and those with college or above education (32.3%) or high household income (46.3%). C2 was dominated by later cohorts (1980s:

43.4%; 1990s: 16.5%), with moderate educational and balanced distribution between urban and rural areas. C3 was the most rural class (62.5% rural), showed the lowest educational attainment (30.0% primary or below), and was spread across older cohorts (1960s: 15.0%; 1970s: 48.1%). C4 closely resembled C3 in sociodemographic profile but was distinguished entirely by its behavioral pattern of chronic repeat abortion.

Table 3. Sociodemographic Characteristics of Each Latent Class

	C1	C2	C3	C4	Total
N (%)	6262 (16.9%)	2892 (7.8%)	19224 (51.8%)	8754 (23.6%)	37132 (100%)
Age at first abortion (mean, SD)	28.1±4.77	21.02±2.39	27.79±5.09	25.87±4.2	26.86±5.04
Number of abortions (mean, SD)	1.19±0.45	1.60±0.83	1.00±0.05	2.32±0.70	1.39±0.70
Birth cohort (%)					
1960s	15.3	6.4	15.0	17.0	14.9
1970s	51.2	33.7	48.1	54.7	49.1
1980s	28.0	43.4	32.2	25.7	30.8
1990s	5.5	16.5	4.7	2.6	5.3
Education (%)					
Primary or below	10.0	21.2	30.0	31.0	26.2
Junior high	33.7	44.6	42.8	40.1	40.8
Senior high	23.9	19.7	14.5	15.4	16.7
College or above	32.3	14.5	12.7	13.5	16.3
Residence (%)					
Rural	31.1	56.4	62.5	57.3	55.5
Urban	68.9	43.6	37.5	42.7	44.5
Household income (%)					
Low	11.8	14.3	21.7	21.2	19.3
Lower-middle	17.7	19.2	24.4	23.1	22.5
Upper-middle	24.1	25.4	25.2	24.3	24.8
High	46.3	41.0	28.8	31.5	33.3

Table 4 presents multinomial logistic regression results predicting class membership, with C3 as the reference. For C1 versus C3, education was the strongest predictor. College-educated women showed 4.26

times higher odds of belonging to C1 rather than C3 (95% CI: 3.76–4.83), with junior high (OR = 1.97, 95% CI: 1.78–2.18) and senior high (OR = 3.15, 95% CI: 2.80–3.55) showing intermediate effects, and none of these intervals overlapping 1. Cohort-by-education interaction terms indicate that this positive education gradient was markedly attenuated in the 1980s and 1990s cohorts relative to the 1960s reference cohort (Appendix Table A2). Urban residence (OR = 2.08, 95% CI: 1.93–2.24) and higher household income were also independently associated with higher odds of C1 membership, with confidence intervals for upper-middle and high income both excluding 1. Desired number of children showed a strong, monotonic association with C1 membership. Women who desired only one child had 2.16 times higher odds of C1 versus C3 membership (95% CI: 1.98–2.37) relative to those desiring two children, while women who desired three or more children showed substantially lower odds (OR = 0.40, 95% CI: 0.33–0.48).

Table 4. Multinomial Logistic Regression Predicting LCA Class Membership

	C1 vs C3	C2 vs C3	C4 vs C3
Birth cohort (ref: 1960s cohort)			
1970s cohort	0.850**	1.589***	0.996
	(0.762, 0.947)	(1.342, 1.881)	(0.913, 1.074)
1980s cohort	0.571***	3.025***	0.701***
	(0.516, 0.631)	(2.554, 3.582)	(0.643, 0.762)
1990s cohort	0.982	8.592***	0.501***
	(0.841, 1.147)	(7.067, 10.446)	(0.426, 0.589)
Education (ref: primary or below)			
Junior high	1.969***	0.929	0.954
	(1.777, 2.182)	(0.830, 1.039)	(0.893, 1.018)
Senior high	3.152***	0.948	1.019
	(2.799, 3.549)	(0.823, 1.093)	(0.930, 1.117)
College or above	4.260***	0.678***	0.933
	(3.756, 4.832)	(0.576, 0.799)	(0.841, 1.036)
Residence (ref: rural)			
Urban	2.079***	1.211***	1.193***
	(1.932, 2.237)	(1.103, 1.331)	(1.122, 1.268)
Household income (ref: low income)			
Lower-middle income	1.132*	1.122	0.979
	(1.010, 1.268)	(0.973, 1.293)	(0.905, 1.059)
Upper-middle income	1.180**	1.408***	1.003
	(1.057, 1.318)	(1.228, 1.615)	(0.927, 1.087)
High income	1.375***	2.082***	1.136**
	(1.232, 1.534)	(1.818, 2.385)	(1.047, 1.234)
Desired number of children (ref: 2 children)			
1 child	2.162***	1.311***	0.858**
	(1.975, 2.366)	(1.142, 1.506)	(0.775, 0.950)
≥3 children	0.398***	1.011	1.132**

	(0.332, 0.476)	(0.866, 1.179)	(1.034, 1.239)
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Note: OR = odds ratio (relative risk ratio). 95% confidence intervals in brackets.

Significance: *** p<0.001 ** p<0.01 * p<0.05

For C2 versus C3, the birth cohort gradient was the dominant predictor, rising from an odds ratio of 1.59 (95% CI: 1.34–1.88) in the 1970s to 3.03 (95% CI: 2.55–3.58) in the 1980s and 8.59 (95% CI: 7.07–10.45) in the 1990s, none of these intervals approaching 1. The confidence intervals for junior and senior high school education included 1, indicating no clear association with C2 membership at these levels; only college-educated women showed lower odds of C2 versus C3 (OR = 0.68, 95% CI: 0.58–0.80). Higher household income was positively associated with C2 membership (high income OR = 2.08, 95% CI: 1.82–2.39), and desiring one child was likewise associated with modestly higher odds of C2 membership (OR = 1.31, 95% CI: 1.14–1.51).

For C4 versus C3, the confidence intervals for education and income at almost all levels included 1, while the odds ratios for the 1980s (OR = 0.70, 95% CI: 0.64–0.76) and 1990s (OR = 0.50, 95% CI: 0.43–0.59) cohorts fell clearly below 1. Urban residence was modestly associated with C4 membership (OR = 1.19, 95% CI: 1.12–1.27). Desired number of children showed a pattern opposite to that observed for C1: the higher a woman's desired number of children, the more likely she was to belong to C4 rather than C3. Women desiring only one child had lower odds of C4 versus C3 membership (OR = 0.86, 95% CI: 0.78–0.95), while those desiring three or more children showed higher odds (OR = 1.13, 95% CI: 1.03–1.24). The confidence intervals for education and income in the C4-versus-C3 comparison all included 1, indicating that the differentiation between chronic repeat abortion and single-episode compliance was not predicted by individual socioeconomic resources within this shared social space, but rather appears linked to fertility preference itself. Women whose reproductive aspirations exceeded the prevailing policy allocation were more likely to experience repeated abortion.

Based on these behavioral and sociodemographic profiles, the four latent classes were labeled as follows: C1 (Urban One-Child Compliance), C2 (Premarital Unintended Pregnancy), C3 (Rural One-and-a-Half Policy Compliance), and C4 (Chronic Repeat Abortion). A robustness check additionally controlling for ethnicity, which accounts for the historically more permissive fertility policies applied to ethnic minority populations, and employment status, which distinguishes agricultural from non-agricultural employment as an alternative to the urban–rural residence indicator, confirmed all of the associations reported above (Appendix Table A3).

Discussion and Conclusions

This study advances understanding of induced abortion in China by integrating cohort-period analysis with latent class typology across successive birth cohorts. Two contributions distinguish this study from prior research: it identifies two structurally distinct compliance-driven abortion types corresponding to China's urban and rural policy regimes, which prior studies have treated as a single category; and it provides one of the first population-representative behavioral typologies of induced abortion in China, moving beyond the binary distinction between having and not having an abortion.

The dual policy regime and the social distribution of abortion risk

The identification of two structurally distinct compliance-driven abortion types, C1 (Urban One-Child Compliance) and C3 (Rural One-and-a-Half Policy Compliance), helps clarify a mechanism that prior studies have left unspecified. Existing research has documented that abortion proportions were higher among urban and higher-educated women during the enforcement peak [29, 30], but has not distinguished the institutional pathways that may have produced this pattern. Under the strict urban one-child policy, any pregnancy following a first birth was generally terminated regardless of fetal sex, which is consistent with C1's predominantly single-child profile [20]. Under the more permissive rural one-and-a-half-child policy, which permitted a second birth if the first child was female [31, 32, 33], women more often completed a two-child allocation and generally achieved son-ownership before terminating further pregnancies, a pattern broadly consistent with C3.

The sociodemographic gradient for C1 relative to C3 appears to reflect this institutional channeling. College-educated women showed 4.26 times higher odds of C1 membership than primary-educated women, and urban residents showed 2.07 times higher odds than rural residents. Compliance under the urban policy was enforced primarily through formal-sector employment, where the permitted number of births was more limited and enforcement was generally more rigorous than in rural areas [34]. This may reframe the standard reading of the positive education–abortion association observed in earlier cohorts.

Diffusion-based accounts of health-behavior gradients typically describe reversal as a gradual process, in which early adopters' initial advantage becomes protective as knowledge and access diffuse downward through the social hierarchy [35, 36, 37]. The Chinese case appears to depart from this model. Because abortion risk was largely institutionally assigned rather than self-selected, its concentration among the socially advantaged more likely reflects targeted enforcement than early adoption. The observed reversal of the sociodemographic gradient of abortion across cohorts may therefore reflect the transformation of an institutional structure rather than a diffusion process, a distinction that could be relevant to understanding fertility transitions in other state-mediated demographic contexts.

The cohort-driven, cross-class emergence of premarital abortion

The premarital pattern of induced abortion appears to be a largely cohort-driven, rather than socioeconomic, phenomenon. The odds of Premarital (C2) versus Rural Compliance (C3) class membership increased eightfold across cohorts, from 1.59 in the 1970s to 8.59 in the 1990s, with no consistent association across education or income. This trend is broadly consistent with the declining age at first abortion documented in Section 3.1, and with the second demographic transition framework, in which rising age at first marriage and a weakening link between marriage and sexual onset tend to unfold across successive cohorts [38]. In China, mean age at first marriage rose from 22.88 years in 1980 to 27.95 years in 2020, while premarital sexual activity appears to have become common across social backgrounds [39, 40]. As the interval between sexual debut and marriage lengthens, the period during which effective contraceptive practice has not yet been established may extend correspondingly, and premarital unintended pregnancy could be becoming an increasingly central mechanism of abortion [41, 42].

This carries a policy implication. China's reproductive health service system has historically been organized around married couples. Financial support, post-abortion care (PAC), post-abortion family planning services (PAFP), and follow-up counseling are overwhelmingly organized around marriage registration and childbearing within marriage [43, 44, 45]. Unmarried women often appear to face more limited access to reproductive health services [46]. Because the rise in premarital abortion is cohort-driven rather than concentrated in specific socioeconomic groups, targeting resources by social strata is unlikely to be an effective strategy on its own. What may instead be needed is a structural shift that removes marital-status requirements from public family planning services and extends contraceptive counseling through channels that reach unmarried women directly, such as schools and community health centers.

Fertility desire and chronic repeat abortion

C4 (Chronic Repeat Abortion) and C3 (Rural Compliance) are similar in sociodemographic characteristics but differ sharply in abortion frequency. The confidence intervals for education and income at almost all levels included 1, indicating no clear association with C4 membership, whereas desired number of children was the clearest predictor, with a dose-response pattern in which higher desired parity was associated with higher odds of C4 membership. This suggests that chronic repeat abortion may reflect an unmet need for family planning, the gap between a woman's fertility aspirations and the births actually permitted or achieved [47].

The cohort gradient supports this account. C4 membership was no less likely among 1970s than 1960s cohort women, when childbearing desires may have exceeded policy allocations, but declined by the 1980s (OR = 0.70) and 1990s (OR = 0.50) as this gap appears to have narrowed [48]. Repeat abortion may therefore reflect not service shortfalls alone, but the persistence of childbearing and abortion risk as intertwined outcomes among women pursuing larger families. Reproductive health services could accordingly benefit from extending structured contraceptive counseling to women with higher parity intentions, whose recurrent pregnancy risk may not be fully captured by conventional socioeconomic targeting.

A related pattern may help explain the rising share of first abortions among women of advanced maternal age noted in Section 3.1. As policy relaxation after 2013 permitted compensatory second births among women who had completed only one child, pregnancies among women aged 35 and above became more common, and a share of these pregnancies likely ended in abortion [49].

Policy implications

Together, these findings point to a structural mismatch between China's reproductive health service system, still organized around marriage and policy compliance, and the population whose abortion risk it now serves. The C2 pattern calls for removing marital-status barriers to reproductive health services and extending them into settings that reach unmarried women directly. The C4 pattern calls for structured, parity-sensitive contraceptive counseling for women with high fertility desires, delivered as part of routine post-abortion care. Both point toward a system organized around life-course timing and fertility circumstances rather than marital status and policy compliance, a reorientation consistent with Sustainable Development Goal target 3.7, which calls for universal access to sexual and reproductive health-care services [50].

Limitations

Several limitations should be acknowledged. First, abortion histories are retrospectively self-reported and subject to recall bias, so estimates for earlier cohorts are likely conservative. Second, the cross-survey design does not permit formal age-period-cohort decomposition, and parity is measured at the survey date rather than at the time of each abortion; both introduce a degree of imprecision that is likely greatest for the youngest cohort. Third, the sample is restricted to ever-married women, so the prevalence of the premarital pattern is likely underestimated. Finally, we cannot distinguish medically indicated terminations from elective abortions. Despite these limitations, the large sample size provides a reasonably reliable picture of the overall level and main features of induced abortion in China.

Conclusions

This study suggests that the social patterning of induced abortion in China has shifted across successive birth cohorts. Using latent class analysis, this study further distinguishes four typologies of induced abortion in China: Urban One-Child Compliance, Rural One-and-a-Half Policy Compliance, Premarital Unintended Pregnancy, and Chronic Repeat Abortion. Four conclusions follow. First, the age structure of abortion risk appears to have expanded bidirectionally: the age at first abortion has declined across cohorts, while risk among women of advanced maternal age has risen. Second, the sociodemographic gradient of abortion appears to have reversed. In earlier cohorts, abortion was concentrated among urban, higher-educated, and higher-income women, but this gradient weakened markedly in later cohorts and, for education, appears to have reversed direction altogether. This pattern is consistent with the transformation of China's dual urban–rural policy regime. Third, premarital unintended pregnancy has risen markedly as a cross-class mechanism of abortion among younger cohorts, plausibly tied to life-course transition. Fourth, chronic repeat abortion persists across cohorts and is plausibly linked to unmet fertility desires. Together, these findings indicate that no single socioeconomic gradient is likely to fully characterize abortion risk in contemporary China, and suggest that reproductive health services organized around marriage and policy compliance may benefit from restructuring around the life-course and fertility circumstances that increasingly appear to shape this risk.

Abbreviations

IAR - The induced abortion rate

P - The proportion of induced abortions

RAR - The repeat abortion rate

AFA – The mean age at First Abortion

LCA - Latent Class Analysis

CPR – The contraceptive prevalence rate

AIC - Akaike Information Criterion

BIC - Bayesian Information Criterion

SABIC - Sample-size adjusted BIC

BLRT - Bootstrapped Likelihood Ratio Test

VLMR - Vuong-Lo-Mendell-Rubin

Declarations

Ethics approval and consent to participate

This study was based on a secondary analysis of existing datasets with all participant identifiers removed. In the original surveys, informed consent was obtained from all participants prior to data collection. All research methods were carried out in accordance with relevant guidelines and regulations, and the protection of human subjects is not an issue in this study. The surveys were organized and implemented by the former National Health and Family Planning Commission of China and were approved by the Ethics Committee of the National Health and Family Planning Commission.

Consent for publication

Not applicable.

Availability of data and materials

The national fertility surveys that support the findings of this study are available from the China Population and Development Research Center, but restrictions apply to the availability of these data, which were used under licence for the current study and so are not publicly available. The data are, however, available upon request and with the permission of the China Population and Development Research Center.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

QQZ led the conceptualization and methodological design of the study, curated the data, conducted the formal statistical analyses, and drafted the original manuscript and contributed to subsequent revisions. HZ and JHS were responsible for project administration and supervision, validated the analytical approach and results, and contributed to the writing and critical revision of the manuscript. JW acquired the research funding, oversaw project administration and supervision, validated the study design and findings, and contributed to the writing and critical revision of the manuscript. All authors read and approved the final manuscript.

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Footnotes

1. The data was calculated based on the *China Health Statistical Yearbook*.

Figures

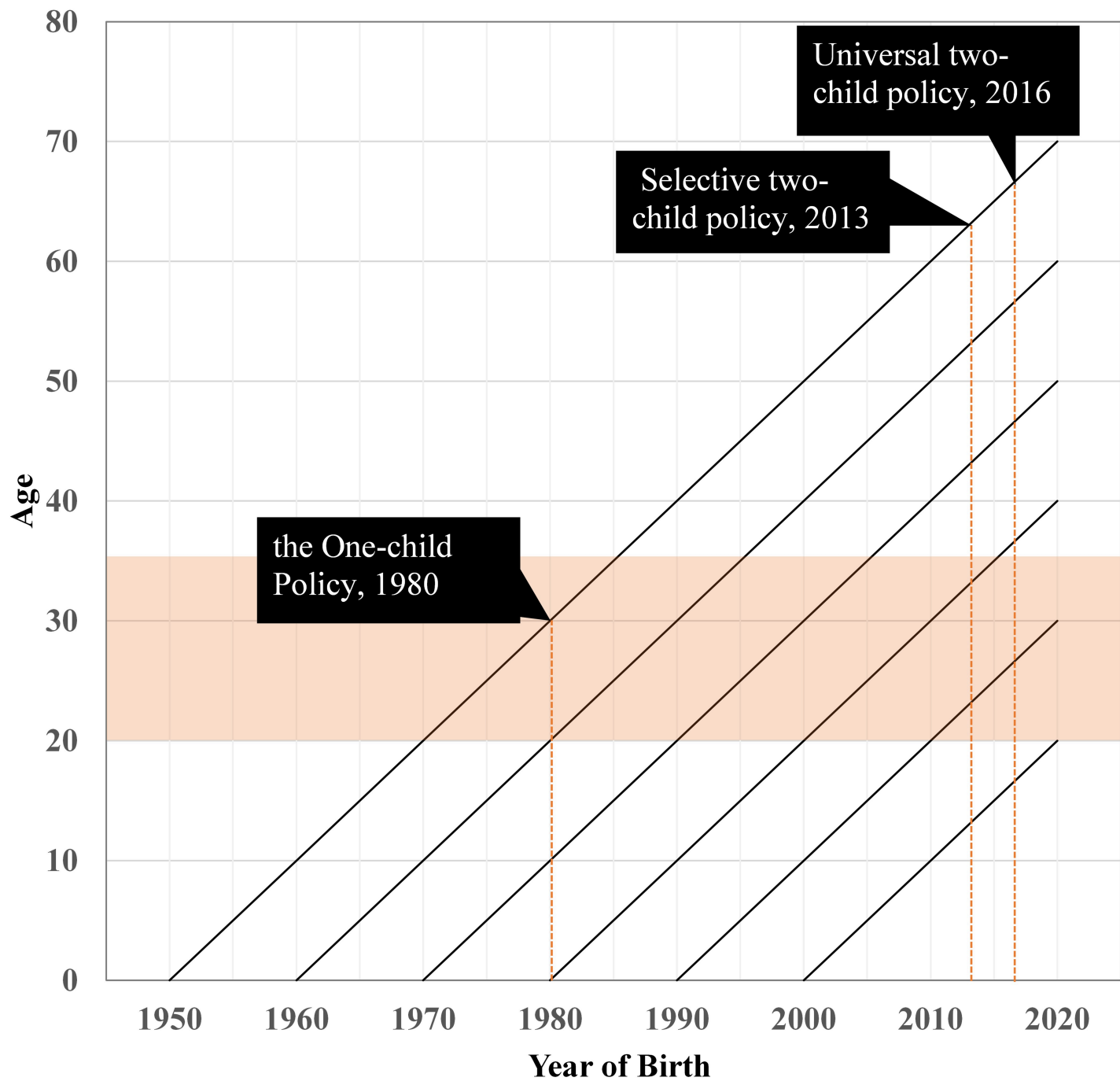


Figure 1

Main reproductive periods and family planning policy overlap by birth cohort in China.

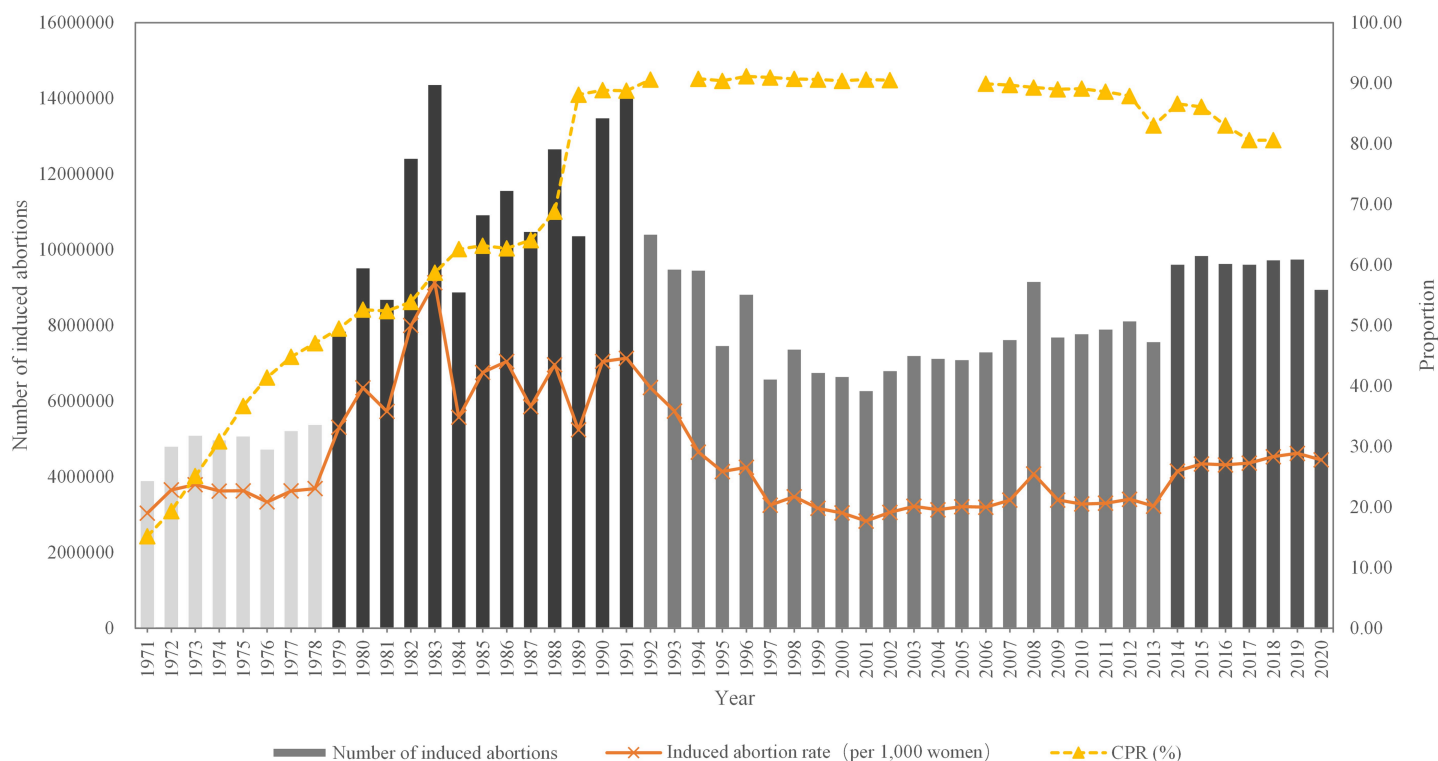


Figure 2

Four-phase trajectory of induced abortions in China, 1971–2020.

Data sources: The number of induced abortions is obtained from the China Health Statistics Yearbook. The population of women of childbearing age is obtained from the China Population Statistical Yearbook (1988–2006), the China Population and Employment Statistical Yearbook (2007–2020), and national population censuses (1990, 2000, 2010, 2020); population for other years is estimated from annual population sample surveys. Contraceptive prevalence rates come from Huang and Duan (1998) [27] (1971–1988), the China Family Planning Yearbook (1989–2002), and the China Health Statistics Yearbook (2006–2018).

Period Analysis

Cohort Analysis

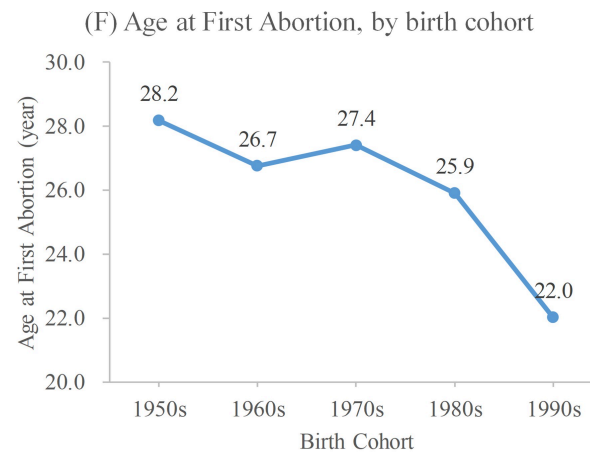
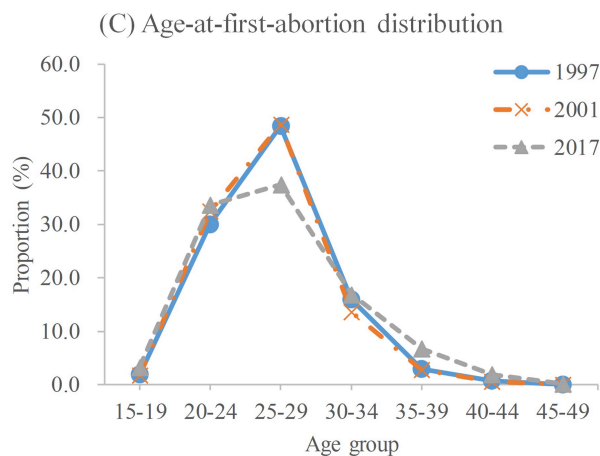
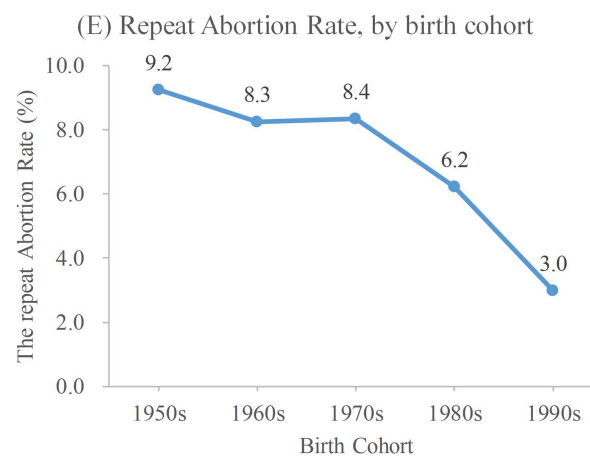
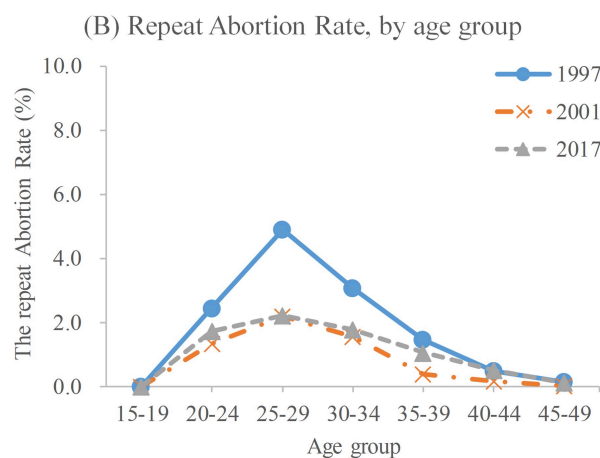
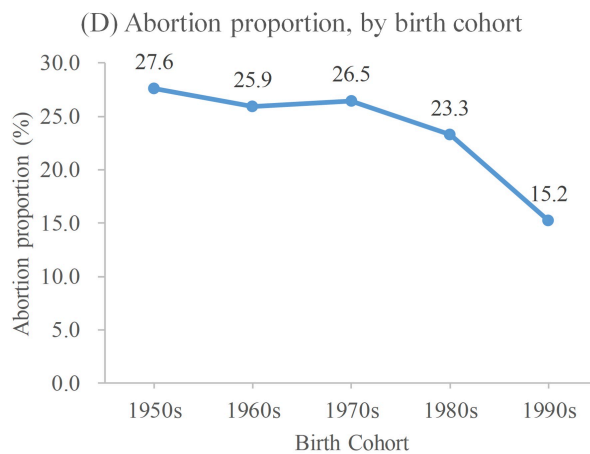
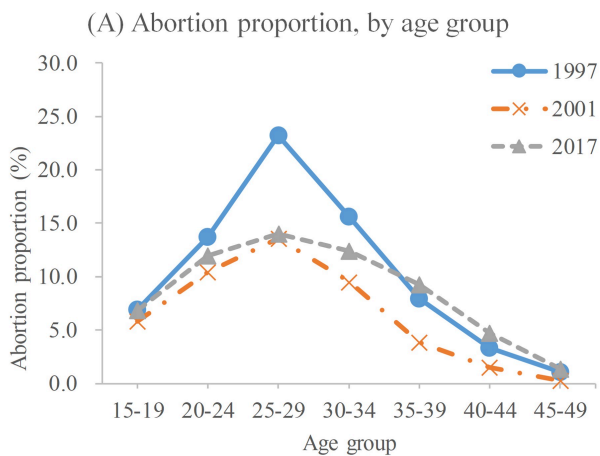


Figure 3

Abortion proportion, Repeat abortion rate, and Age at first abortion, by period and cohort.

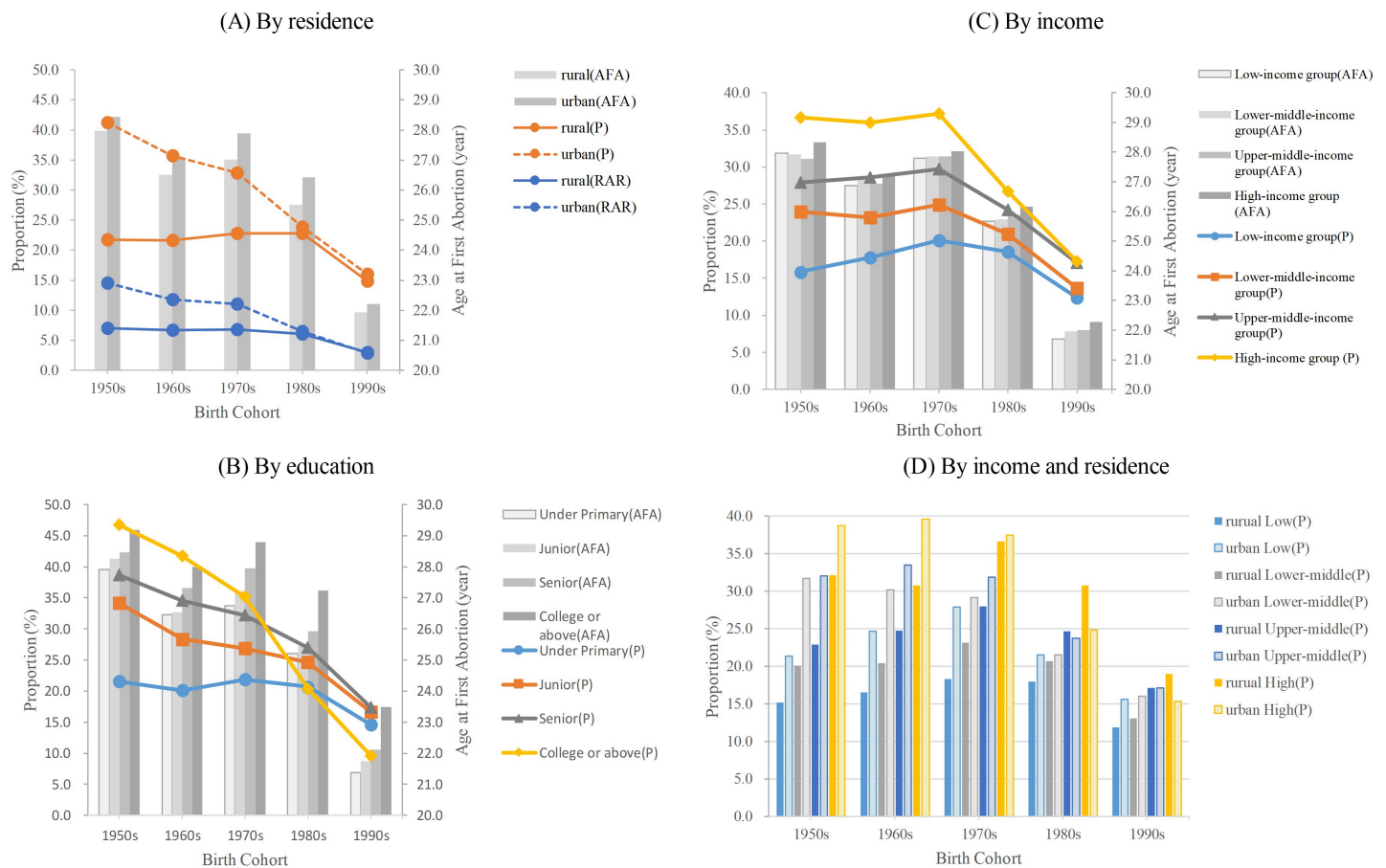


Figure 4

Abortion proportion, Repeat abortion rate, and Age at first abortion by cohorts and sociodemographic factors.

Supplementary Files

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- [Appendix.docx](#)