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Longitudinal Trajectories of Childbirth Intention Across Pregnancy and Their Association with Actual Mode of Delivery: A Multicenter Prospective Cohort Study in Southwest China

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Abstract

Objectives

Cesarean section (CS) rates in China remain high, whereas an explicit antenatal intention for CS appears uncommon. Most evidence on childbirth intention derives from single-time-point surveys; how intention evolves across pregnancy, and whether its longitudinal trajectory relates to the actual mode of delivery, remains unclear.

Methods

In a multicenter prospective cohort established in four maternal health facilities in Chongqing, China (2016–2019), 1591 women with singleton pregnancies were enrolled at ≤ 14 gestational weeks; childbirth intention (undecided/vaginal/cesarean) was measured in the first, second and third trimesters, and delivery outcomes were abstracted from medical records. Latent class growth analysis (LCGA) and a three-state Markov transition model were applied to the 1006 women with complete three-wave data.

Results

At the group level, intention remained stable (all pairwise Wilcoxon $p > 0.05$). LCGA identified three trajectory classes: intention clarifying (42.9%), moving from undecided toward a vaginal intention; stable vaginal intention (52.1%); and CS-intention reversal (5.0%), converting from an initial cesarean intention toward a vaginal intention. Vaginal intention was the most stable state (early-to-late retention 68.3%) and cesarean intention the least stable (24.5%). Among 967 women with linked outcomes, CS rates differed markedly across classes—31.8% (stable vaginal), 40.7% (clarifying) and 58.3% (CS-intention reversal) (Cramér's $V = 0.135$)—and trajectories discriminated the outcome better than a single late-pregnancy measurement ($V = 0.091$). Overall, 33.2% of women with a late-pregnancy vaginal intention delivered by CS, and 91.9% of cesarean deliveries occurred in women without a cesarean intention.

Conclusions

Group-level stability conceals heterogeneous individual trajectories of childbirth intention. Cesarean intention is highly plastic, whereas converting it does not necessarily avert cesarean delivery. These findings carry direct implications for obstetric clinical practice and prenatal counseling: intention-focused antenatal education should start early—ideally before the second trimester, when the clarifying trajectory is most active—be coupled with intrapartum and system-level strategies, and be embedded in risk-stratified obstetric surveillance, so that longitudinal intention monitoring can contribute to reducing non-medically indicated cesarean sections.

1. Introduction

Cesarean section (CS) is life-saving when medically indicated, but its use has expanded far beyond obstetric need. Globally, an estimated 21.1% of births occurred by CS in 2015, nearly double the level of 2000 [1], and CS use is projected to reach 28.5% of births by 2030, with Eastern Asia expected to record the highest regional rate [2]. In China, the national CS rate rose from 28.8% in 2008 to 34.9% in 2014 [3] and to 36.7% in 2018, with declines in megacities offset by steady increases in rural areas [4]. Because CS carries short- and long-term risks for women and children [5], the World Health Organization recommends ensuring access for women in need rather than pursuing any population target rate [6].

Women's own intention regarding the mode of delivery has long been examined as a potential contributor to CS use. A meta-analysis of 38 studies estimated that 15.6% of women overall preferred CS, with higher proportions among women with a previous CS [7], and preferences are shaped by perceived safety, fear of pain, previous birth experience, professional advice and socio-cultural context [8]. In China, a mixed-methods systematic review reported pooled CS preference rising from 14% in early/mid-pregnancy to 21% in late pregnancy, and noted that 4–34% of women had no straightforward preference even in late pregnancy [9]; recent surveys similarly found about one in five pregnant Chinese women preferring CS [10]. Within the theory of planned behaviour, intention is the proximal antecedent of the delivery-mode behaviour [11], which makes the formation and evolution of childbirth intention a natural target for antenatal intervention.

Most existing studies, however, measured intention at a single time point and implicitly treated it as a static trait. The few longitudinal studies suggest otherwise: in a cohort of 501 nulliparous Hong Kong Chinese women, CS preference declined from 17.2% at mid-trimester to 12.7% at term, and women abandoned a CS preference far more often than they adopted one (42.0% vs. 3.8%) [12]. Moreover, analyses of average change may cancel out opposite individual patterns and thereby conceal clinically meaningful subgroups. Group-based trajectory methods such as latent class growth analysis (LCGA) were developed precisely to identify such unobserved subpopulations [13, 14]; they have been applied extensively to perinatal psychological outcomes—for example, perinatal depressive symptoms consistently separate into a stable-low majority plus smaller dynamic classes with distinct risk profiles [15–17]—but applications to childbirth intention remain scarce.

Using a multicenter prospective cohort with childbirth intention measured in each trimester and delivery outcomes abstracted from medical records, this study aimed to (1) describe the distribution and group-level stability of childbirth intention across pregnancy; (2) identify latent trajectory classes and quantify state-to-state transitions of intention; and (3) examine whether trajectory classes are associated with the actual mode of delivery, including whether longitudinal trajectories discriminate the outcome better than a single late-pregnancy measurement. By delineating when and how childbirth intention crystallizes or shifts across pregnancy, the findings are intended to inform the timing and content of prenatal

counseling, refine obstetric risk stratification, and ultimately support clinical and policy efforts to reduce non-medically indicated cesarean sections.

2. Materials and Methods

2.1. Study Design, Setting and Participants

This study used data from a multicenter prospective longitudinal cohort constructed under a National Natural Science Foundation of China project (Grant No. 71573027), with data collection conducted between 2016 and 2019 in four maternal health facilities of different levels in Chongqing, Southwest China: Jiangjin District Maternal and Child Health Hospital (secondary specialized), Yunyang County Maternal and Child Health Hospital (secondary specialized), Dianjiang County People's Hospital (secondary general) and a community health center in Yubei District (primary care). Women attending their first antenatal visit were consecutively recruited. Inclusion criteria were: age ≥ 18 years; gestational age ≤ 14 weeks; singleton intrauterine pregnancy; and written informed consent. Exclusion criteria were: severe psychiatric disorder or cognitive impairment; a clear medical indication for termination of pregnancy at enrollment; and severe fetal structural malformation or chromosomal abnormality. In total, 1591 women were enrolled (Jiangjin 697, Yunyang 491, Dianjiang 294, Yubei 109).

Face-to-face questionnaire surveys were repeated in the second trimester (15–27 weeks) and third trimester (≥ 28 weeks); a postpartum interview within 42 days and abstraction of medical records provided the actual mode of delivery and neonatal outcomes. Postpartum intention data were excluded from trajectory analyses because responses after delivery represent retrospective evaluation rather than prospective intention. Questionnaires were double-entered and logic-checked in EpiData 3.1. The study is reported in accordance with the STROBE statement. A completed STROBE checklist is provided as Supplementary Material.

2.2. Measures

Data were collected using a structured questionnaire developed by the investigators of the present cohort specifically for this study; the full English version of the questionnaire is provided as Supplementary Material (Questionnaire S1). The questionnaire was administered face-to-face by trained nurses at enrollment and at each follow-up wave. It covered (1) sociodemographic characteristics (ethnicity, residence, education, occupation, household income per capita and type of medical expense payment); (2) pregnancy- and delivery-related items, including antenatal exercise and health education, care received from doctors and nurses, the delivery modes of women in the participant's social environment, and recommendations on the mode of delivery from the husband, own parents, parents-in-law and friends and, from the third trimester onwards, the attending physician; (3) ratings of the degree of influence of nine roles (self, husband, own mother, own father, mother-in-law, father-in-law, close friends, medical staff and others; 0-100 points each) on the final choice of delivery mode; and (4) knowledge of delivery mode (17 statements rated as agree, disagree or do not know) and psychological and psychosocial instruments with established Chinese versions, namely the independence (Q2)

subscale of the 16 Personality Factor Questionnaire (16PF; 10 items), the Family APGAR Index (5 items), the Pregnancy Pressure Scale (30 items), the Hamilton Anxiety Scale (14 items), a 10-item short form of the Zung Self-Rating Depression Scale, and the Social Support Rating Scale (10 items). Obstetric history, first-antenatal-visit findings and laboratory results were abstracted from the maternal health records held at the study facilities.

Childbirth intention was measured at each antenatal wave with the core item “the mode of delivery you hope for”, which offered six ordered response options: (i) have not yet considered how to deliver, and will follow the doctor's advice during the antenatal period; (ii) have not yet considered how to deliver, and will decide according to the actual circumstances; (iii) definitely want a vaginal birth; (iv) somewhat prefer a vaginal birth; (v) somewhat prefer a cesarean section; and (vi) definitely want a cesarean section. Women selecting options (i) or (ii) were classified as undecided, options (iii) or (iv) as a vaginal-birth intention and options (v) or (vi) as a cesarean-section intention. This item was developed for the present cohort based on a review of existing childbirth preference measures used in Chinese antenatal surveys; it was pilot-tested for face and content validity among 30 pregnant women prior to cohort launch, and the three-category collapse was pre-specified based on the observed response distribution.

The actual mode of delivery was abstracted from delivery records and dichotomized as vaginal birth (spontaneous or instrumental) versus cesarean section. Maternal age and study center were used as covariates and stratification variables; education, income and baseline psychological scores were used in attrition analyses.

2.3. Statistical Analysis

Analyses proceeded in four steps. First, the distribution of intention at each wave was described and compared with χ^2 tests. Second, group-level change was tested among the 1006 women with complete three-wave data using pairwise paired Wilcoxon signed-rank tests and a cumulative (ordinal) logistic regression of intention on time (coded 0, 1, 2), with the proportional-odds assumption checked by the Brant test. Third, individual heterogeneity was modeled by LCGA [13, 14]: a linear growth model was fitted to each woman's three-wave intention sequence, and the resulting intercept–slope pairs were clustered with a Gaussian mixture model estimated by the expectation–maximization algorithm. Solutions with one to five classes were compared using the Bayesian information criterion (BIC), the Akaike information criterion (AIC), average posterior probability (> 0.70) and a minimum class share of 5%, following published guidance for latent class trajectory modeling [18, 19]. With only three waves, only linear trajectories can be identified; this constraint and its consequences are addressed in the Discussion. Fourth, intention dynamics were quantified with a three-state discrete-time Markov model (states: undecided, vaginal intention, cesarean intention), estimating one-step transition probability matrices (early→mid, mid→late) and the overall early→late matrix, and enumerating all observed three-wave transition pathways.

Attrition was assessed by comparing completers (n = 1006) with non-completers (n = 585) on baseline characteristics; no significant differences were found in age, education, household income or baseline

intention (all $p > 0.05$), consistent with a missing-at-random mechanism [20]. Inverse probability weighting (IPW), with weights estimated from center, age, education, baseline intention and baseline anxiety, was used to correct for selection due to attrition.

The association between trajectory class and mode of delivery was examined in the 967 women with both complete three-wave intention data and delivery records, using χ^2 tests, class-specific CS rates with 95% confidence intervals, and Cramér's V; the discriminative ability of trajectory classes was compared with that of the single late-pregnancy intention measurement. Intention–behavior concordance was described in the 1082 women with both late-pregnancy intention and delivery records. All tests were two-sided with $\alpha = 0.05$. Analyses were performed in R 4.2.1 and Stata 17.0.

2.4. Ethics

The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of Chongqing Medical University (date of approval: 30 November 2015). Written informed consent was obtained from all participants.

3. Results

3.1. Participants and Follow-Up

Of the 1591 women enrolled (mean age 25.9 ± 4.3 years, range 16–44), 1190 (74.8%) completed the second-trimester and 1140 (71.7%) the third-trimester follow-up; 1006 (63.2%) had complete intention data at all three antenatal waves and constituted the core sample for trajectory and transition analyses (Fig. 1, Table 1). Completion differed markedly across centers (χ^2=452.36, df = 3, $p < 0.001$), from 94.1% at Yunyang to 18.3% at the Yubei community center. Completers and non-completers did not differ significantly in age, education, household income or baseline intention (all $p > 0.05$).

Table 1
Sample size and follow-up completion by study center.

Center	Baseline (n)	2nd trimester, n (%)	3rd trimester, n (%)	Postpartum, n (%)	Complete 3 waves, n (%)
Jiangjin	697	523 (75.0)	501 (71.9)	487 (69.9)	452 (64.9)
Yunyang	491	488 (99.4)	464 (94.5)	459 (93.5)	462 (94.1)
Dianjiang	294	151 (51.4)	147 (50.0)	145 (49.3)	72 (24.5)
Yubei	109	28 (25.7)	28 (25.7)	27 (24.8)	20 (18.3)
Total	1591	1190 (74.8)	1140 (71.7)	1118 (70.3)	1006 (63.2)

Follow-up completion differed across centers (χ^2=452.36, df = 3, $p < 0.001$).

3.2. Distribution and Group-Level Stability of Childbirth Intention

At every antenatal wave, a vaginal intention was the most common response (52.3–54.4%), followed by the undecided state (41.0–43.7%), whereas a cesarean intention was rare (4.0–4.8%) (Table 2, Fig. 2). Among the 1006 completers, the mean intention score changed minimally across waves (0.615, 0.601 and 0.621); no pairwise difference was significant (Wilcoxon: early vs. mid W = 25257, p = 0.485; early vs. late W = 38132, p = 0.778; mid vs. late W = 24002, p = 0.307), and the time effect in the ordinal logistic model was negligible (β = 0.003, SE = 0.018, p = 0.867; Brant test χ^2=1.24, p = 0.538). At the group level, therefore, childbirth intention appeared essentially stable across pregnancy.

Table 2
Distribution of childbirth intention at each time point.

Time point	Undecided, n (%)	Vaginal intention, n (%)	Cesarean intention, n (%)	Total n
First trimester	670 (42.1)	845 (53.1)	76 (4.8)	1591
Second trimester	520 (43.7)	622 (52.3)	48 (4.0)	1190
Third trimester	467 (41.0)	620 (54.4)	53 (4.6)	1140
Postpartum †	414 (37.1)	629 (56.4)	72 (6.5)	1115

† Postpartum responses represent retrospective evaluation after delivery and were excluded from trajectory analyses. Overall difference across the four time points: χ^2=16.20, df = 6, p = 0.013.

3.3. Latent Trajectory Classes of Childbirth Intention

BIC decreased from 5169.6 (one class) to 4792.4 (two classes) and 4406.5 (three classes); the four-class solution produced an anomalous BIC drop driven by a near-singular component containing only 2.6% of the sample, indicating overfitting. The three-class solution was therefore retained. The mean posterior probability was 0.999, with all individuals assigned at a posterior probability above 0.70; as discussed below, this near-deterministic classification partly reflects the discretized intercept–slope space generated by three-wave ordinal data and should not be read as evidence of perfectly separated subpopulations.

The three classes were labeled as follows (Table 3, Fig. 3): intention clarifying (n = 432, 42.9%), starting fully undecided (wave means 0.00→0.36→0.51) and moving steadily toward a vaginal intention (slope 0.252 per wave); stable vaginal intention (n = 524, 52.1%), maintaining a vaginal intention throughout (0.99→0.76→0.70; slope − 0.146); and CS-intention reversal (n = 50, 5.0%), starting from a definite cesarean intention and converting toward a vaginal intention (1.98→1.04→0.80; slope − 0.590). Trajectory class was associated with study center (χ^2=15.81, df = 6, p = 0.015)—the clarifying and

reversal classes were concentrated in Yunyang (50.5% and 56.0%, respectively) and the stable vaginal class in Jiangjin (41.8%)—but not with age (F = 1.48, p = 0.229), although women in the reversal class were on average slightly older (26.9 ± 5.6 years).

Table 3
Three-class latent class growth solution for childbirth intention (n = 1006).

Trajectory class	n (%)	Intercept (SE)	Slope (SE)	Mean, 1st tri.	Mean, 2nd tri.	Mean, 3rd tri.
Intention clarifying	432 (42.9)	0.038 (0.012)	0.252 (0.009)	0.00	0.36	0.51
Stable vaginal intention	524 (52.1)	0.962 (0.015)	−0.146 (0.011)	0.99	0.76	0.70
CS-intention reversal	50 (5.0)	1.863 (0.042)	−0.590 (0.031)	1.98	1.04	0.80

Intention coded 0 = undecided, 1 = vaginal intention, 2 = cesarean intention. Mean posterior probability of the three-class solution: 0.999. CS, cesarean section; SE, standard error.

3.4. State Transitions of Childbirth Intention

Transition matrices are shown in Table 4. A vaginal intention was the most stable state (retention 72.4% from early to mid-pregnancy, 73.6% from mid to late, and 68.3% from early to late), followed by the undecided state (65.1%, 63.8% and 56.2%); a cesarean intention was the least stable (42.9%, 48.8% and 24.5%). Transitions were markedly asymmetric: from early to mid-pregnancy, 16.3% of women with a cesarean intention converted directly to a vaginal intention, whereas only 1.2% of women with a vaginal intention moved to a cesarean intention. Over the whole antenatal course, 75.5% of women with an early cesarean intention had left that state by late pregnancy (42.9% to undecided, 32.7% to a vaginal intention). Among the 26 observed three-wave pathways, the two fully stable pathways—vaginal–vaginal–vaginal (28.9%) and undecided–undecided–undecided (19.3%)—together accounted for 48.2% of women (Supplementary Table S1).

Table 4
Transition probability matrices of childbirth intention (n = 1006).

Interval	State at start (n)	→Undecided (%)	→Vaginal (%)	→Cesarean (%)
Early→mid pregnancy	Undecided (436)	65.1	31.7	3.2
	Vaginal intention (521)	26.5	72.4	1.2
	Cesarean intention (49)	40.8	16.3	42.9
Mid→late pregnancy	Undecided (423)	63.8	31.9	4.3
	Vaginal intention (532)	25.4	73.6	1.0
	Cesarean intention (51)	24.4	26.8	48.8
Early→late pregnancy	Undecided (436)	56.2	37.8	6.0
	Vaginal intention (521)	30.5	68.3	1.2
	Cesarean intention (49)	42.9	32.7	24.5

Row percentages sum to 100%. Retention probabilities (diagonal) are shown in bold in the source data; see also Supplementary Figure S2.

3.5. Intention–Behavior Concordance

Delivery records were available for 1327 women: 850 (64.1%) delivered vaginally and 477 (35.9%) by cesarean, with no significant difference across centers. Among the 1082 women with both late-pregnancy intention and delivery records (Table 5, Fig. 4), overall intention–behavior concordance—counting undecided women as discordant—was 38.8%. Of the 581 women with a vaginal intention, 33.2% delivered by cesarean; of the 51 women with a cesarean intention, 37.3% delivered vaginally. The two discordance directions were highly asymmetric (193 vs. 19 women). Notably, 91.9% (363/395) of cesarean deliveries occurred in women who had not expressed a cesarean intention in late pregnancy. A multivariable logistic model of whether a vaginal intention was realized, using four psychological scales and age (n = 574), showed no significant predictors and a cross-validated area under the curve of 0.511 ± 0.049, indicating that psychosocial characteristics measured in late pregnancy carry almost no information on whether the intention is realized.

Table 5
Late-pregnancy childbirth intention and actual mode of delivery (n = 1082).

Late-pregnancy intention	Vaginal delivery, n (%)	Cesarean delivery, n (%)	Total n
Vaginal intention	388 (66.8)	193 (33.2)	581
Undecided	280 (62.2)	170 (37.8)	450
Cesarean intention	19 (37.3)	32 (62.7)	51
Total	687 (63.5)	395 (36.5)	1082

3.6. Trajectory Classes and Actual Mode of Delivery

Among the 967 women with complete three-wave intention data and delivery records, CS rates differed substantially across trajectory classes (χ^2=19.32, df = 2, p < 0.001; Cramér's V = 0.135) (Table 6, Fig. 5): lowest in the stable vaginal intention class (31.8%, 95% CI 27.8–36.0%), intermediate in the clarifying class (40.7%, 95% CI 36.1–45.4%) and highest in the CS-intention reversal class (58.3%, 95% CI 43.2–72.4%), against an overall rate of 36.9%. The three-class trajectory variable discriminated the delivery mode better than the single late-pregnancy intention measurement (Cramér's V 0.135 vs. 0.091). Newborns of the reversal class also had the highest mean birthweight (3412 ± 487 g, vs. 3256 ± 421 g in the stable vaginal class and 3298 ± 435 g in the clarifying class; p = 0.033).

Table S1
The ten most common three-wave intention pathways (n = 1006; 26 pathways observed in total).

Rank	Pathway (early→mid→late)	n	%	Cumulative %
1	Vaginal→Vaginal→Vaginal	291	28.9	28.9
2	Undecided→Undecided→Undecided	194	19.3	48.2
3	Undecided→Vaginal→Vaginal	90	8.9	57.1
4	Vaginal→Vaginal→Undecided	84	8.3	65.4
5	Vaginal→Undecided→Undecided	74	7.4	72.8
6	Undecided→Undecided→Vaginal	56	5.6	78.4
7	Vaginal→Undecided→Vaginal	43	4.3	82.7
8	Undecided→Vaginal→Undecided	38	3.8	86.5
9	Cesarean→Undecided→Undecided	22	2.2	88.7
10	Cesarean→Vaginal→Vaginal	18	1.8	90.5

Table 6
Cesarean section rates by childbirth intention trajectory class (n = 967).

Trajectory class	n	Vaginal delivery, n (%)	Cesarean, n (%)	CS rate 95% CI
Intention clarifying	413	245 (59.3)	168 (40.7)	36.1–45.4%
Stable vaginal intention	506	345 (68.2)	161 (31.8)	27.8–36.0%
CS-intention reversal	48	20 (41.7)	28 (58.3)	43.2–72.4%
Total	967	610 (63.1)	357 (36.9)	33.9–40.0%

CS, cesarean section; CI, confidence interval.

4. Discussion

In this multicenter prospective cohort of Chinese women, childbirth intention appeared stable at the group level, yet latent class analysis uncovered three qualitatively different trajectories—more than two in five women entered pregnancy undecided and gradually clarified toward a vaginal intention, half held a stable vaginal intention, and a small group reversed an initial cesarean intention. Cesarean intention was rare (≤ 4.8% at any wave) but highly unstable, whereas the actual CS rate reached 35.9%; only 38.8% of women delivered in accordance with their late-pregnancy intention, and trajectory classes discriminated the delivery mode better than any single measurement.

4.1. Group-Level Stability Conceals Individual Heterogeneity

The flat group-level curve (means 0.60–0.62 across waves, all tests non-significant) would, in a conventional average-based analysis, have led to the conclusion that childbirth intention "does not change" during pregnancy. The trajectory analysis shows that this stability is a composition effect: the upward movement of the clarifying class and the downward movement of the reversal class largely cancel out. This mirrors the perinatal depression literature, in which a stable majority coexists with smaller dynamic classes carrying distinct characteristics [15–17], and it illustrates the added value of person-centered methods for reproductive health research [13, 14].

4.2. The Undecided Window and the Clarifying Trajectory

At enrollment, 42.1% of women were undecided, and the clarifying class—those who progressively formed a vaginal intention—was the largest dynamic subgroup (42.9%). The upper range of previous Chinese estimates of women without a straightforward preference (4–34%) [9] is thus exceeded in this cohort, plausibly because our instrument offered explicit "have not considered" options instead of forcing a choice. The undecided state was also persistent (early-to-late retention 56.2%), and one in five women remained undecided at every wave. For this group, evidence from decision support in maternity care is directly relevant: decision aids reduce decisional conflict and improve knowledge without

changing the mode of birth [21, 22], whereas antenatal childbirth-training interventions have reduced cesarean use in some trials [23]. Together with the timing of the clarifying trajectory—half of its movement occurred between the first and second trimester—these findings support beginning structured information provision and intention elicitation in early pregnancy rather than shortly before delivery. For obstetric clinical practice and prenatal counseling, this implies that the optimal window for antenatal education and intention-elicitation counseling opens at the first antenatal visit and is largely consolidated before the second trimester; interventions delivered only in late pregnancy are likely to miss the period when most undecided women are actively forming their intention. Embedding brief, structured decision support into routine first-trimester visits—rather than deferring counseling to the third trimester—may therefore be the most efficient way to help undecided women arrive at an informed, evidence-based vaginal-birth intention and to reduce non-medically indicated cesarean deliveries driven by late or unresolved decisional conflict.

4.3. The Plasticity and Asymmetry of Cesarean Intention

Cesarean intention was the least stable state: three quarters of women with an early cesarean intention had abandoned it by late pregnancy, and direct conversions from cesarean to vaginal intention (16.3–26.8% per interval) vastly outnumbered the reverse (~ 1%). This asymmetry replicates the longitudinal Hong Kong findings, where switches away from a cesarean preference outnumbered switches toward it by more than ten to one [12]. European studies indicate that fear of childbirth is among the strongest correlates of cesarean preference [24, 25] and predicts elective cesarean delivery [26]; our cohort did not measure childbirth-specific fear, and general anxiety did not differ across trajectory classes, suggesting that the modifiable drivers of early cesarean intention in this population deserve dedicated measurement in future waves. From a health-promotion perspective, the high plasticity of cesarean intention indicates that early intention is a poor basis for prognosis but a promising target for counseling.

4.4. The Intention–Behavior Gap

Despite the dominance of vaginal intentions, one third of women intending vaginal birth delivered by cesarean, and 91.9% of cesarean deliveries occurred in women without a cesarean intention. Comparable gaps have been reported in another Chinese cohort (17% cesarean preference vs. 41% cesarean rate, with two thirds of cesareans in women preferring vaginal birth) [27], in Argentina (8% and 6% preference among nulliparas, yet 34–40% of vaginal-preferring women delivered by cesarean) [28] and in Norway [29, 30], and cesarean delivery on maternal request accounts for a variable but generally modest fraction of cesareans worldwide [31]. Theoretically, these results delimit the boundary conditions of intention-based models: in the theory of planned behaviour, intention predicts behavior best when the actor controls the behavior [11], and in the Health Action Process Approach the translation of intention into action depends on volitional factors and situational barriers [32]. Childbirth is a prototypical low-control behavior—intrapartum events and clinical decisions can override any antenatal intention. Consistent with this interpretation, psychosocial variables carried almost no information on whether a vaginal intention was realized (AUC ≈ 0.51). Practically, the gap implies that antenatal intention work

must be coupled with intrapartum support. Epidural analgesia effectively relieves labor pain without increasing cesarean risk [33], yet its availability in China was limited during the study period, with a national promotion program launched only in 2018 [34]; expanding such support, alongside multicomponent strategies addressing provider and system factors [35], appears necessary to help women realize vaginal-birth intentions.

4.5. The Paradox of the CS-Intention Reversal Class

The most striking finding is that women who converted an initial cesarean intention into a vaginal intention nevertheless had the highest CS rate (58.3%). A plausible explanation is confounding by indication: women who form an early cesarean intention may do so partly because of pre-existing risk factors, and counseling can change the intention without changing the underlying risk—consistent with the highest mean birthweight observed in this class. This aligns with evidence that previous birth events dominate future mode-of-delivery preferences [36, 37] and suggests that the reversal class may be concentrated in high-risk Robson groups [38]. Clinically, the implication is cautionary: converting a cesarean intention is not an end point but a marker for closer obstetric surveillance, and evaluations of intention-focused education should not assume that intention change translates into mode-of-delivery change. For obstetric risk stratification, this reversal-class paradox argues against treating a documented shift from cesarean to vaginal intention as evidence of reduced obstetric risk; instead, women who reverse an early cesarean intention should be flagged for individualized risk assessment and enhanced antenatal and intrapartum surveillance, including closer monitoring of fetal growth, labor progress, and intrapartum fetal status. The trajectory itself—rather than the final intention alone—should be incorporated into the clinical record as a prognostic marker, prompting multidisciplinary review when other risk indicators converge. The better discrimination of trajectories over the single late-pregnancy measurement (Cramér's V 0.135 vs. 0.091) further indicates that how an intention was reached carries prognostic information beyond where it ended, supporting the use of longitudinal intention trajectories as a complementary input to obstetric risk stratification and as a quality-improvement lever for reducing non-medically indicated cesarean sections.

4.6. Strengths and Limitations

Strengths of this study include the multicenter prospective design spanning facility levels from community to county hospitals; intention measurement repeated in every trimester with outcomes abstracted from medical records; and the combination of variable-centered (group trend, Markov transitions) and person-centered (LCGA) analyses within one cohort.

Several limitations must be acknowledged. First, with only three waves, trajectories are restricted to linear form, and the two-stage estimation (individual regressions followed by Gaussian mixture clustering) over a discretized intercept–slope space yields near-deterministic classification (mean posterior probability 0.999); this should not be interpreted as perfectly separated subpopulations, and replication with more measurement waves and one-stage mixture modeling is warranted. Second, the core sample comprised 63.2% of the cohort, with completion ranging from 18.3% to 94.1% across

centers; although completers and non-completers were similar at baseline and IPW was applied, selection effects cannot be fully excluded. Third, the association between trajectory class and delivery mode is unadjusted; parity and obstetric risk factors—including prior cesarean, hypertensive disorders of pregnancy, gestational diabetes, abnormal placentation, fetal macrosomia, and intrapartum indications—were not captured in this analysis set, and confounding by indication, highlighted by the reversal-class paradox, cannot be quantified. This is a substantive limitation: because women who form an early cesarean intention may do so on the basis of pre-existing clinical or obstetric concerns, the higher CS rate observed in the reversal class may partly reflect residual risk that intention change does not erase. Future studies should therefore link trajectory classes to detailed obstetric risk data—including Robson group classification, parity, prior mode of delivery, and intrapartum indications—and report adjusted odds ratios from multivariable logistic or multinomial regression models. Such analyses would allow the independent contribution of intention trajectories to mode of delivery to be disentangled from baseline obstetric risk, would clarify whether the reversal-class paradox persists after risk adjustment, and would provide the evidence base needed to translate intention-trajectory monitoring into clinical decision tools for prenatal counseling and risk-stratified obstetric care. Fourth, intention was measured with a single item, and childbirth-specific fear was not assessed. Fifth, the recorded age range (16–44 years) conflicts with the stated inclusion criterion of ≥ 18 years and requires source-data verification. Sixth, data were collected in 2016–2019, under the universal two-child policy [39] and before the national expansion of labor analgesia [34]; extrapolation to the current three-child-policy era should be cautious, and the cohort is best read as a pre-transition baseline. Finally, all participants came from one municipality in Southwest China, limiting generalizability.

5. Conclusions

Across pregnancy, childbirth intention in this Chinese cohort was stable on average but heterogeneous underneath: half of the women held a resilient vaginal intention, more than two in five clarified an initially undecided stance, and a small group reversed an early cesarean intention. Cesarean intention was rare and highly plastic, yet reversing it did not avert cesarean delivery, and two in five women overall did not deliver in accordance with their final antenatal intention. These findings carry direct implications for obstetric clinical practice and prenatal counseling. Antenatal counseling should start early—ideally at the first antenatal visit and before the second trimester, when the clarifying trajectory is most active—prioritize persistently undecided women, and treat an early cesarean intention as both a counseling target and a risk marker that warrants enhanced obstetric surveillance. By aligning the timing and content of prenatal education with the natural trajectory of intention formation, and by embedding intention-trajectory monitoring within risk-stratified intrapartum and system-level strategies, clinicians and policymakers can support women in realizing their intended mode of birth and contribute to reducing non-medically indicated cesarean sections.

Abbreviations

AIC
Akaike information criterion
AUC
area under the curve
BIC
Bayesian information criterion
CI
confidence interval
CS
cesarean section
IPW
inverse probability weighting
LCGA
latent class growth analysis
SE
standard error.

Declarations

Supplementary Materials

The following supporting information can be downloaded at: [the link will be generated by the journal upon acceptance]. Questionnaire S1: English version of the study questionnaire; Table S1: The 26 observed three-wave intention pathways (top 10 shown); Figure S1: Scatter plot of individual intercepts and slopes by class; Figure S2: State distribution and retention rates across waves.

Author Contributions

Conceptualization, X.Z. and Q.Y.; methodology, X.Z. and Q.Y.; formal analysis, Q.Y. and K.L.; investigation, Q.Y., Y.P., K.L. and W.L.; data curation, Q.Y. and W.L.; writing—original draft preparation, Q.Y.; writing—review and editing, X.Z., Y.P. and K.L.; supervision, X.Z.; project administration, X.Z.; funding acquisition, X.Z. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of Chongqing Medical University (date of approval: 30 November 2015).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Consent for publication

Not applicable. This manuscript does not contain any individually identifiable data, images, or personal or clinical details of study participants; all data are reported in aggregate, de-identified form.

Data Availability Statement

The data presented in this study are available on request from the corresponding author due to privacy and ethical restrictions.

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Use of Artificial Intelligence: During the preparation of this manuscript, the authors used an AI-assisted language tool (ChatGPT, OpenAI) for English language polishing and translation assistance. The authors have reviewed and edited the output and take full responsibility for the content of this publication.

Conflicts of Interest

The authors declare no conflicts of interest.

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Figures

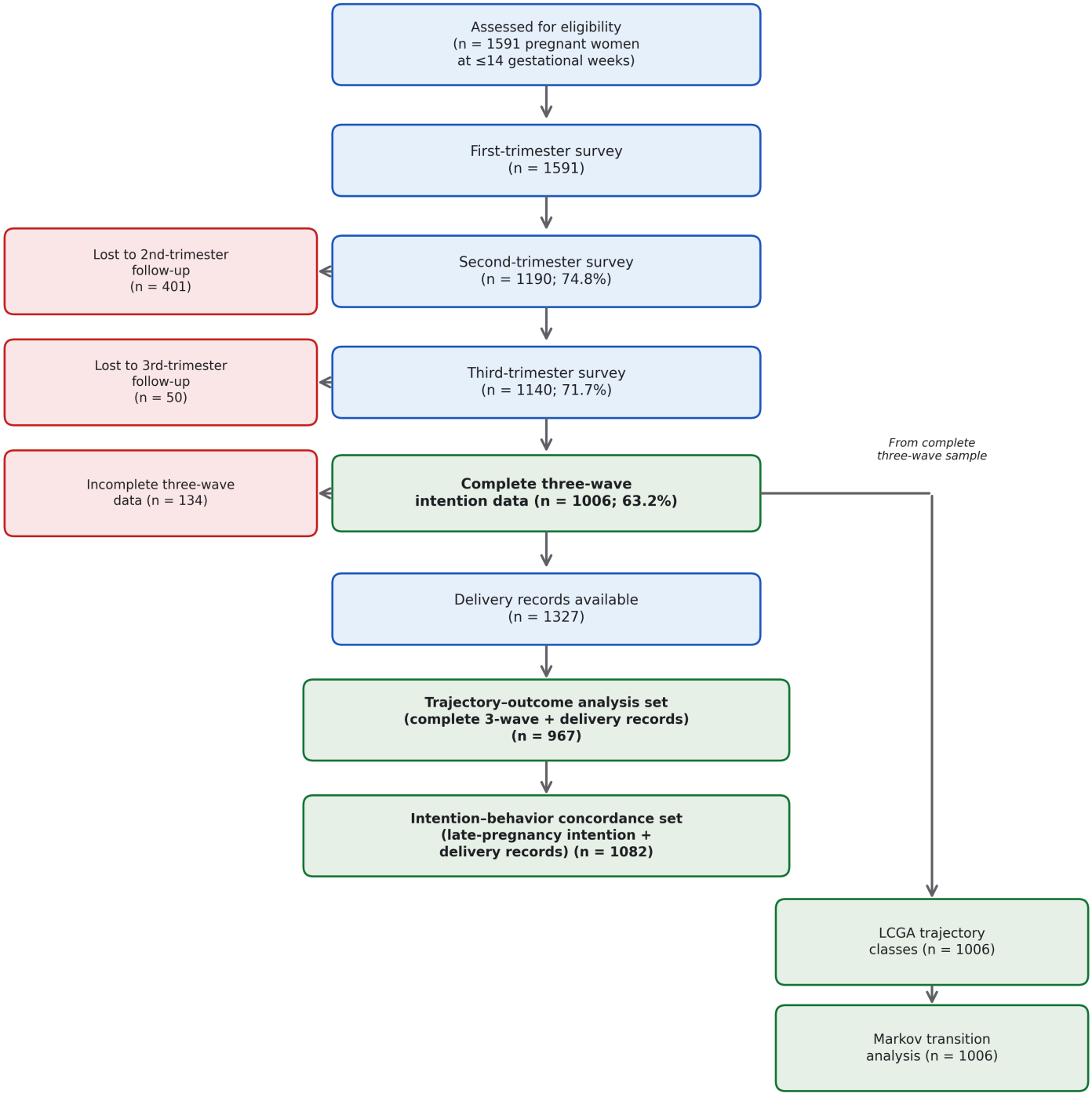


Figure 1

Flow of study participants. A total of 1591 pregnant women were enrolled at ≤14 gestational weeks; 1190 (74.8%) completed the second-trimester and 1140 (71.7%) the third-trimester follow-up, yielding 1006 (63.2%) women with complete three-wave intention data (core sample for trajectory and transition analyses). Delivery records were available for 1327 women. The trajectory–outcome analysis set comprised 967 women with both complete three-wave intention data and delivery records; the intention–behavior concordance analysis set comprised 1082 women with late-pregnancy intention and delivery records.

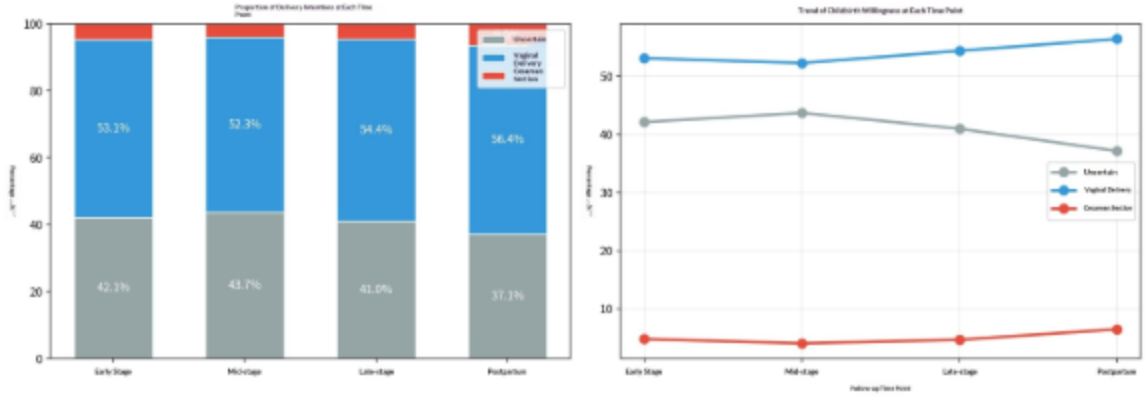


Figure 2

Composition of childbirth intention at each time point.

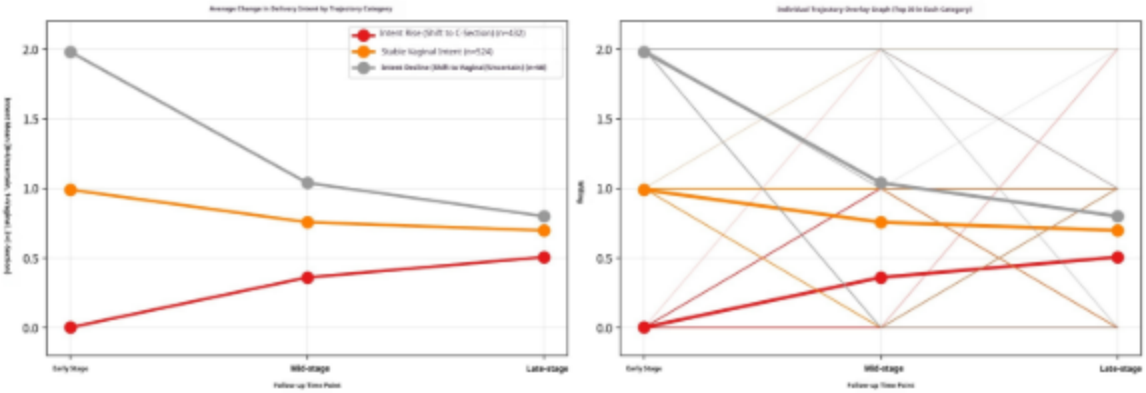


Figure 3

Mean intention trajectories by class (left) and individual trajectories overlay (right).

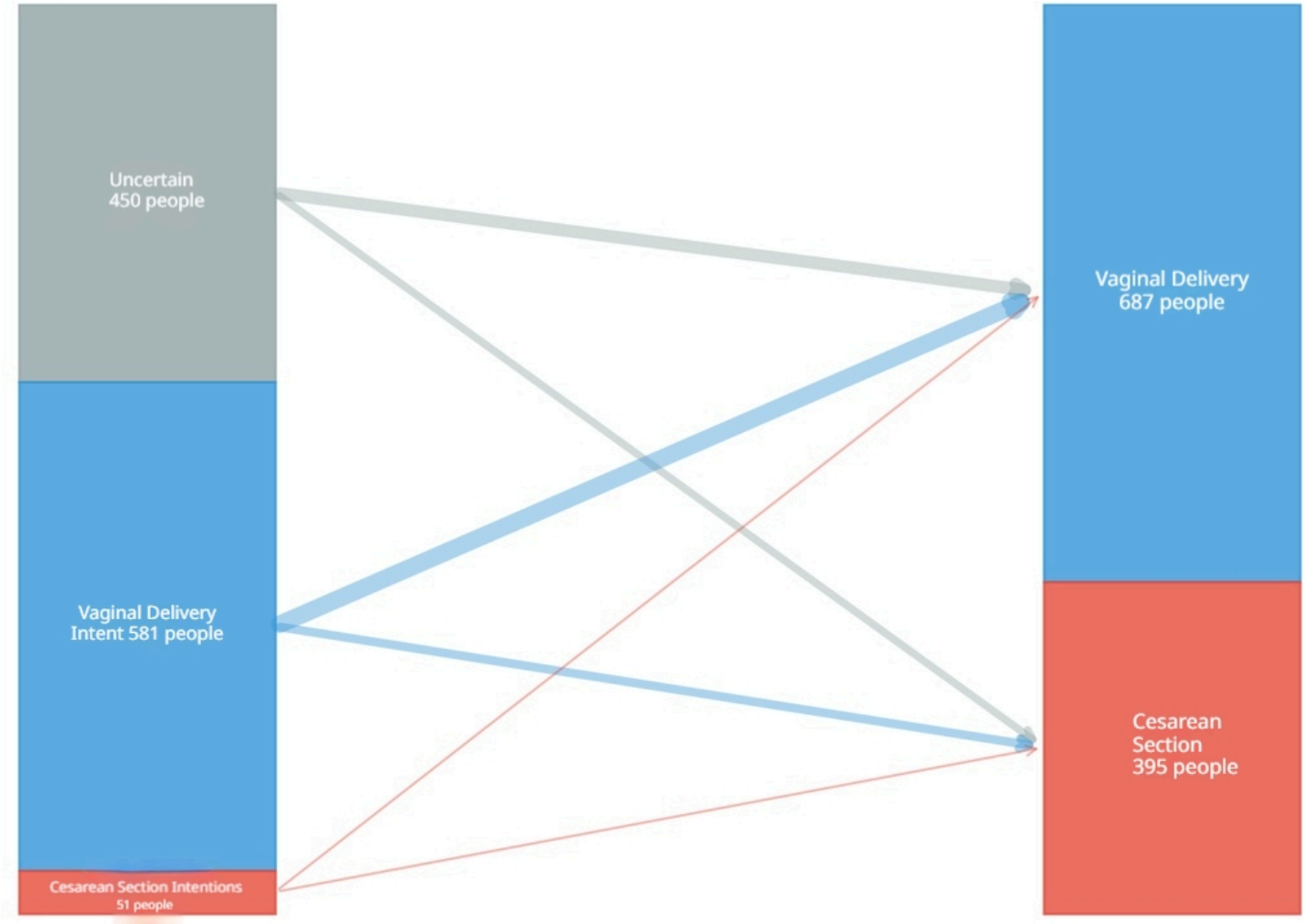


Figure 4

Flow from late-pregnancy childbirth intention to actual mode of delivery.

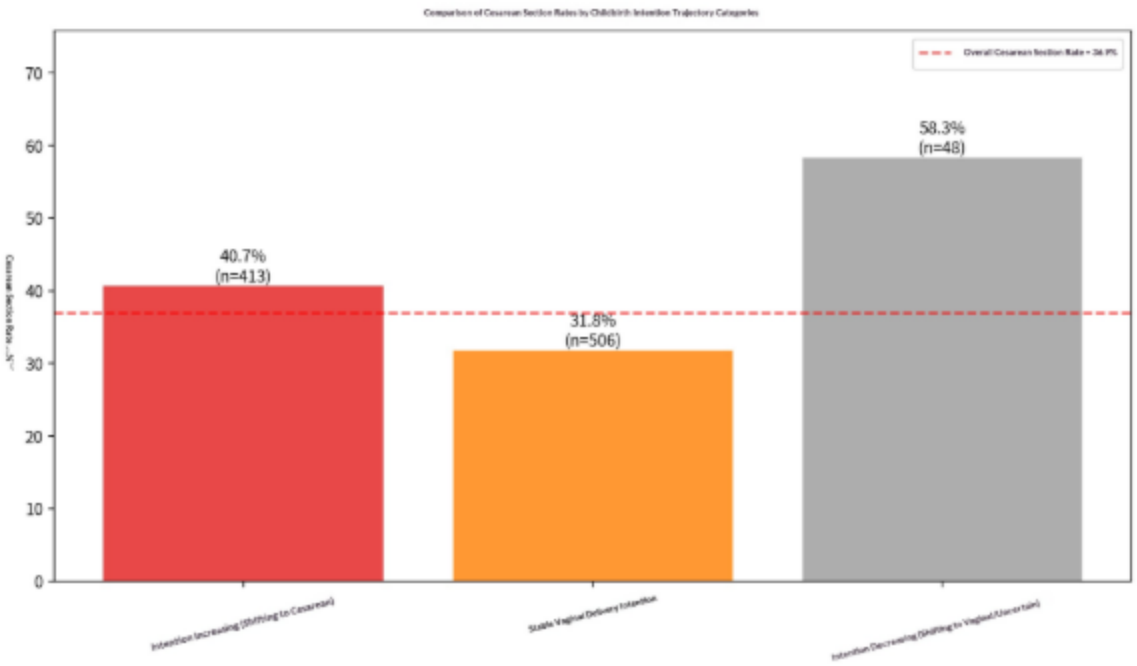


Figure 5

Cesarean section rates by trajectory class.

Supplementary Files

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