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Longitudinal Examination of Fertility Intentions and Contraceptive Behaviours Over a Period of Three Years: A Performance Monitoring for Action (PMA) Approach

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Abstract: Unintended pregnancies remain an important reproductive health concern in Pakistan, particularly given high fertility rates and low contraceptive use. This study examines how past fertility intentions and contraceptive use influence subsequent pregnancy experiences. Data from 1,874 women in union aged 15–49 from the Longitudinal Panel Study: Performance Monitoring for Action (PMA) Framework (2020–2022) were analyzed. Fertility intentions were measured by women's desire to delay or limit pregnancies, and contraceptive use was recorded as use of any method. Results indicate that women who previously expressed a desire to delay pregnancy still experienced subsequent pregnancies, and those using contraception were less likely to report unintended pregnancies. Specifically, 47% of women in round 2 and 81% in round 3 who wished to delay pregnancies reported a subsequent pregnancy, while 40% and 43% of contraceptive users in the baseline and midterm periods, respectively, experienced fewer unintended pregnancies. These findings highlight the need to strengthen women-focused family planning programs, improve access to effective contraceptive methods, and provide counseling tailored to women's reproductive goals.

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The study employed the secondary data, therefore there is no need of ethical approval for the study.

Data Availability Statement
The minimal anonymized data set necessary to replicate our study findings can be available upon request.

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1. Introduction

Unintended pregnancies, those occurring earlier than desired (mistimed) or when no more children are wanted (unwanted), remain a major public health concern worldwide (Aiken et al., 2016; Habib et al., 2017). Globally, approximately 85 million unwanted pregnancies occurred in 2012, with Africa having the highest regional rate among women aged 15–44 (Sedgh et al., 2014). Unintended pregnancies are associated with adverse reproductive outcomes, including increased risk of unsafe abortion and maternal morbidity (Dehingia et al., 2020).

In Pakistan, reproductive health is characterized by high fertility, low contraceptive use, and limited access to safe abortion services, contributing to maternal mortality and morbidity (Shaeen et al., 2022). Approximately 37% of pregnancies are unintended, resulting in 890,000 induced abortions annually. 197,000 women are treated in public and private hospitals for abortion-related complications, with fever and hemorrhage the most common (Sathar et al., 2007). These patterns impose a substantial burden on the healthcare system and underscore the importance of understanding the alignment between fertility intentions and contraceptive behavior (Kankeu et al., 2013; Speizer & Lance, 2015).

Research shows that fertility intentions are dynamic and shaped by life events such as changes in marital status, childbirth, education, and employment (Speizer et al., 2020; Speizer & Lance, 2015). Women who use modern contraception to delay or space pregnancies are least likely to experience unintended pregnancies, indicating alignment between their fertility intentions and outcomes (Speizer & Lance, 2015). Misalignment may arise from access barriers, uncertainty about future fertility, or inconsistent contraceptive use (Speizer & Lance, 2015; Ranatunga & Jayaratne, 2020).

Theoretical frameworks offer insight into these patterns. The Theory of Planned Behavior holds that individuals' attitudes toward a behavior, perceived social norms, and perceived behavioral control shape intentions and subsequent actions, thereby explaining contraceptive decision-making (Aiken et al., 2016). The Reproductive Autonomy

Framework emphasizes women's ability to make independent reproductive decisions within household, social, and structural constraints (Upadhyay et al., 2014). Together, these frameworks help interpret observed patterns in fertility intentions and contraceptive adoption.

2. Study Rationale and Objectives

This study uses longitudinal data from the Performance Monitoring for Action (PMA) panel study to examine how baseline fertility intentions and contraceptive behaviors influence subsequent pregnancy outcomes. The specific objectives are: (1) to assess how baseline contraceptive use and fertility desires affect the likelihood of subsequent pregnancies, (2) to track changes in fertility intentions over time, and (3) to inform family planning program design by identifying factors that support women in achieving their reproductive goals. The longitudinal design enables simultaneous tracking of fertility intentions and behaviors, providing insights into their interaction over time.

3. Material and Methods

The present study used survey data from three rounds of the "Longitudinal Panel Study: Performance Monitoring for Action (PMA) Framework (2020 – 2022), conducted by the National Institute of Population Studies (NIPS). It was a Punjab-focused study that collected data from a representative provincial-level sample of 1981 households and 2258 women in selected households. The survey involved interviewing currently married women aged 15 to 49 years. The main purpose of the panel study is to produce estimates for family planning and other health indicators with acceptable reliability. This study is the first of its kind to capture the state and dynamics of important family planning indicators. The panel survey data will advance knowledge of the causal factors underlying contraceptive dynamics and women's fertility intentions, beyond conventional metrics available from cross-sectional surveys that family planning programs can address. From the dataset, our analysis incorporated 1874 women across 52 Primary Sampling Units (PSUs) from both urban and rural areas. We used sequential observations from the same cohort and estimated period-specific logistic regression models to examine how fertility intentions and contraceptive behavior in an earlier wave predict subsequent pregnancy outcomes. This study directly monitors how fertility intentions evolve over time, which represents its main research advantage and methodological novelty, centered on temporal analysis.

The study will control for selectivity and break down complex interrelationships between variables.

The research investigates how earlier contraceptive choices and women's fertility objectives influence their pregnancy experiences and pregnancy intentionality across three time points. We employed a binary logistic regression model to examine the determinants of subsequent pregnancy among women, with the dependent variable coded as 1 if a woman experienced a pregnancy between survey rounds and 0 otherwise. Our research examines later births by linking initial fertility intentions and contraceptive use status, using sequential data and lagged independent variables from earlier survey waves to predict subsequent pregnancy outcomes. This approach helps mitigate, though not fully eliminate, potential endogeneity and reverse causality between fertility preferences, contraceptive use, and pregnancy outcomes. In the case of Pakistan, the comparison of three time periods has not been done before.

4. Outcome Variable

4.1 Subsequent Pregnancy

The present study used data from three rounds of the *Longitudinal Panel Study: Performance Monitoring for Action (PMA) Framework*, conducted by the National Institute of Population Studies (NIPS) between 2020 and 2022. The survey was implemented in three successive waves: the baseline round in 2020, the midline round in 2021, and the endline round in 2022.

The study groups women into three categories. Women in the first category failed to get pregnant during the three-year period analyzed. Women who reported wanting the child or pregnancy at the time of pregnancy belong to the second category. The third category includes women who experienced an unintended subsequent pregnancy, that is, a pregnancy that occurred when they did not wish to become pregnant or wanted to delay childbirth (unintended pregnancy).

4.2 Regression Equation

To clarify the estimates we present, consider a simple example with two binary independent variables, x_1 and x_2, and an outcome D. We perform logistic regression of D on x_1 and x_2, and their interaction. The conventional logistic probability that D = 1 is

$$\Pr(D = 1|x_1, x_2) = \frac{\exp(\beta_o + \beta_1.x_1 + \beta_2.x_2 + \beta_3.x_1.x_2)}{1 + \exp(\beta_o + \beta_1.x_1 + \beta_2.x_2 + \beta_3.x_1.x_2)}$$

The conventional odds ratio for the terms x_1, x_2 and $x_1.x_2$ are, respectively,

$$\exp(\beta_1)$$
$$\exp(\beta_2)$$

and

$$\exp(\beta_3)$$

However, the presence of the interaction term suggests another interesting odds ratio:

$$\exp(\beta_1 + \beta_3)$$

This is the odd ratio associated with x_1 when $x_2 = 0$. The latter odd ratio offer us the opportunity to see how the overall odds ratio for one variable depends on the value of another variable. These are the results presented and interpreted for the final models.

Regression equation:

$$y_i = f(x_i, \beta_i) + e_i$$

$y_i = dependent\ variable$
$f = function$
$x_i = independent\ variables$
$\beta = unknown\ parameters$
$e_i = error\ term$

$$\begin{aligned} Subsequent\ Pregnancy_t \\ &= f\ (\beta_o + \beta_1 Age_{t-1} + \beta_2 Education_{t-1} \\ &+ \beta_3 Wealth\ Index_{t-1} + \beta_4 Household\ Size_{t-1} + \beta_5 Parity_{t-1} \\ &+ \beta_6 Contraceptive\ Use_{t-1} + \beta_7 Fertility\ Desires_{t-1} \\ &+ \beta_8 Contraceptive\ Use\ \times\ Fertility\ Desire_{t-1}) \end{aligned}$$

This model posits that the likelihood of a subsequent pregnancy at time t is a function of socioeconomic and demographic characteristics observed in the preceding period (t–1). Specifically, it hypothesizes that a woman's age, educational attainment, wealth status, household size, parity, contraceptive behavior, and fertility intentions in the previous period collectively influence her probability of experiencing a pregnancy in the current period. The inclusion of the interaction term between

contraceptive use and fertility desires allows examination of whether the effect of contraceptive use on subsequent pregnancy varies by the respondent's fertility preferences. In short, the model captures the dynamic relationship between past reproductive intentions and behaviors and current pregnancy outcomes.

5. Results and Discussion

5.1 Descriptive Analysis

Table 1 presents descriptive statistics for the key study variables measured at the baseline, midterm, and endline phases of the survey. The baseline sample consisted of 1,874 respondents, and 1,848 participants were successfully followed up at the midterm, indicating minimal attrition across the study period. The table summarizes the mean, minimum, and maximum for each variable across time points, capturing changes in respondents' demographic, socioeconomic, and reproductive characteristics over the study period.

Table 1: Descriptive statistics by demographic characteristics, contraceptive use, and subsequent birth/pregnancy for women in union at baseline (2020), midterm (2021), and endline (2022) in rural and urban areas of Punjab Province, Pakistan

	Baseline			**Midterm**			**Endline**		
Sample Size (N)	**1874**			**1848**					
Variables	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
Subsequent Pregnancy	-	-	-	0.267	0	1	0.248	0	1
Age	32.979	15	49	34.128	15	49			
No Education	0.372	0	1						
Primary Education	0.323	0	1	5.093	0	16			
Secondary Education	0.162	0	1						
Higher Education	0.143	0	1						
Wealth Index	2.966	1	5	3.023	1	5			
Household Size	6.735	1	23						
0 Parity	0.095	0	1						
1 Parity	0.128	0	1	4.050	0	15			
> 2 Parity	0.777	0	1						
Contraceptive Use	0.381	0	1	0.251	0	1			
Fertility Desires									
Want Now	0.293	0	1	0.155	0	1			
Want to Delay	0.203	0	1	0.127	0	1			
No Desire	0.398	0	1	0.258	0	1			
undecided or did not know	0.106	0	1	0.460	0	1			

Note: Authors' Calculations.

The mean age of respondents rose from 32.98 years at baseline to 34.13 years at midterm, reflecting the cohort's natural aging. Regarding education, 37.2% of women reported no formal education, 32.3% had completed primary education, 16.2% had attained secondary education, and 14.3% had higher education. This distribution underscores relatively low educational attainment among women in the study population. The average wealth index increased only marginally from 2.97 at baseline to 3.02 at midterm, suggesting stability in household economic conditions. The average household size remained relatively large (6.73 members), consistent with extended family structures commonly observed in Pakistan.

Reproductive characteristics reveal a predominantly high-fertility profile: at baseline, 77.7% of women had more than two children, whereas only 9.5% were nulliparous and 12.8% had one child. By midterm, parity increased, with a mean of 4.05 births, indicating a progression toward higher-order births as women advanced in their reproductive cycles.

Regarding reproductive behavior, contraceptive use declined from 38.1% at baseline to 25.1% at midterm, indicating a reduction in family planning uptake over time. The proportion of women experiencing a subsequent pregnancy (measured only at follow-up stages) was 26.7% at midterm, decreasing slightly to 24.8% at endline, suggesting a modest decline in new pregnancies during the observation period.

The fertility desire variables (*Want Now, Want to Delay*, and *No Desire*) were each coded as binary (0/1) indicators based on women's responses about their fertility intentions at the time of the survey. Specifically:

- *Want Now* = 1 if the respondent desired to have a child soon, 0 otherwise.
- *Want to Delay* = 1 if the respondent wanted to postpone childbearing for two years or more, 0 otherwise.
- *No Desire* = 1 if the respondent did not want any (or any additional) children, 0 otherwise.

Fertility desires reflect evolving reproductive intentions. At baseline, 29.3% of women expressed a desire for another child soon, 20.3% wished to delay childbearing, 39.8% reported no desire for additional children, and 12.0% were undecided or did not know, summing to 100%. By midterm, the corresponding proportions were 15.5%, 12.7%, 25.8%, and 46.0% undecided, indicating increased uncertainty and a decline in stated fertility desires as the cohort aged.

Table 2: Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) Subsequent Pregnancy	1.000															
(2) Age	-0.433	1.000														
(3) No Education	-0.049	0.150	1.000													
(4) Primary Education	-0.029	-0.043	-0.525	1.000												
(5) Secondary Education	0.061	-0.080	-0.333	-0.312	1.000											
(6) Higher Education	0.041	-0.063	-0.309	-0.290	-0.184	1.000										
(7) Wealth Index	0.012	-0.027	0.026	-0.054	0.012	0.025	1.000									
(8) HHsize	-0.034	-0.020	-0.009	0.020	0.014	-0.029	0.091	1.000								
(9) 0 Parity	0.028	-0.307	-0.087	-0.006	0.044	0.080	0.022	0.075	1.000							
(10) 1 Parity	0.182	-0.314	-0.095	-0.019	0.048	0.103	-0.007	0.021	-0.126	1.000						
(11) >2 Parity	-0.166	0.469	0.137	0.019	-0.069	-0.140	-0.010	-0.070	-0.607	-0.713	1.000					
(12) Contraceptive Use	-0.169	0.180	-0.067	0.060	0.001	0.010	0.049	-0.007	-0.246	-0.183	0.321	1.000				
(13) Want Now	0.156	-0.387	-0.085	0.006	0.028	0.078	0.008	0.020	0.383	0.295	-0.507	-0.326	1.000			
(14) Want to Delay	0.197	-0.221	-0.038	-0.059	0.046	0.081	-0.010	-0.027	-0.068	0.073	-0.011	-0.053	-0.330	1.000		
(15) No Desire	-0.205	0.387	0.100	-0.009	-0.026	-0.097	-0.017	0.015	-0.224	-0.249	0.359	0.062	-0.515	-0.408	1.000	
(16) Cont use * Want delay	-0.019	-0.047	0.005	-0.021	0.021	-0.001	0.006	-0.018	-0.035	-0.026	0.045	0.137	-0.068	0.205	-0.086	1.000

Note: Authors' Calculations.

Table 2 presents the correlation coefficients among the study variables, including subsequent pregnancy, demographic characteristics, socioeconomic factors, and reproductive behavior indicators. The values range from –1 to +1, with negative coefficients indicating an inverse relationship and positive coefficients reflecting a direct association between variables.

The results show a moderate negative correlation between age and subsequent pregnancy (r = –0.433), indicating that younger women are more likely to experience a subsequent pregnancy than older women. This finding aligns with demographic patterns in which fertility tends to decline with age. Educational variables show weak correlations with subsequent pregnancy, suggesting that the level of education alone may not have a strong linear relationship with the likelihood of subsequent pregnancy, though higher education levels tend to be slightly positively correlated (r = 0.041).The wealth index shows a negligible association with subsequent pregnancy (r = 0.012), suggesting that economic status may not directly influence the occurrence of subsequent pregnancies in this sample. Household size also shows a very weak negative association (r = –0.034), implying limited linear dependency.

Regarding parity, women with one child (r = 0.182) are more likely to have another pregnancy, whereas higher parity (>2 children) is negatively correlated with subsequent pregnancy (r = –0.166). This pattern suggests that as women reach or exceed their desired family size, their likelihood of becoming pregnant again declines.

Contraceptive use shows a negative correlation with subsequent pregnancy (r = –0.169), as expected, indicating that contraceptive use reduces the likelihood of a new pregnancy. Fertility desires show expected associations: women who want another child soon are positively correlated with subsequent pregnancy (r = 0.156), while those reporting no desire for additional children are negatively correlated (r = –0.205). The interaction term (contraceptive use × fertility desire) has a near-zero correlation (r = –0.019), suggesting limited direct linear association, though interaction effects may emerge in multivariate models.

Overall, the correlation coefficients are generally low, indicating no serious multicollinearity among the independent variables. These preliminary findings suggest that although age, parity, and fertility preferences are meaningfully correlated with subsequent pregnancy, most

socioeconomic characteristics (education, wealth, household size) show weak linear relationships, supporting the need for multivariate analysis to capture complex interactions.

5.2 Statistical Analysis: Results and Discussion

Our analysis examined the relationship among fertility intentions, contraceptive use, and subsequent pregnancy experiences. Contraceptive use was associated with substantially lower odds of subsequent pregnancy, reducing them by approximately 40% in Round 2 (OR = 0.598, 95% CI 0.447–0.802) and 43% in Round 3 (OR = 0.572, 95% CI 0.404–0.810).

Fertility intentions also showed strong associations with subsequent pregnancy. Relative to women undecided about future childbearing, those who wished to delay pregnancy had the highest odds of subsequent pregnancy (OR = 3.48, 95% CI 1.77–6.84, $p < 0.01$), whereas those who wanted a child immediately had elevated but lower odds (OR = 2.50, 95% CI 1.24–5.01, $p < 0.05$). The larger odds ratio among women wishing to delay points to a gap between expressed fertility intentions and realized outcomes, likely driven by inconsistent contraceptive use, access barriers, or external disruptions, such as those associated with the COVID-19 period. Descriptively, 47% of Round 2 pregnancies and 81% of Round 3 pregnancies were reported as unintended.

The interaction between contraceptive use and wanting to delay helps explain this pattern. The interaction term is negative and marginally significant (OR = 0.315, 95% CI 0.097–1.024, $p < 0.10$), indicating that the protective effect of contraception is concentrated among women who want to delay. Specifically, among Want-to-Delay women, switching from non-user to user is associated with approximately 81% lower odds of subsequent pregnancy in Round 2 (combined OR = $0.598 \times 0.315 \approx 0.19$). The elevated pregnancy risk among women wishing to postpone childbearing is therefore concentrated almost entirely in the subgroup not using contraception — the classic profile of unmet need for family planning.

Educational attainment was included as a categorical variable with four levels (no education, primary, secondary, and higher education), and "no education" was specified as the reference category in all regression models.

Table 3: Baseline Fertility Intentions and Contraceptive Use Associated with Pregnancy Outcomes at 2-Year Follow-Up (midline)

Subsequent Pregnancy	OR	Robust SE	95% CI	
Age	0.851***	0.010	0.833	0.870
Education				
No Education	1	.	.	.
Primary Education	0.885	0.134	0.657	1.190
Secondary Education	1.230	0.218	0.870	1.740
Higher Education	1.205	0.222	0.839	1.730
Wealth Index	1.033	0.044	0.950	1.123
Household Size	0.968	0.022	0.926	1.012
Parity				
0 Parity	1	.	.	.
1 Parity	2.626***	0.595	1.683	4.095
≥ 2 Parity	3.791***	0.845	2.449	5.867
Contraceptive Use	0.598***	0.089	0.447	0.802
Fertility Desires				
Undecided/did not know	1	.	.	.
Want Now	2.498**	0.888	1.244	5.012
Want to Delay	3.476***	1.200	1.767	6.839
No Desire	1.782*	0.599	0.922	3.445
Contraceptive Use * Want to Delay	0.315*	0.189	0.097	1.024
Constant	9.866***	5.368	3.396	28.661
Mean dependent variable	0.271	SD dependent variable		0.445
Pseudo R-squared	0.224	Number of Observations		1874
Chi-square	489.861	Prob > chi2		0.000
Akaike crit. (AIC)	1728.200	Bayesian crit. (BIC)		1805.702

Note: *Reference categories: No education, 0 parity (no children) and Undecided/did not know. *** p<.01, ** p<.05, * p<.1*

Table 4: Fertility Intentions and Contraceptive Use Among Women in Union Across Midline and Endline

Subsequent Pregnancy	OR	Robust SE	95% CI	
Age	0.869***	0.010	0.849	0.889
Education	1.009	0.015	0.980	1.040
Contraceptive Use	0.572***	0.101	0.404	0.810
Fertility Desires				
Want Now	1.213	0.409	0.627	2.348
Want to Delay	2.816***	0.971	1.432	5.537
No Desire	1.608	0.478	0.899	2.878
Undecided/did not know	1	.	.	.

Subsequent Pregnancy	OR	Robust SE	95% CI	
Contraceptive Use * Want to Delay	0.702	0.222	0.377	1.304
Parity	1.100***	0.038	1.027	1.177
Wealth Index	0.964	0.053	0.867	1.073
Constant	15.671***	7.789	5.916	41.514
Mean dependent variable	0.233	SD dependent variable		0.423
Pseudo R-squared	0.169	Number of observations		1848
Chi-square	339.115	Prob > chi2		0.000
Akaike crit. (AIC)	1688.345	Bayesian crit. (BIC)		1743.564

Note: *Reference categories: No education, 0 parity (no children) and Undecided/did not know. *** p<.01, ** p<.05, * p<.1*

After re-specifying the education variable with "no education" as the reference category, educational attainment was not a strong or consistent predictor of subsequent pregnancy across models. Women with primary and secondary education exhibited odds of pregnancy that were comparable to or slightly higher than those with no education, while higher education showed no statistically significant difference. This pattern suggests that education alone does not uniformly reduce the likelihood of subsequent pregnancy in this population, particularly in a context characterized by early marriage, high parity norms, and constrained reproductive autonomy.

Unintended pregnancies were notably higher in Round 3 (81%) than in Round 2 (47%). This increase may reflect cohort effects, disruptions in access to family planning services, or broader structural challenges. For example, the COVID-19 pandemic likely temporarily limited access to reproductive health services, while policy or programmatic shifts could have affected contraceptive supply and utilization. Such contextual factors underscore the importance of resilient, accessible family planning services that can adapt to social and systemic disruptions.

5.3 Robust Analysis

To ensure the reliability and consistency of the main findings, a series of robustness checks was conducted by altering model specifications and introducing additional variables. All robustness models were re-estimated using "no education" and "zero parity" as the reference category, and the direction and significance of the key explanatory variables remained unchanged. Across all specifications (Tables 5 – 8), the results remain broadly consistent with the baseline analysis, reinforcing

the stability of the estimated associations among contraceptive behavior, fertility desires, and subsequent pregnancy outcomes.

The first robustness check replaced the aggregate indicator of contraceptive use with disaggregated categories for short- and long-term methods. Results indicate that both types of contraceptive use significantly reduce the likelihood of subsequent pregnancy. Long-term methods showed a larger protective effect (OR = 0.62, $p<0.01$) than short-term methods (OR = 0.92, $p<0.1$), consistent with their higher continuation rates and lower user-failure rates. The model also shows that parity remains a significant predictor.

In the second specification, age, previously modeled as a continuous variable, was entered as categorical groups to capture potential non-linearities in its relationship with pregnancy outcomes. Using women aged 15–19 years as the reference category, the results indicate a clear, monotonic decline in the likelihood of subsequent pregnancy with increasing age. Women aged 20–24, 25–29, 30–34, 35–39, and 40–45 all exhibit significantly lower odds of experiencing a subsequent pregnancy compared to adolescents, with the magnitude of the effect increasing steadily across age groups. This pattern reflects expected life-course fertility dynamics: younger women, particularly those at the beginning of their reproductive lives, are more likely to experience pregnancies, while older women face declining biological fecundity and are more likely to have achieved their desired family size.

Fertility desire categories ("want now," "want to delay," and "no desire") continue to show statistically significant associations, with those undecided or don't know about delaying pregnancy exhibiting the highest likelihood of reporting a subsequent conception, consistent with the observed discrepancy between fertility intentions and behavior.

The third robustness model incorporated an additional construct, awareness of family planning (FP), to assess whether exposure to FP information alters the association between contraceptive use and pregnancy outcomes. Variables representing exposure across multiple media sources (e.g., news, social media, healthcare providers) were included.

In the model including family planning awareness (Table 7), exposure through mass media (radio/television) served as the reference

category. Compared with this group, awareness sources such as newspapers, social media, or informal messages were not significantly associated with pregnancy outcomes. Notably, including FP awareness variables did not substantially alter the coefficients for contraceptive use or fertility desire, suggesting that the main associations are not driven by unobserved heterogeneity in FP knowledge.

As an additional robustness check, we included region (Rural/Urban) as a place of residence in the analysis (Table 8) and observed that it is also not significantly associated with subsequent pregnancy. Moreover, the main effects remain stable.

We included an interaction term between contraceptive use and reporting no desire for additional children in the analysis to assess robustness (Table 9). The interaction term was not statistically significant, indicating that we find no evidence that contraceptive use modifies the relationship between no fertility desire and subsequent pregnancy. The main effects remain stable, including the elevated likelihood of pregnancy among women reporting no desire for further children, highlighting persistent constraints in translating fertility preferences into outcomes.

Across all robustness specifications, the direction, magnitude, and significance of key predictors, particularly contraceptive use, parity, and fertility desires, remain stable. The pseudo-R^2 values (ranging from 0.22 to 0.27) are consistent with those of the baseline model, further confirming model adequacy. These results collectively reinforce the internal validity of the study findings, demonstrating that the observed relationships among women's fertility intentions, contraceptive practices, and subsequent pregnancies are not sensitive to changes in model specification or to the inclusion of additional explanatory variables.

Table 5: Robustness Analysis Using Alternative Contraceptive Method Specifications (Long-Term vs. Short-Term Use)

Subsequent Pregnancy	OR	Robust SE	95% CI	
Age	0.851***	0.010	0.833	0.871
Education				
No Education	1	.	.	.
Primary Education	0.834	0.128	.618	1.126
Secondary Education	1.192	0.212	.841	1.689
Higher Education	1.092	0.205	.756	1.577
Wealth Index	1.029	0.044	.946	1.119

Subsequent Pregnancy		OR	Robust SE	95% CI	
Household Size		0.967	0.022	.924	1.011
Parity					
0 Parity		1	.	.	.
1 Parity		2.645***	0.603	1.691	4.136
≥ 2 Parity		3.616***	0.812	2.328	5.616
Long term methods of Contraception		0.623*	0.424	0.972	2.708
Short term methods of Contraception		0.925***	0.307	1.408	2.632
Fertility Desires					
Undecided/did not know		1	.	.	.
Want Now		2.931***	1.172	1.339	6.417
Want to Delay		3.820***	1.487	1.781	8.194
No Desire		1.780	0.663	0.858	3.692
Contraception Use * Want to delay		0.299*	.184	0.089	1.001
Constant		8.543***	4.921	2.762	26.421
Mean dependent variable	0.271	SD dependent variable		0.445	
Pseudo R-squared	0.232	Number of observations		1874	
Chi-square	507.801	Prob > chi2		0.000	
Akaike crit. (AIC)	1714.261	Bayesian crit. (BIC)		1802.834	

*Note: Authors' Calculations. *** p<.01, ** p<.05, * p<.1*

Table 6: Robust Analysis Using Age Categories Instead of Continuous Age

Subsequent Pregnancy	OR	Robust SE	95% CI	
Age				
Age 15-19	1	.	.	.
Age 20–24	0.696	0.218	0.377	1.286
Age 25–29	0.436***	0.137	0.235	0.808
Age 30–34	0.264***	0.085	0.140	0.498
Age 35–39	0.089***	0.031	0.044	0.177
Age 40 & above	0.014***	0.006	0.006	0.035
Education				
No Education	1	.	.	.
Primary Education	0.873	0.131	0.650	1.172
Secondary Education	1.190	0.210	0.842	1.681
Higher Education	1.077	0.201	0.747	1.554
Wealth Index	1.026	0.043	0.945	1.115
Household Size	0.969	0.022	0.928	1.013
Parity				
0 Parity	1	.	.	.
1 Parity	2.428***	0.535	1.576	3.741
≥ 2 Parity	2.869***	0.631	1.864	4.415
Contraceptive Use	0.576***	0.086	0.430	0.771

Subsequent Pregnancy		OR	Robust SE	95% CI	
Fertility Desires					
Undecided/did not know		1	.	.	.
Want Now		2.609***	0.931	1.296	5.252
Want to Delay		3.712***	1.291	1.877	7.338
No Desire		1.884*	0.640	0.968	3.667
Contraceptive Use * Want to Delay		0.313*	0.186	0.098	1.002
Constant		0.386*	0.197	0.142	1.050
Mean dependent var	0.271	SD dependent var		0.445	
Pseudo r-squared	0.227	Number of observations		1874	
Chi-square	496.861	Prob > chi2		0.000	
Akaike crit. (AIC)	1729.200	Bayesian crit. (BIC)		1828.845	

*Note: In Table 6, the youngest age group (15–19 years) is used as the reference category in the categorical age specification. *** p<.01, ** p<.05, * p<.1*

Table 7: Robustness Analysis with Inclusion of Family Planning Awareness Variable

Subsequent Pregnancy	OR	Robust SE	95% CI	
Age	0.838***	0.013	0.812	0.865
Education				
No Education	1	.	.	.
Primary Education	0.869	0.182	0.577	1.310
Secondary Education	1.626*	0.416	0.985	2.685
Higher Education	1.102	0.296	0.651	1.866
Wealth Index	0.981	0.057	0.875	1.100
Household Size	1.005	0.033	0.943	1.072
Parity				
0 Parity	1	.	.	.
1 Parity	2.796***	0.978	1.409	5.552
≥ 2 Parity	3.102***	1.024	1.624	5.925
Contraceptive Use	0.586***	0.121	0.391	0.877
Fertility Desires				
Undecided/don't know	1	.	.	.
Want Now	2.203*	0.954	0.942	5.149
Want to Delay	2.792**	1.166	1.231	6.330
No desire	1.412	0.567	0.642	3.103
Contraceptive Use * Want to Delay	0.405	0.271	0.109	1.506
FP Awareness				
Radio/TV	1	.	.	.
Heard FP	1.065	0.074	0.929	1.220

Subsequent Pregnancy	OR	Robust SE	95% CI	
News/Msgs	1.029	0.182	0.728	1.454
Doctor talk about FP	0.674	0.141	0.447	1.014
Newspaper	1.122	0.097	0.947	1.330
Social media	0.973	0.065	0.854	1.109
Constant	57.395***	48.681	10.887	302.587
Mean dependent variable	0.412	SD dependent variable		0.492
Pseudo R-squared	0.268	Number of observations		889
Chi-square	322.514	Prob > chi2		0.000
Akaike crit. (AIC)	922.029	Bayesian crit. (BIC)		1017.831

Note: *Reference category for family planning awareness is "heard or saw information about family planning on radio/television." *** p<.01, ** p<.05, * p<.1*

Table 8: Robustness Analysis with Inclusion of Place of Residence (Urban–Rural Residence)

Subsequent Pregnancy	OR	Robust SE	95% CI	
Age	0.850***	0.010	0.831	0.869
Education				
No Education	1	.	.	.
Primary Education	0.869	0.133	0.645	1.172
Secondary Education	1.196	0.214	0.843	1.698
Higher Education	1.164	0.218	0.807	1.679
Wealth Index	1.033	0.044	0.950	1.123
Household Size	0.970	0.022	0.928	1.014
Parity				
0 Parity	1	.	.	.
1 Parity	2.643***	0.599	1.695	4.122
≥ 2 Parity	3.804***	0.848	2.458	5.887
Contraceptive use	0.597***	0.089	0.445	0.801
Fertility Desires				
Undecided/don't know	1	.	.	.
Want Now	2.500***	0.889	1.245	5.021
Want to Delay	3.472***	1.200	1.764	6.836
No Desire	1.772*	0.596	0.916	3.427
Contraceptive Use * Want to Delay	0.312*	0.189	0.095	1.020
Type of Residence				
Rural	1	.	.	.
Urban	1.149	0.142	0.902	1.464
Constant	8.366***	4.712	2.773	25.234

Subsequent Pregnancy	OR	Robust SE	95% CI
Mean dependent variable	0.271	SD dependent variable	0.445
Pseudo R-squared	0.224	Number of observations	1874
Chi-square	491.137	Prob > chi2	0.000
Akaike crit. (AIC)	1728.925	Bayesian crit. (BIC)	1811.962

*Note: Authors' Calculations. *** p<.01, ** p<.05, * p<.1*

Table 9: Robustness Analysis Including Interaction Between Contraceptive Use and No Fertility Desire

Subsequent Pregnancy	OR	Robust SE	95% CI	
Age	0.851***	0.010	0.833	.87
Education				
No Education	1	.	.	.
Primary Education	0.878	0.133	0.652	1.183
Secondary Education	1.219	0.216	0.861	1.725
Higher Education	1.192	0.220	0.830	1.713
Wealth Index	1.030	0.044	0.947	1.120
Household Size	0.969	0.022	0.926	1.013
Parity				
0 Parity	1	.	.	.
1 Parity	2.614***	0.593	1.676	4.076
≥ 2 Parity	3.765***	0.839	2.433	5.828
Contraceptive Use	0.616***	0.094	0.457	0.831
Fertility Desires				
Undecided/don't know	1	.	.	.
Want Now	2.551***	0.907	1.271	5.123
Want to Delay	3.537***	1.221	1.798	6.960
No Desire	1.854*	0.627	0.955	3.599
Contraceptive Use * Want to Delay	0.308*	0.186	0.095	1.005
Contraceptive Use * No Desire	0.648	0.335	0.235	1.783
Constant	9.762***	5.308	3.363	28.336
Mean dependent variable	0.271	SD dependent variable		0.445
Pseudo R-squared	0.224	Number of observations		1874
Chi-square	490.628	Prob > chi2		0.000
Akaike crit. (AIC)	1729.434	Bayesian crit. (BIC)		1812.471

*Note: Authors' Calculations. *** p<.01, ** p<.05, * p<.1*

6. Research Implications and Conclusions

This study provides evidence on the relationship among fertility intentions, contraceptive behavior, and subsequent pregnancy among women in union in Punjab, Pakistan. Several findings are particularly noteworthy.

First, women who reported no desire for additional children still had elevated odds of subsequent pregnancy relative to undecided women (OR = 1.78, 95% CI 0.92–3.45, $p < 0.10$). Although this estimate is only marginally significant, the direction aligns with the broader finding that stated fertility preferences do not always translate into realized outcomes, pointing to constraints beyond individual intentions, such as limited reproductive autonomy, inconsistent contraceptive use, or partner and household influences. These findings underscore that unmet need for family planning persists even among women who explicitly wish to stop childbearing.

Second, after controlling for fertility intentions, parity, age, and contraceptive use, education shows no strong or consistent association with subsequent pregnancy. Notably, the correlation matrix (Table 2) also shows very weak associations between education level and contraceptive use in this sample ($r = -0.07$ to $+0.06$), suggesting that education and contraceptive uptake are largely decoupled in this context. This pattern is inconsistent with the standard view that education affects fertility primarily through contraceptive uptake, and suggests that in Punjab, contraceptive decisions may be shaped more strongly by household-level factors — spousal preferences, decision-making autonomy, and access to services — than by women's individual educational attainment.

Third, household wealth is not significantly associated with subsequent pregnancy, indicating that economic status alone does not protect women from unintended or closely spaced pregnancies in this setting. This reinforces the need for universal access to high-quality family planning services rather than narrowly targeted economic interventions.

Across all models, contraceptive use emerges as the most robust and policy-relevant predictor, substantially reducing the likelihood of subsequent pregnancy, particularly among women who wish to delay childbearing. However, the analysis does not explicitly model the determinants of contraceptive uptake. Future research should examine who can access and consistently use contraception and why, to better understand persistent gaps between fertility intentions and outcomes.

Overall, the findings show that improving reproductive outcomes in Pakistan requires more than raising awareness or increasing educational attainment. Policies should prioritize effective, accessible contraceptive services, personalized counseling, and interventions that address social

and relational constraints on women's reproductive decision-making, particularly for those who wish to limit or postpone further childbearing.

Furthermore, the study's longitudinal approach strengthens its contribution to reproductive health research by examining fertility intentions across time rather than treating them as static decisions. Given Pakistan's high maternal mortality rate, these findings underscore the need for safe reproductive choices to improve maternal and child health outcomes. This research also underscores the importance of integrating fertility-related policies into broader health initiatives, such as maternal healthcare programs and socioeconomic development efforts.

References

Aiken, A. R. A., Borrero, S., Callegari, L. S., & Dehlendorf, C. (2016). Rethinking the Pregnancy Planning Paradigm: Unintended Conceptions or Unrepresentative Concepts? *Perspectives on Sexual and Reproductive Health*, *48*(3), 147–151. https://doi.org/10.1363/48e10316

Bongaarts, J. (1987). The Proximate Determinants of Exceptionally High Fertility. *Population and Development Review, 13*(1), 133-139.

Dehingia, N., Dixit, A., Atmavilas, Y., Chandurkar, D., Singh, K., Silverman, J., & Raj, A. (2020). Unintended pregnancy and maternal health complications: Cross-sectional analysis of data from rural Uttar Pradesh, India. *BMC Pregnancy and Childbirth*, *20*(1), 1–11. https://doi.org/10.1186/s12884-020-2848-8

Habib, M. A., Raynes-Greenow, C., Nausheen, S., Soofi, S. B., Sajid, M., Bhutta, Z. A., & Black, K. I. (2017). Prevalence and determinants of unintended pregnancies amongst women attending antenatal clinics in Pakistan. *BMC Pregnancy and Childbirth*, *17*(1), 1–10. https://doi.org/10.1186/s12884-017-1339-z

Kankeu, H. T., Saksena, P., Xu, K., & Evans, D. B. (2013). The financial burden from non-communicable diseases in low- and middle-income countries: A literature review. *Health Research Policy and Systems*, *11*(1), 1–12. https://doi.org/10.1186/1478-4505-11-31

Ranatunga, I. D. J. C., & Jayaratne, K. (2020). Proportion of unplanned pregnancies, their determinants and health outcomes of women delivering at a teaching hospital in Sri Lanka. *BMC Pregnancy and Childbirth*, *20*(1), 1–15. https://doi.org/10.1186/s12884-020-03259-2

Sanjiv Singh, K. K. (2025). Factors associated with unintended pregnancies in India among married women over the past one and half decade (2005– 2021): a multivariable decomposition analysis. *BMC Pregnancy and Childbirth, 25*(404).

Sathar, Z. A., Singh, S., & Fikree, F. F. (2007). Estimating the Incidence of Abortion in Pakistan. *Studies in Family Planning*, *38*(1), 11–22. https://doi.org/10.1111/j.1728-4465.2007.00112.x

Sedgh, G., Singh, S., & Hussain, R. (2014). Intended and Unintended Pregnancies Worldwide in 2012 and Recent Trends. *Stud Fam Plann.*, *76*(3), 93–94. https://doi.org/10.1111/j.1728-4465.2014.00393.x.Intended

Shaeen, S. K., Tharwani, Z. H., Bilal, W., Islam, Z., & Essar, M. Y. (2022). Maternal mortality in Pakistan: Challenges, efforts, and recommendations. *Annals of Medicine and Surgery*, *81*(August), 2019–2021. https://doi.org/10.1016/j.amsu.2022.104380

Speizer, I. S., Escamilla, V., Lance, P. M., & Guilkey, D. K. (2020). Longitudinal examination of changing fertility intentions and behaviors over a four-year period in urban Senegal. *Reproductive Health*, *17*(1), 1–10. https://doi.org/10.1186/s12978-020-0893-4

Speizer, I. S., & Lance, P. (2015). Fertility desires, family planning use and pregnancy experience: Longitudinal examination of urban areas in three African countries. *BMC Pregnancy and Childbirth*, *15*(1), 1–13. https://doi.org/10.1186/s12884-015-0729-3

Upadhyay, U. D., Dworkin, S. L., Weitz, T. A., & Foster, D. G. (2014). Development and Validation of a Reproductive Autonomy Scale. *Studies in Family Planning*, *45*(1), 19–41. https://doi.org/10.1111/j.1728-4465.2014.00374.x