



LUND UNIVERSITY
School of Economics and Management

Master's Programme in Economic Growth, Population and Development

Married Too Soon?

Correlating Age at Marriage with Fertility and Contraceptive Use in
Bangladesh: A Socioeconomic Analysis

by

Afra Saiara,

saiarachitree@gmail.com

This thesis examines the relationship between age at marriage, fertility, and contraceptive use among married women in Bangladesh, using the cross-sectional 2022 Bangladesh Demographic and Health Survey (BDHS). Applying linear and logistic regression models, controlling for education, wealth, residence, region, and age, the findings reveal that later age at marriage is associated with lower fertility but also with reduced contraceptive use. Education levels are associated with fewer children and higher contraceptive use. Fertility and contraceptive use vary by region and urban-rural residence, while wealthier groups tend to have fewer children but are less likely to use contraception than poorer women. These patterns reflect complex interactions between socio-economic factors influencing reproductive behavior.

Keywords: Age at First Marriage, Fertility, Contraceptive, Demographic factors, Bangladesh,

Course code: EKHS02
Master's Thesis (15 credits ECTS)
May 2025
Supervisor: Maria Stanfors
Examiner: Gabriel Brea-Martinez
Word Count: 14,551

Acknowledgements

I want to express my heartfelt gratitude to Professor Maria Stanfors. Your exceptional guidance, unwavering support, and insightful feedback have made my thesis journey both rewarding and enjoyable. Your encouragement has been invaluable.

A sincere thank you to my family and friends, especially Louis and the PhD students, for helping and supporting me. Lastly, big thanks to my family for always giving me emotional support.

Table of Contents

1	Introduction	1
1.1	Research Problem.....	3
1.2	Significance of the Problem	5
1.3	Aim and Scope	6
1.4	Outline of the Thesis.....	7
2	Context	8
3	Theoretical Framework	11
3.1	Previous Literature.....	14
4	Data and Methods	18
4.1	Independent Variable	19
4.2	Dependent Variable	19
4.3	Control Variable	20
5	Results	24
6	Discussion.....	37
6.1	Limitations	43
7	Conclusion and Considerations.....	45
	References	48

List of Tables

1. Table 1: Descriptive statistics (Bangladesh - Demographic and Health Survey, 2022)	
.....	21
2. Table 2: <i>Estimated Linear Regression Showing the Association Between Age at First Marriage and Fertility Among Currently Married Women in Bangladesh</i>	24
3. Table 3: <i>Logistic Regression Showing the Association Between Age at First Marriage and Modern Contraceptives Among Currently Married Women in Bangladesh</i>	28
4. Table 4: <i>Overview of Hypothesis Testing Results</i>	32
5. Table 5: <i>Interpretation of Hypothesis Testing Results</i>	34

1 Introduction

Marriage timing plays a major role in shaping the life opportunities of women, especially when it comes to education, career, and personal freedom (Couch, et al., 2013). The age at marriage is not just about personal choice; it reflects broader issues such as gender roles, development levels, and whether women have control over their reproductive (Marphatia, et al., 2017). Research shows that marrying young can seriously impact women's health, limit education, reduce chances of earning an income, and affect fertility (Budu et al., 2021). In regions like Sub-Saharan Africa and South Asia, discussions around women's rights, reproductive freedom, and population growth often focus on marriage age (Hertrich, 2017). Global goals like the SDGs even highlight delaying marriage to help improve women's lives. Still, even with progress, the average age at marriage varies a lot depending on culture, poverty, and location (Tauseef, 2024). Increasing education levels is not always enough; there also needs to be a change in the social and economic systems that pressure girls into early marriage (Mitra et al., 2020).

In Bangladesh, age at marriage continues to be a factor shaping reproductive behavior, deeply rooted in cultural norms, gender expectations, and socioeconomic conditions (Ahmed, 1986). While national averages suggest a gradual increase in marriage age, these figures hide large inequalities based on educational background, urban-rural divides, and administrative divisions, but in many rural and economically disadvantaged communities, marriage is often influenced by intergenerational family strategies, religious expectations, and traditional gender roles, limiting women's autonomy over reproductive decisions (Faroque and Amin, 2017). This has significant implications for fertility and contraceptive behavior. However, in Bangladesh, the increase in contraceptive use has slowed down, with rates staying around 61-62% between 2011 and 2017, and the fertility rate has also stayed the same at 2.3 children per woman during that time (Kundu et al., 2022). Consequently, modern contraceptive methods remain unevenly adopted, with usage patterns heavily influenced by factors such as education, economic status, exposure to family planning services, and women's empowerment (Fagbamigbe et al., 2018). Urban women, for instance, are more likely to access and adopt modern contraceptives compared to their rural counterparts (Shabuz et al., 2022). Moreover, fertility levels and birth spacing are often shaped by the age at marriage, with younger marriages correlating with higher

fertility and lower contraceptive uptake (Haq, 2018). Understanding the intersection of age at marriage with fertility and contraceptive use thus requires an analysis that includes these broader socioeconomic dimensions.

Understanding age at marriage needs more than just looking at demographic numbers. It also depends a lot on the social and cultural world people live in. A lot of research links marriage to fertility and contraceptive use, but most of it focuses on age as the main factor. Some studies do include socioeconomic factors such as education or income, but usually just one at a time, not all together. Additionally, family expectations, cultural values, and community norms play a vital role in both when people marry and how they approach reproduction (Mannan, 1989). These social influences are especially important in South Asia, but they have not been fully explored in most research.

This study aims to explore the relationship between age at marriage and fertility/contraceptive use among married women in Bangladesh, while also examining how different socioeconomic status (education, wealth), residence (urban/rural), region influence this relationship not simply as control variables, but as interactive factors that may shape or moderate the main association. It utilizes well-known demographic and behavioral theories, such as Life Course Theory, Demographic Transition Theory, Modernization Theory, and the Theory of Planned Behavior, to understand how larger social structures influence personal choices in shaping women's reproductive lives. The study's focus is to understand not just if marriage age relates to fertility and contraception, but also how this relation might vary depending on a woman's background and environment.

Importantly, the age at marriage can deeply impact women's lives. Getting married at a certain age can shape when and how often she has children, whether she can continue her education, and how easily she can access reproductive health care, and her chances to work and earn money (Godha et al., 2013). Women who marry young often face longer periods of childbearing and have less say in household decisions, which can limit their ability to use birth control or wait before having kids (Belachew et al., 2023). On the other hand, women who marry later might have more freedom and better knowledge about family planning, but they can also deal with social judgment or pressure to have children quickly and these effects go beyond individual lives; they add to a larger pattern of inequality, influencing health, poverty between generations, and how fairly men and women can access resources and opportunities (Jain et al., 2019; Salauddin, 2024)

Building on this context, the following section outlines the specific research question:

How does age at marriage correlate with fertility and contraception use among married women in Bangladesh, and how do factors such as education, residence, wealth, and region influence this relationship?

1.1 Research Problem

Many studies in Bangladesh have looked at the problems of early marriage, high fertility, and low contraceptive use. However, these topics are often studied separately. It is essential to first highlight the fragmented approach of previous studies on this issue. For instance, the paper on “Relationship Between Age at Marriage, Education and Fertility Among Residents of Bangladesh” by Haq (2018) mainly focuses on age at marriage and education. Still, it ignores other major factors like contraceptive use and access to healthcare that also affect fertility. It uses fundamental statistical analysis, which is insufficient to explain the real reasons behind the differences. The study also lacks depth and does not explore regional or cultural differences that could have added more meaning to the findings.

Building on this, another paper on “Inconsistencies in the Relationship between Contraceptive Use and Fertility in Bangladesh,” by Saha and Bairagi (2007) talks about the Matlab area (rural), which does not show the full picture of the whole country. This indicates the need for studies that consider a broader, division-specific perspective. It is important to know the scenario of different regions. Another thing the paper misses is the details about which contraceptive methods people are relying on more. It only highlights the use of contraception increases, but it lacks an explanation of whether they preferred a modern method or not using any method. These gaps in the literature motivated me to explore the issue further.

Moreover, while numerous studies have explored fertility and contraceptive behavior in Bangladesh, few have analyzed how these behaviors vary across different regions of the country. Regional differences in education, access to better health, cultural norms, and economic opportunities are crucial factors that must be examined. However, most existing research treats Bangladesh as a homogeneous unit, ignoring these important geographic variations. Without region-specific analysis, it is difficult to develop targeted policies or understand the deeper connection between age at marriage, fertility, and contraceptive

behavior. Although national surveys like BDHS 2014 collect regional data, many secondary research papers, including Mohsena and Kamal (2014) and Mostafa Kamal and Aynul Islam (2010), do not observe region-specific patterns in fertility or contraceptive use. Therefore, my research addresses this critical gap by exploring patterns across regions.

Concerning education, an author Chaudhury (1977) highlights that there is a lack of intensive research in Bangladesh on the relationship between education and fertility. He points out that no in-depth studies have been conducted to fully understand how education (both formal and non-formal) influences fertility behavior. A paper on “Determinants of Contraceptive Use in Bangladesh” by (Mohsena and Kamal, 2014) found that educated women are more likely to understand and access modern contraceptive methods. However, several studies, like Mostafa Kamal and Aynul Islam (2010), found that even when modern contraceptives are available, many educated women still do not use contraception because of strong cultural norms and limited decision-making power. Moreover, a paper on “Exploring the impact of perceived early marriage on women’s education and employment in Bangladesh through a mixed-methods study” by Khan et al. (2024) suggests that some educated women still marry early due to family pressure, showing that social norms may weaken the effect of education. These mixed results create more complexity and highlight the need for deeper investigation.

On the other hand, researchers often consider wealth and women's residence (rural or urban) as separate influences on fertility and contraceptive use. However, many scholars lack the discussion regarding how these two factors might work together. For example, an author, Nyrop (1975), highlights that wealthy women are pushed to have many kids, even if they are financially stable, to buy birth control. Families and society expect them to give birth, especially to sons. Having male children is seen as a way to get respect, security, and support.

Contrastingly, the paper on “Contraceptive Use and Method Choice in Urban Slums of Bangladesh” by Akter (2020) found that many poor women in the urban slums of Bangladesh can get modern birth control, and some even buy it themselves. But still, not all of them use it. Family pressure and losing a child make them want more kids. So even if birth control is there, social and personal reasons stop them. This indicates that studying location alone is insufficient without also considering wealth. Most importantly, there is a lack of research that studies wealth and residence together. What happens when a woman is rich but lives in a rural area? Or a poor woman lives in an urban setting? These mixed situations are not often explored. This lack of research does not provide a full picture of what influences women’s fertility and contraceptive

use, which my study will focus on this matter. Moreover, a key limitation is that many papers do not separate voluntary and forced timing of marriage. In some cases, early or later marriage is a personal choice, while in others, it is due to family pressure. For example, this paper by Haq et al. (2017) examines different socio-economic factors concerning contraceptive use. However, it does not differentiate between voluntary and forced early marriages, nor does it delve into the women's freedom to decide. Furthermore, most studies on fertility and contraceptive use in Bangladesh focus mainly on present-day patterns and statistical relationships. However, it is equally important to understand the historical and cultural roots of current behaviors. There is very little discussion on how social norms, cultural beliefs, religious values, and family traditions have influenced the time of marriage and fertility across different generations.

The evolution of contraceptive practices, access, and acceptance, especially with changing policies or rural vs. urban contexts, is also largely missing. Consequently, they overlook how traditional family values, community pressure, and even past legal reforms have contributed to current outcomes. For instance, the paper by Saha and Bairagi (2007) focused mainly on the statistical patterns and lacked a detailed analysis of religious beliefs, cultural traditions, or historical evolution. Also, another paper by Mostafa et al. (2010) focuses on education, wealth, and residence as factors, but misses discussing how cultural or religious norms impact contraceptive use decisions. In addition, some studies lack a discussion of the consequences for women's health. The long-term impacts of early or delayed marriage on health outcomes remained underexplored, especially in connection with fertility behavior and contraceptive access. There is a strong need to examine how reproductive factors shape women's overall health and well-being across urban and rural settings. For instance, the paper by Kibria et al. (2016) analyzes the factors that are affecting contraceptive use among married women, but lacks an analysis of women's overall health outcomes. Most existing research focuses on patterns and usage rates but lacks a deeper understanding of how these reproductive factors shape women's overall health and well-being, a gap this study aims to fill.

1.2 Significance of the Problem

Overall, this research is important because it addresses the gaps in existing studies on timing at marriage, fertility, and contraceptive use in Bangladesh. Most previous research looks at these

issues separately, but my study brings them together to show how they are connected and influenced by education, wealth, residence, women's age group, and division. This is especially important because many studies treat Bangladesh as one single unit, ignoring the regional and cultural differences that shape women's reproductive behavior. By exploring these factors in a more integrated way, my research offers a clearer understanding of how different backgrounds impact women's choices. It also highlights how social norms, family pressure, and limited agency affect educated women, even when contraceptives are available. This helps move beyond surface-level statistics and uncovers the real reasons behind these behaviors.

The findings can help policymakers create more targeted and effective programs by considering regional patterns and complex personal situations. My study also fills a gap in understanding how different socio-economic factors can be combined and affect contraceptive use and fertility decisions, something that has not been explored enough. In short, this research adds a new perspective and helps improve knowledge that can support better health and social outcomes for women in Bangladesh.

1.3 Aim and Scope

My research aims to explore how age at marriage is related to fertility and contraceptive use among married women in Bangladesh, while considering key socio-economic factors such as education, wealth, residence, women's age group, and regions. Even though my analysis is based on quantitative data from the Bangladesh Demography and Health Survey (BDHS) 2022, it also seeks to understand how social and cultural factors such as family values, gender expectations, and traditional norms may influence when women get married and how that, in turn, affects their reproductive choices. Most existing research tends to focus only on numbers, but this research emphasizes the importance of considering the broader social context to gain a more complete understanding. Through this study, the goal is to offer deeper insights into how marriage timing, shaped by both personal and structural factors, plays a role in fertility behavior and contraceptive use. The findings could help inform policies that are not only data-driven but also more sensitive to the social realities women face in Bangladesh.

1.4 Outline of the Thesis

This thesis begins with an Introduction, presenting the research question, the problem statement, and its significance, clarifying the aim and scope of the study. The structure and content of the thesis are also outlined here. The context section describes the broader background relevant to the research and discusses the overall view of each demographic factor. Following this, the Theory and Previous Research section reviews existing theories and models related to the research problems, summarizes previous studies, and identifies gaps in the literature that the current study aims to address. The Data and method provide a detailed description of the data used and outline the research design and methodology, explaining data collection procedures and discussing the analytical techniques and tools used for data analysis. The Results section presents the main findings, using tables to illustrate key results. In the Discussion section, the results are interpreted in the context of the research problem and compared with previous research, and implications for theory, limitations, and future research are discussed. The thesis concludes with a Conclusions and Considerations section that summarizes the key findings and their significance and reflects on the study's limitations. Finally, a comprehensive References list is provided, including all the sources and literature cited in the thesis.

2 Context

In Bangladesh, early marriage remains a widespread issue, especially among poorer and rural populations. The median age of marriage is 15 years for women from the poorest households and 18 years for those from the wealthiest households (Bhowmik et al., 2021). This early start to family life often leads to early childbearing, reflected in a high adolescent fertility rate, 82 births per 1000 women aged 15-19 in 2018. While the overall fertility rate declined to 1.954 births per woman in 2022 (Akif, 2025). Cultural norms still strongly support early marriage; according to UNICEF, 52% of girls marry before 18, and over 70% marry within two years after their first period. And these practices are more common in rural areas, where family structures are more traditional, and community expectations often push for early marriage. Although early marriage has dropped from 65% in 2000 to 52%, a 2017 law allowing marriage under “special circumstances” has raised concern that this progress may slow down (Zahangir et al., 2021).

Fertility patterns in Bangladesh show strong links to income, regions, and levels of urbanization. According to the 2004 Bangladesh Demographic Health Survey (BDHS), total Fertility Rate (TFR) differed by 1.5 children between women in the poorest and richest wealth quintiles. Rural areas also display notably higher fertility rates, with a TFR of 3.54 compared to 2.69 in urban areas, about 30% higher, largely due to earlier marriages and lower educational attainment in rural settings (Uddin et al., 1985) (The DHS, 2004). Fertility is also closely tied to marriage age. Women aged 35-39 who married before 18 have an average of 4.12 live births, compared to 3.001 for those who married after 18 (Bhowmik, Biswas and Hossain, 2021). Similarly, early married women average 3.7 children, while those marrying at off after 18 have 2.4. Additionally, in terms of regional, Sylhet and Rajshahi report higher fertility (4.8 and 4.5) among early married women, versus 2.4-2.9 for late marriages. Early marriage is more common among the poorest; 63% of the poorest marry early, compared to 39% of the richest. Prevalence is highest in Chapai Nawabganj (73%), and Naogaon (70%), though divisions like Sylhet and Chattogram have seen sharp declines since the 1990s (UNICEF, 2020).

Fertility rate in Bangladesh shows a clear inverse relationship with education level. Women with no education have the highest total fertility rate at 3.5 children per woman, followed by

those with primary education at 3.3. TFR drops more significantly among women with secondary education of 2.6 and reaches the lowest (2.3) among those with higher education (Sabina, 2009). Contraceptive use also increases with education. While only 6% of respondents were illiterate, 41% had completed secondary education (Hasan et al., 2025). Additionally, early marriage is more common among women with low education: 68.9% of women with no education were married before 18, compared to 32% among those with secondary or higher education (UNICEF, 2024). These patterns suggest education plays a critical role in shaping fertility behavior, contraceptive use, and age at marriage in Bangladesh.

Fertility trends differ significantly between urban and rural areas. Across 36 low- and middle-income countries, total fertility rates are consistently lower in urban areas by 0.2 to 1.5 children per woman (Adhikari et al., 2023). According to BDHS 2017-18, the median age at first marriage is 16 years in rural areas and 17 in urban areas in Bangladesh, reflecting higher early marriage rates among rural women (Antu et al., 2022). Even among women with similar education levels, rural women tend to have higher fertility, indicating the existence rural-urban gap, particularly among less-educated groups. However, in Bangladesh, rural contraceptive use is reported at 61%, compared to 55% in urban areas, showing regional differences and method specification variation (Uddin et al., 1985).

Nationally, the modern contraceptive prevalence rate is 62.91%, with traditional methods accounting for 8.79%. Implant usage remains low, with only 1.95% of women opting for it. Overall, contraceptive use stands at 59.48%, with urban areas showing slightly higher prevalence (60.59%) compared to rural regions (54.54%) (Hossaine et al., 2024). Modern contraceptive methods are especially notable, with uniform usage across income groups: 73.3% among the poor, 72.2% among the middle income, and 71.1% among the rich, indicating income has minimal influence. However, regional differences were more significant. Sylhet reported one of the lowest modern method usage rates (69.8%), while Rangpur (73.4%) and Mymensingh (73.2%) have the highest usage of modern contraceptives (Kundu et al., 2022).

The government introduced targeted programs such as the FP2020 commitment to improve access, which was renewed during the 2017 London Summit. This outlines nine strategies pledged aligned with the FP2020 and Every Woman Every Child initiative. A key element includes mobilizing USD 615 million from the national development budget under the 4th Health, Population and Nutrition Sector Program (2017-2021), led by the Directorate General of Family Planning (Akram et al., 2020). Despite this progress, 17% of married women who

wish to avoid pregnancy still do not use any contraceptive method, indicating an unmet need for family planning services (Jalandar, 2015). However, from 2010 to 2022, average household income increased from TK. 11,479 to TK. 32,422 (Tapan, 2024), reflecting broader economic shifts that may influence fertility and health behaviors over time.

3 Theoretical Framework

Michael Todaro's development theory and Ester Boserup's theory both help explain important parts of my research. Todaro suggests that as migration, education, income, and urbanization increase, people tend to marry later and have fewer children because they have more opportunities for better lives (Todaro and Smith, 2009). Additionally, Boserup's theory says that when women get more education and job opportunities, they have more control over their lives, which usually leads to smaller families (Boserup, 1989). Both theories provided important perspectives that motivated me to explore these issues in the context of Bangladesh and guided how I developed my research questions related to fertility and contraceptive use.

In this study, I use four main theories to support my research: Life Course Theory, Theory of Planned Behavior, Modernization Theory, and Demographic Transition Theory. These theories help explain how age at marriage is linked to fertility and contraceptive use among married women in Bangladesh. They also demonstrate how other factors, such as education, wealth, residence, and social division, can influence these relationships. I treat these other variables both as control factors and potential mechanisms through which age at marriage correlates with reproductive outcomes. These theoretical perspectives provide a strong foundation for understanding how social and economic conditions influence women's reproductive behavior in various parts of the country.

Life Course Theory

Life Course Theory, by Elder Jr., (1998), focuses on how the timing sequence of social context shapes individual lives. It argues that life events like marriage, parenthood, and education occur within a larger life trajectory, influenced by historical and socio-economic factors. The theory highlights that the timing of marriage can significantly correlate with future outcomes, including fertility. For instance, early marriage can extend the potential childbearing years but may limit opportunities for education and economic stability, while later marriage typically provides more financial security and educational opportunities, often leading to lower fertility rates.

In Bangladesh, where early marriage is common, Life Course Theory helps explain how the timing of marriage influences fertility. Early marriage often results in early childbearing, restricting women's access to education and opportunities, which may contribute to higher fertility. Conversely, later marriage tends to be associated with fewer children, as women have more chances for education and better financial stability. Studies like (Huinink et al., 2019) support this theory, showing that delayed marriage leads to lower fertility. However, a contrasting perspective in Zettermark (2024) argues that fertility is not mainly shaped by the timing of marriage, but by deeper structural issues like gender inequality, lack of reproductive rights, and healthcare access. This view suggests that even women who marry later may still have high fertility if they lack control over their bodies and decisions.

Demographic Transition Theory

Demographic Transition Theory, originally developed by Frank Notestein in 1945, describes how societies shift from high birth and death rates to lower ones as they modernize (Kirk, 1996). The theory is built on earlier work by Warren Thompson (1929) and Adolphe Landry (1934). It suggests that economic growth, urbanization, rising education levels, and access to health services reduce the need for large families. As people gain more control over their reproductive choices, often through education and family planning, fertility naturally declines. In simple terms, as societies progress, families tend to have fewer children because survival improves, and the social and economic benefits become clearer (Kirk, 1996).

This theory is especially relevant in the context of Bangladesh, where fertility rates have declined even in areas with limited industrial development. Simmons (1996) found that in rural Bangladesh, women began valuing smaller families due to changing norms, education, and widespread access to family planning programs. Similarly, a cross-cultural study on fertility and wealth dynamics found that as communities became more market-integrated and education levels rose, fertility declined, supporting the Demographic transition theory (DTT) model (Colleran et al., 2015). These findings show how age at marriage, fertility behavior, and contraceptive use are closely tied to the broader social shifts described by DTT.

Theory of Planned Behavior

The theory of planned behavior (TPB) was developed by Icek Ajzen in 1991 to explain how people's intentions lead to specific actions (Conner, 2020). According to this theory, a person's behavior is driven by three key elements: their attitude toward behavior, their perception of

social expectations (subjective norms), and their belief in their ability to perform the behavior (perceived behavioral control). These factors together shape the intention to carry out a behavior, which then predicts whether the behavior is performed. In the case of contraceptive use, if a woman believes using contraception is beneficial, feels supported by her family or society, and thinks she can access and use it easily, she is more likely to intend to use it and follow through. This theory is especially relevant in countries like Bangladesh, where social, religious views, and gender roles strongly influence women's health decisions, including family planning (Hossain *et al.*, 2024). TPB helps explain why simply access to contraception is not enough, attitudes, social support, and self-confidence matter just as much.

Several studies have applied TPB to contraceptive behavior. For example, Kiene *et al.*, (2014) found that women's decision to use contraceptives was influenced by their attitudes and social pressures. Women with more autonomy, often those who marry later, were more likely to adopt birth control. Similarly, Paul (1990) applied a behavioral model in rural Bangladesh and found that women's attitudes toward contraception in general, as well as motivation from key influencers, significantly predicted contraceptive intentions. In contrast, Subedi *et al.* (2018) discovered in Nepal that even when women had favorable attitudes and knowledge, cultural restrictions limited their use of contraception, challenging TPB's assumption that intention leads directly to behavior. Taken together, these studies show that TPB can explain contraceptive behavior in many contexts but must account for cultural barriers.

Modernization Theory

Modernization theory was developed by Ronald Inglehart and Wayne Baker in 2000. This theory says that urbanization leads to behavioral changes through improved access to education, healthcare, and family planning services (Goorha, 2010). It highlights that urban environments foster greater exposure to information and enhance individual autonomy, leading to the adoption of modern practices like contraception. Essentially, the theory suggests that as societies urbanize, individuals, especially women, are more likely to embrace modern methods of family planning due to better access to resources and greater social freedoms (Goorha, 2010).

This theory is highly relevant to understanding contraceptive use among married women in Bangladesh. Previous studies by Murphy (2004) have shown that urban women, who typically marry later, enjoy better access to education and healthcare services compared to rural women. These women are more likely to use modern contraceptives, as urban areas provide greater

autonomy and exposure to family planning programs through mass media and political elites. In contrast, rural women, often constrained by traditional norms, earlier marriages, and limited access to services, tend to have lower contraceptive usage. The theory thus highlights the crucial role of urbanization in enabling women to make informed choices regarding reproductive health (Bhowmik et al., 2024).

3.1 Previous Literature

Early marriage remains a widespread issue across many parts of the world, but it is especially prevalent in South Asia, where deep-rooted cultural traditions and gender norms continue to shape expectations around marriage and fertility (Streatfield et al., 2015). In many communities, a girl's value is often closely tied to her marital status and ability to bear children, leading families to arrange marriages soon after puberty. These practices are frequently justified through beliefs about female purity, social respectability, and family honor, making early marriage seem like a necessary step toward securing a daughter's future (Rahman and Kabir, 2005). However, it is important to note that social norms, religious beliefs, and economic status all play major roles in shaping fertility behavior and contraceptive use in Bangladesh, where fertility behavior is deeply influenced by collective norms rather than individual choice (Munshi and Myaux, 2006). Scott et al. (2021) argued that age at early marriage, followed by immediate and continuous childbearing, is expected for women, and these norms are reinforced by religious authority and community expectations, leaving little room for personal choice. Strict gender roles, joint family living, patrilocal residence, and arranged matches create intense pressure on young girls to marry early, with illiteracy being the strongest predictor of early marriage (Uddin, 2015).

On the other hand, other scholars caution against overemphasizing cultural explanation. For instance, Schuler et al. (2006) argued that many girls in the village get married early because their families are poor and worry about their safety. Parents fear gossip, criticism, and practical challenges and want to protect their daughters and the family's reputation. Similarly, Rashid and Islam (2023) argue that weak law enforcement and limited access enable early marriage to exist, even when social norms are beginning to shift, suggesting that early marriage is not solely a cultural practice but is also shaped by poverty and structural barriers.

In urban Bangladesh, later marriage is increasingly associated with greater autonomy and better reproductive outcomes, as women gain access to higher education and career opportunities. Oppenheimer's theory of marriage timing explains that later marriage can give women more time to build independence, choose partners more carefully, and feel more in control of their futures (Oppenheimer, 1988). Moreover, access to birth control helps women separate marriage and childbearing, giving them more space to grow individually. For instance, Islam and Rahman (2020), conducted a meta-analysis across 15 developing countries, including Bangladesh, and found that women marrying at age 18 or older have a 53% lower likelihood of high fertility compared to those marrying earlier. Similarly, Chaudhury (1984) found that women who married before 15 had over 4 children on average, those who married at 20-21 had fewer than 2.

In Bangladesh, the timing of marriage is deeply shaped by rural-urban divides, where traditional beliefs often outweigh legal reforms in rural areas. Rural girls are more likely to marry before the legal age of 18 due to lower education levels, few job opportunities, and strong pressure to follow traditional roles. In contrast, urban areas are experiencing a shift, where higher levels of education, exposure to media, and involvement in income-generating work empower individuals to delay marriage and make more informed life choices (Islam, 2014). As (Hackman and Hruschka, 2020) suggest that wealthier women in similar low-income countries tend to have higher fertility because they feel they can afford more children with more economic resources. Similarly, (Kundu *et al.*, 2022) found that women aged between 35-39 years are less likely to use modern contraceptive methods, with a lower likelihood compared to younger women (15-24). Goni and Rahman (2012) argued that education, age, religion, media exposure, area of residence, and membership in organizations like Grameen Bank, ASA, and others play a key role in contraceptive use and continuation in Bangladesh. Education and TV exposure were the most important factors. They found that women who are educated and watch TV regularly are more likely to use contraception. Khan and Raeside (1994) found that using the 1989 Bangladesh Fertility Survey, rural areas have higher fertility than urban areas. In 1989, factors like mothers' education, age at marriage, and childhood background had a stronger impact on urban fertility compared to 1975, while religion no longer influenced urban fertility. A previous study by Islam *et al.* (2003) found that Chattogram (4.0) and Sylhet (4.1), based on BDHS 2002, because of stronger cultural and regional factors, including a higher desire for larger families and a preference for sons. (Mahmud and Mumin, 2024) using BDHS 2018 found

that Khulna, Rajshahi, and Rangpur have lower fertility, showing the reason to high urbanization, but their findings also showed that Mymensingh (2.873) had high fertility.

Additionally, Bangladesh has undergone a major transition in family planning culture. The use of contraceptives rose from just 8% in 1975 to 61% by 2011, showing that more families are choosing to plan and control fertility based on knowledge rather than tradition. Education, spousal communication, and media access are key drivers of this change, yet a 12% unmet need for contraception reveals that gaps still exist, especially in rural settings (Islam and Rahman, 2013). Islam and Nesa (2009) utilized the BDHS 2004 data and found, women with higher education have fewer children, and the fertility rate is 2.6, which is lower than the national average of 3.0. However, Arends-Kuenning and Amin (2001) argued that although education reduces fertility, the effect may vary depending on urban-rural residence and access to family planning services, suggesting education alone does not predict fertility outcome. They also noted that the paper lacks contextual differences and social norms.

Contraceptive use is more than just a health decision; it is deeply tied to trust and social negotiation, especially for women in Bangladesh. Common methods include pills, condoms, IUDs, injectables, and traditional approaches like the rhythm method. While modern methods are often promoted for their effectiveness, they are sometimes met with suspicion. Many women, especially in rural areas, face myths suggesting modern contraception leads to infertility or long-term health problems (Hossain et al., 2024). Religious beliefs and misinformation also shape decisions, with some communities viewing contraception as morally wrong or against religious teachings (Sahu and Hutter, 2012). Education plays a key role; women with limited schooling or access to media are less likely to understand or trust modern methods. Family influence, especially from husbands or elders, often outweighs a woman's personal choice. In many households, decisions about contraception are controlled by men, leaving women with limited autonomy (Hossain et al., 2024). Hossain et al. (2018) argued that wealth significantly impacts contraceptive use in Bangladesh by highlighting that women from wealthier households are more likely to use contraception due to better access to health services and family planning resources. In contrast, women from lower wealth backgrounds face barriers that limit their access to contraception, such as financial constraints and limited availability of services. Moreover, the study shows that wealth is a major determinant in whether women can make informed reproductive choices, as financial resources enable access to healthcare and contraceptive methods. For those in lower wealth quintiles, these opportunities are often out of

reach, leaving them with fewer reproductive options. This intersection between contraceptive use and wealth reveals a pattern where wealthier women have greater reproductive autonomy, while poorer women face structural disadvantages that limit their ability to control their reproductive health.

This literature supports the idea that age at first marriage is not only a personal choice but is shaped by broader social, economic, and cultural factors, which aligns with the theories guiding this research. These findings justify the inclusion of SES, education, region, and residence not only as control variables but also as explanatory factors.

Based on the theories and previous literature discussed above, I have developed four key hypotheses to guide my study. Each hypothesis is linked to a specific theory and helps explain how age at marriage is related to fertility and contraceptive use among married women in Bangladesh. These hypotheses also consider how other factors like education, wealth, residence, and region may affect these relationships. Together, they provide a clear structure for analyzing the data and understanding the social and economic influences on women's reproductive behavior.

Hypothesis 1: Married women who entered marriage at age 18 or older have significantly fewer children compared to those who married before 18, controlling for education and wealth

Hypothesis 2: The relationship of age at first marriage has a significant correlation with fertility is mediated by education and place of residence.

Hypothesis 3: Among married women, those who married later, after 18, are more likely to use modern contraceptive methods compared to those who married earlier.

Hypothesis 4: Urban married women who married after age 18 are more likely to use modern contraceptives than rural women, who are more likely to use no method at all.

4 Data and Methods

Summary of overall approach

This study employs a quantitative research design to examine how women's age at first marriage correlates with fertility and contraceptive use in Bangladesh. Using data from the Bangladesh Demographic and Health Survey (BDHS) 2022, the study follows a stepwise regression approach to analyse these relationships. The models are built progressively, first testing the relation of age at marriage alone, then introducing socio-economic control variables like women's age group, education, wealth, division, and residence. Both linear regression for fertility and logistic regression for contraceptive use are applied. This structured approach helps understand both the direct and adjusted effects of marital timing on reproductive outcomes.

The data for this research is sourced from the BDHS 2022, the eighth round of DHS surveys conducted in the country (DHS-VIII). The surveys were carried out by the National Institute of Population Research and Training (NIPORT), with fieldwork conducted by Mitra and Associates between June and December 2022. The BDHS 2022 is a nationally representative survey aimed at collecting information on a wide range of demographic and health indicators. It follows a standard DHS methodology, with adaptations to suit the national context. The target population for this survey includes ever-married women aged 15-49, which aligns directly with the fields of my study on fertility and age at marriage. No individual-level interviews were conducted with men, though male household members were included in other components such as anthropometric measurements and biomarker testing in selected households.

A total of 30,030 households were selected for the survey, and 30,018 households completed the household interview. Data were collected from 30,078 ever-married women. The Individual Record file will be primarily used for this study, including detailed information on women's age at marriage, fertility history, contraceptive use, and socio-economic characteristics. After excluding observations with missing values relevant to the study variables, the final analytical sample consists of 19,987 women. The dataset includes extensive modules relevant to this study. Most notably, it collects complete pregnancy and birth histories, which allows for detailed calculation of fertility outcomes such as the number of children ever born. Furthermore,

the survey includes key socioeconomic variables such as household wealth index, urban-rural residence, education level, and region, which are essential for understanding contextual influences on fertility behaviors. The data is available in both weighted and unweighted formats, with cluster-level weighting applied for national representation.

Previous research has effectively used the BDHS 2022 data to explore various public health and demographic issues. For example, studies have examined the Prevalence and Risk Factors of Malnutrition among Women of Reproductive Age (Moushumi et al., 2025) Applied the Generalized Linear Mixed Model Approach for Analyzing Water, Sanitation, and Hygiene Facilities (Mim, Rahaman and Sajib, 2025), and investigated the Socio-demographic determinants of sexual inactivity among reproductive married women (Hossain et al., 2025). While these studies show the usefulness and reliability of the BDHS 2022 dataset, there is still a noticeable gap when it comes to examining how age at marriage relates to fertility rates, especially when analyzed alongside socioeconomic factors like age, wealth, education, region, and contraceptive use.

4.1 Independent Variable

Age at Marriage: Age at marriage, measured as the respondent's exact age at first marriage with a spouse, serves as a key independent variable in this study. The values range from age 10 to 48, with the majority of women marrying between ages 15 and 18. This variable is treated as continuous in the analysis, allowing for detailed examination of how variations in marriage timing influence fertility outcomes and contraceptive use (Bangladesh - Demographic and Health Survey, 2022).

4.2 Dependent Variable

Contraceptive Use: Contraceptive use is an important outcome variable in this study, as it provides insight into women's reproductive intentions and control. The BDHS data includes information on current contraceptive practices, distinguishing between modern methods (such as pills, injectables, IUDs, Implants, and sterilization, traditional methods (such as periodic abstinence and withdrawal), and non-use (The DHS program, 2022). This variable is central to

examining how age at marriage influences a woman's likelihood of adopting family planning strategies. Understanding contraceptive behavior about marital timing offers a valuable perspective on how early or delayed marriage affects women's capacity to make informed reproductive choices within different socioeconomic contexts.

Fertility (Children Ever Born): The total number of children ever born is a key dependent variable in reflecting each woman's lifetime fertility outcome at the time of the survey. This measure captures the cumulative number of live births reported by married women and serves as a direct indicator of reproductive behavior. By analyzing fertility outcomes about age at marriage and other socioeconomic variables, this study aims to explore how marital timing influences childbearing patterns across different population subgroups. (Bangladesh - Demographic and Health Survey, 2022).

4.3 Control Variable

Age group: For this research, I include women's age group from 15 to 49 years as a control variable because this is the usual age range when women have children and use contraception. This will help me to see which age groups have higher or lower fertility and who uses more contraception, giving more accurate and trustworthy results for my analysis (Bangladesh - Demographic and Health Survey, 2022).

Highest Education Level: In the data, they have a lot of variables regarding education, such as female grades, when they enroll in school or registration, but I specifically looked at the highest education level achieved by married women, which includes complete. I specifically chose educated women for my research because. Education plays an important role in shaping reproductive behavior by influencing women's awareness, autonomy, and decision-making capacity (Hasan et al., 2025). By focusing on the highest education level attained, this study seeks to understand how education interacts with age at marriage to shape fertility outcomes and contraceptive choices (Bangladesh Demographic and Health Survey, 2022).

Region: The variable for region represents the eight major administrative regions of Bangladesh included in the survey: Barishal, Chattogram, Dhaka, Khulna, Mymensingh, Rajshahi, Rangpur, and Sylhet, including regional exploration of geographic differences in fertility behavior and contraceptive use. These differences may result from disparities in

education, healthcare access, cultural practices, and overall socioeconomic development across regions, making it an important contextual factor in understanding reproductive outcomes in Bangladesh. The analysis allows for exploration of geographic differences in fertility behavior and contraceptive use. These differences may result from disparities in education, healthcare access, cultural practices, and overall socioeconomic development across divisions, making it an important contextual factor in understanding reproductive outcomes (Bangladesh - Demographic and Health Survey, 2022).

Wealth Index: The wealth index shows the economic status of a household based on things like ownership of assets, housing quality, and access to basic services. It is divided into five groups, from poorest to richest. I included this variable to see how financial background relates to fertility and contraceptive use among married women (Bangladesh - Demographic and Health Survey, 2022).

Place of Residence: I am looking at rural and urban areas within Bangladesh, but the data does not specifically mention any village or city names, as the national-level dataset already includes both rural and urban parts. But it represents the distribution of participants based on their place of residence (Bangladesh Demographic and Health Survey, 2022)

Table 1: Descriptive statistics (Bangladesh - Demographic and Health Survey, 2022)

<i>Category</i>	<i>Subcategory</i>	<i>Frequency</i>	<i>Percentage</i>
<i>Age at first marriage</i>	Under 15	5,503	27.53
	15-17	7,720	38.64
	18-20	4,406	22.04
	21 and above	2,358	11.79
<i>Total Children Ever Born</i>	0	2,087	10.44
	1-2	11,000	55.02
	3-4	5,721	28.62

	5 or more children (5+)	1,180	5.91
<i>Contraceptive use</i>	No method	9,548	47.77
	Modern method	10,439	52.23
<i>Age group</i>	15-24	4,868	24.36
	25-34	6,977	59.26
	35-44	5,923	29.63
	45-49	2,219	11.10
<i>Division</i>	Barishal	2,117	10.59
	Chattogram	2,983	14.92
	Dhaka	3,028	15.15
	Khulna	2,602	13.02
	Mymensingh	2,156	10.79
	Rajshahi	2,546	12.74
	Rangpur	2,399	12.00
	Sylhet	2,156	10.79
<i>Education Attainment</i>	No education	2,721	13.61
	Primary	5,207	26.05
	Secondary	9,136	45.71
	Higher	2,923	14.62

<i>Wealth</i>	Low (Poorest-Poorer)	7,502	37.53
	Middle	3,989	19.96
	High (Richer-Richest)	8,496	42.51
<i>Place of Residence</i>	Rural	12,980	64.94
	Urban	7,007	35.06

Note: Total Observation is 19,987

This study uses a quantitative research design to explore the relationship between age at first marriage, fertility, and contraceptive use among married women in Bangladesh. This study applies both **linear** and **logistic** regression techniques to analyse how age at first marriage influences fertility outcomes and contraceptive behavior. The linear regression model focuses on the number of children ever born, while the logistic regression model looks at the likelihood of contraceptive use. Control variables like women's age, education, wealth, region, and place of residence are included in the analysis to account for socio-economic factors that might also influence these outcomes.

The data for this study comes from the BDHS 2022, which is a cross-sectional survey that collects information on women's health, socio-economic status, and demographic characteristics. A total of 19,987 ever-married women aged 15-49 participated in the survey, ensuring a representative sample from both urban and rural areas across Bangladesh.

The analysis was conducted using STATA software, and the dataset was complete after excluding missing data. This ensures the robustness and reliability of the results. By using linear and logistic regression, this study provides a clear understanding of how age at first marriage affects fertility and contraceptive use, with consideration of important socio-economic factors.

This methodology follows an appropriate approach in demographic research and adds valuable insights into how early marriage impacts reproductive health in Bangladesh. These findings can help inform policies and programs aimed at improving health outcomes.

5 Results

This section presents the results of the regression analyses examining the association between women's age at first marriage and two key outcomes: fertility and contraceptive use. To assess these relationships, two separate models were used. A linear regression model was applied to estimate the correlation between age at marriage and fertility, while a logistic regression model was used for modern contraceptive use. Both models are controlled for key sociodemographic factors, including women's age group, education, wealth, place of residence, and region. The findings are presented in two separate tables, followed by a summary of hypothesis testing and a detailed interpretation of each result. While the overall research question provides a broad view of how age at marriage relates to reproductive outcomes, the hypotheses reflect more specific expectations drawn from established theoretical perspectives.

Table 2: Estimated Linear Regression Showing the Association Between Age at First Marriage and Fertility Among Currently Married Women in Bangladesh

Title	Coeffecient	Robust Std. Error	p-value	95% Confidence Interval
Age at First Marriage	-0.083	0.003	0.000	[-0.090, -0.077]
Age group (Ref: 15-24)				
25-34	1.151	0.016	0.000	[1.120, 1.181]
35-44	1.815	0.020	0.000	[1.777, 1.853]
45-49	2.269	0.034	0.000	[2.202, 2.336]

Education
(Ref: No
Education)

<i>Primary</i>	-0.149	0.033	0.000	[-0.215, -0.084]
<i>Secondary</i>	-0.409	0.032	0.000	[-0.472, -0.346]
<i>Higher</i>	-0.532	0.038	0.000	[-0.607, -0.456]

**Division (Ref:
Barisal)**

<i>Chattogram</i>	0.301	0.030	0.000	[0.242, 0.360]
<i>Dhaka</i>	-0.031	0.029	0.289	[-0.087, 0.026]
<i>Khulna</i>	-0.248	0.028	0.000	[-0.304, -0.193]
<i>Mymensingh</i>	0.118	0.034	0.000	[0.052, 0.184]
<i>Rajshahi</i>	-0.282	0.029	0.000	[-0.338, -0.226]
<i>Rangpur</i>	-0.124	0.029	0.000	[-0.181, -0.067]
<i>Sylhet</i>	0.375	0.037	0.000	[0.303, 0.448]

**Wealth (Ref:
Poorest)**

<i>Poorer</i>	-0.135	0.027	0.000	[-0.188, -0.081]
<i>Middle</i>	-0.204	0.027	0.000	[-0.258, -0.151]
<i>Richer</i>	-0.230	0.028	0.000	[-0.284, -0.176]
<i>Richest</i>	-0.296	0.029	0.000	[-0.353, -0.238]

Residence (Ref: Urban)				
<i>Rural</i>	0.096	0.016	0.000	[0.064, 0.129]
Constant	2.765	0.063	0.000	[2.641, 2.889]
Model Statistics				
<i>Observations</i>	19,987			
<i>R-squared</i>	0.452			

Note: Dependent variable: Number of children (TF). Reference categories: 15-24 (Age group), No education (education), Barisal (division), Poorest (wealth), Urban(residence). Robust standard errors reported.

Source: (Bangladesh - Demographic and Health Survey , 2022)

This linear regression analysis explores the association between age at first marriage and fertility among currently married women in Bangladesh. The analysis includes controls for age group, education, region, wealth status, and place of residence to account for potential socioeconomic differences. The results are interpreted based on the coefficients, significance levels, and confidence intervals.

The coefficient for age at first marriage is -0.083 with a robust standard error of 0.003, and it is statistically significant ($p < 0.001$). The 95% confidence interval ranges from -0.090 to -0.077, which does not include zero. This suggests a negative association between age at marriage and fertility. Specifically, for each negative association between age at marriage, the number of children ever born is associated with a 0.083 decrease, on average, holding other variables constant, meaning that women who marry at older ages tend to have fewer children compared to those who marry younger.

Regarding age groups, and using the 15-24 age group as the reference category, we can see that older age groups have higher outcome values. For example, people aged 25-34 have a coefficient of 1.151, those aged 35-44 have 1.815, and those aged 45-49 have 2.269. All of

these are highly significant (p-value 0.000 for each). This shows a clear trend: as people age, the outcome increases, and the effects get stronger.

Education is included as a categorical variable with “no education” as the reference group. The coefficient for women with primary education is -0.149 (SE = 0.033, $p < 0.001$), suggesting they are associated with having 0.149 fewer children compared to women with no education. For women with secondary education, the coefficient is -0.409 (SE = 0.032, $p < 0.001$), indicating a stronger negative association with fertility. And women with higher education show the largest negative association, with a coefficient of -0.532 (SE = 0.038, $p < 0.001$), meaning they are associated with having 0.532 fewer children compared to undeducated women. The confidence intervals for all education levels do not include zero, confirming the statistical significance of these associations. Overall, the results indicate a strong inverse relationship between educational attainment and fertility, with higher levels of education linked to fewer children.

Geographical region is included as a categorical variable, with Barisal as the reference category. Women from Chattogram are associated with 0.301 more children than Barisal ($p < 0.001$). Women from Dhaka (-0.031, $p = 0.289$) do not show a statistically significant difference, suggesting their fertility is about the same as women from Barisal. Women from Khulna (-0.248), Rajshahi (-0.282), and Rangpur (-0.124) show negative associations with fertility, all statistically significant ($p < 0.001$), suggesting that women in these regions have fewer children than those in Barisal. The coefficient for Mymensing is 0.118, but it is statistically significant ($p < 0.001$), indicating they have slightly more children compared to Barisal. In contrast, women in Sylhet are associated with 0.375 more children ($p < 0.001$) than women in Barisal. These regional differences suggest that fertility patterns vary across regions, even after controlling for education, wealth, and residence.

Wealth status is included with the poorest group as the reference category. The coefficients for the poorer (-0.135), middle (-0.204), richer (-0.230), and the richest (-0.296), all with p-values of 0.000, showing strong statistically significant ($p < 0.001$), indicating no strong association with fertility compared to the poorest group. So, being wealthier is linked to a lower outcome, and the richer people get, the more the outcome decreases.

Residence is categorized as urban (reference) vs. rural. The coefficient for rural residence is 0.096 (SE = 0.016, $p < 0.001$), suggesting that rural women are associated with having 0.096

more children than their urban counterparts. This result is statistically significant, and the confidence interval does not include zero.

The constant value is 2.765 ($p < 0.001$), and overall. This number is not realistic or useful by itself, but it helps from the starting point of the model. The R-squared value is 0.452, which means that about 45.2% of the differences in fertility among women can be linked to the variables included in the model, suggesting that the model does a reasonably good job of capturing the main factors related to fertility

Table 3: Logistic Regression Showing the Association Between Age at First Marriage and Modern Contraceptives Among Currently Married Women in Bangladesh

Title	Coeffecient	Std. Error	p-value	95% Confidence Interval
Age at First Marriage	-0.023	0.005	0.000	[-0.032, -0.014]
Age group (Ref: 15-24)				
25-34	0.365	0.039	0.000	[0.289, 0.441]
35-44	0.209	0.042	0.000	[0.127, 0.290]
45-49	-0.886	0.060	0.000	[-1.004, -0.769]
Education (Ref: No Education)				
Primary	0.256	0.051	0.000	[0.156, 0.355]
Secondary	0.178	0.051	0.001	[0.077, 0.278]
Higher	0.106	0.067	0.116	[-0.026, 0.238]

Region (Ref: Barisal)				
<i>Chattogram</i>	-0.180	0.059	0.020	[-0.294, -0.065]
<i>Dhaka</i>	-0.029	0.060	0.627	[-0.144, 0.087]
<i>Khulna</i>	0.119	0.060	0.048	[0.001, 0.238]
<i>Mymensingh</i>	0.192	0.063	0.002	[0.068, 0.316]
<i>Rajshahi</i>	0.305	0.061	0.000	[0.186, 0.425]
<i>Rangpur</i>	0.249	0.062	0.000	[0.128, 0.369]
<i>Sylhet</i>	-0.329	0.064	0.000	[-0.455, -0.203]
Wealth (Ref: Poorest)				
<i>Poorer</i>	-0.136	0.048	0.005	[-0.231, -0.042]
<i>Middle</i>	-0.192	0.049	0.000	[-0.289, -0.096]
<i>Richer</i>	-0.250	0.051	0.000	[-0.350, -0.150]
<i>Richest</i>	-0.387	0.056	0.000	[-0.497, -0.278]
Residence (Ref: Urban)				
<i>Rural</i>	-0.223	0.034	0.000	[-0.279, -0.147]
Constant	0.516	0.103	0.000	[0.314, 0.719]
Model Statistics				
<i>Observations</i>	19,987			

<i>LR chi2(16)</i>	1007.14
<i>Prob > chi2</i>	0.0000
<i>Pseudo R2</i>	0.036
<i>Log likelihood</i>	-13330.498

Note: Dependent variable: Use of modern contraception (1=yes, 0=no). Reference categories: 15-24 (Age group), No education (education), Barisal (division), Poorest (wealth), Urban (residence). Coefficients represent log-odds, robust standard errors not used here (regular SEs shown). All covariates are categorical variables except for age at first marriage, which is continuous

Source: (Bangladesh - Demographic and Health Survey, 2022)

This logistic regression model explores the association between age at first marriage and the use of modern contraception among currently married women in Bangladesh. Control variables include age group, education, division, wealth, and residence. The coefficients are presented in log-odds form.

The coefficient for age at first marriage is -0.023 (SE = 0.005, $p < 0.001$), with a 95% confidence interval of [-0.032, -0.014]. This negative and statistically significant association indicates that women who marry at older ages are less likely to use modern contraception, even after controlling for other factors. The magnitude is small since the coefficient is in log-odds, but the direction and significance are clear.

Compared to the youngest age group (15-24), women aged 25-34 and 35-44 are significantly more likely to use contraceptives, with coefficients of 0.365 and 0.209, respectively ($p < 0.001$). However, women in the 45-49 age group show a strong negative association (-0.886, $p < 0.001$), likely because many in this age group are nearing the end of their reproductive years and may no longer need contraception. These patterns suggest that contraceptive use peaks in the mid-reproductive years.

Education is compared to the reference group of women with no education. Women with primary education are associated with higher odds of using modern contraception (coefficient

= 0.256, SE = 0.0482, $p < 0.001$), and similar positive associations are found for secondary (coefficient = 0.178, $p < 0.001$). However, the association for women with higher education is not statistically significant (coefficient = 0.106, $p = 0.116$). This pattern suggests that while some education increases awareness and access to contraception, other social or cultural factors may influence decisions among highly educated women.

The results show notable regional variation in contraceptive use across regions in Bangladesh, using Barisal as the reference group. Women in Chattogram (coefficient = -0.180, $p = 0.020$) and Sylhet (coefficient = -0.329, $p < 0.001$) are significantly less likely to use modern contraception than Barisal. In contrast, women in Khulna (coefficient = 0.119, $p = 0.048$), Mymensingh (coefficient = 0.192, $p = 0.002$), Rajshahi (coefficient = 0.305, $p < 0.001$), and Rangpur (coefficient = 0.249, $p < 0.001$) are more likely to use contraception. No significant association is observed in Dhaka ($p = 0.627$). These findings suggest that contraception use is not uniform across regions and may be shaped by local social, cultural, or health service factors.

There is a clear trend showing that wealthier women are less likely to use contraceptives. Compared to the poorest group, all higher wealth categories have negative coefficients, indicating greater contraceptive use (since the outcomes are likely coded as 1= use, 0 = non-use). The richest group has the strongest association (-0.387, $p < 0.001$).

Women living in rural areas are significantly less likely to use modern contraception compared to those in urban areas. The coefficient for rural residence is -0.223 (SE = 0.034, $p < 0.001$), indicating a clear negative association. This suggests that access to family planning services, awareness, or attitudes toward contraception may differ between rural and urban populations, with urban women being more likely to adopt modern contraception methods.

The constant term is 0.516 ($p < 0.001$), representing the log-odds of using modern contraception for women in all the reference categories (different age group, no education, living in Barisal, Poorest wealth quintile, urban residence, and age at first marriage = 0). This number is not realistic or useful by itself, but it helps as a baseline for comparing the associations of other variables. The pseudo R-squared value is 0.036, which means that about 3.6% of the variation in contraceptive use is explained.

Table 4: Overview of Hypothesis Testing Results

Hypothesis	Model & Obs.	Key Predictors & Coefficients	Control Variables	Model Stats	Supported
H1: Married women who entered marriage at age 18 or older have significantly fewer children compared to those who married before 18, controlling for education and wealth	Linear Regression (N=19,987)	Marriage age ≥ 18 (vs. < 18) = -0.353 (p < .001)	Education: Primary = - .582 (p < .001) Secondary = - 1.339 (p < .001) Higher = - 1.711 (p < .001) Wealth: Poorer = -.071 (p = .030) Middle = -.089 (p = 0.005) Richer = -.044 (p = 0.164) Richest = .074 (p = 0.020)	R-squared = 0.1866 F(8,19978) = 559.36 (p < .001)	Yes
H2: The relationship of age at first marriage significantly correlates with	Linear Regression (N=19,987)	Age at first marriage = -.050 (p < .001)	Education: Primary = - .586 (p < .001)	R-squared = 0.1882 F(5,19981) = 890.23	Yes

<i>fertility, is</i>	Secondary = -	(p < .001)
<i>mediated by</i>	1.319(p <.001)	
<i>education and</i>	Higher = -1.617	
<i>place of</i>	(p<.001)	
<i>residence.</i>		
	Residence:	
	Rural = +0.66	
	(p < .001)	

<i>H3: Among</i>	Logistic	Marriage	No control is	Pseudo R2	No
<i>married women,</i>	Regression	age ≥18 (vs.	included in this	= 0.0018	
<i>those who</i>	(N=	<18) = -	model	Wald	
<i>married later,</i>	19,987)	.214 (p <		chi2(1) =	
<i>after 18, are</i>		.001)		39.70	
<i>more likely to</i>				(p < .001)	
<i>use modern</i>					
<i>contraceptive</i>					
<i>methods</i>					
<i>compared to</i>					
<i>those who</i>					
<i>married earlier.</i>					

H4: Urban married women who married after age 18 are more likely to use modern contraceptives than rural women, who are more likely to use no method at all.	Logistic Regression with interaction (N=6,764)	Subsample of women married at 18 or above = .041 (p =.007)	Interaction only	Pseudo R2 = 0.0034 Wald chi2(3) = 22.70 (p < .001)	No
		Residence (rural)=.116 (p = .764)			
		Interaction (rural * subsample) = +0.001 (p = 0.963)			

Source: (Bangladesh - Demographic and Health Survey, 2022)

Table 5: Interpretation of Hypothesis Testing Results

Hypothesis	Descriptive Interpretation
Hypothesis 1	The findings show that women who married at age 18 or older tend to have significantly fewer children compared to those married before 18, even when controlling for education and wealth status. The regression analysis reveals that being married at age 18 or older, compared to being married before age 18, is associated with the coefficient of -0.353 (p < 0.001), indicating a statistically significant decrease in the number of children for women who married later. Education also shows a strong negative relationship with fertility, where women with primary, secondary, and higher education have -0.582, -1.339, and -1.711 fewer children, respectively, compared to women

with no education. Similarly, wealth status shows that those in the poorer and middle groups have slightly fewer children (-0.071 and -0.089, respectively). Women in the richer group have a very small and non-significant decrease (-0.044, $p=0.164$). Interestingly, the richest group has slightly more children (+.074, $p=0.020$), and this is statistically significant. The R-squared value of 0.1866 means that about 18.7% of the variation in the number of children is explained by the variables in the model. The F-statistic is 559.36 with a p-value less than 0.001, which shows the overall model is statistically significant. Overall, education shows a strong association with the number of children.

Hypothesis 2

The regression result shows that age at first marriage significantly negatively affects fertility. Specifically, for each additional year of age at first marriage, fertility decreases by 0.050 children. This suggests that older age at marriage is associated with lower fertility. Education is again strongly associated with fertility. Compared to women with no education. Those with primary education have -0.586 fewer children, secondary education is linked to 1.319 fewer children, and individuals with higher education have -1.617 fewer children. All of these results are statistically significant ($p<.001$), showing a clear negative relationship between education level and number of children. Place of residence also matters. Women living in rural areas have, on average, 0.66 more children than those living in urban areas ($p<0.001$), indicating that rural residence is positively associated with fertility. The R-squared value is 0.1882, meaning the model explains about 18.8% of the variation in the number of children. The F-statistic is 890.23 with a p-value less than 0.001, showing the model is statistically significant overall.

Hypothesis 3

The result found that women who got married at age 18 or older are significantly less likely to use modern contraceptives compared to those who married before 18. The model does not control for any other variables. The coefficient is -0.214, which means the odds of using modern contraceptives are lower for women who marry later. This result is statistically significant because the p-value is less than 0.001, which shows a strong relationship.

However, the pseudo R-squared is very low (0.0018), suggesting that this model explains very little of the variation in contraceptive use.

Hypothesis 4

This logistic regression explores whether place of residence correlates with contraceptive use among women who married at age 18 or older, using an interaction model. The sample includes 6,764 married women. The result found that married women who got married at age 18 or older, and urban women, are slightly more likely to use modern contraceptives than rural women. The main effect for this subsample is positive (.041) and statistically significant ($p=.007$). However, the interaction effect of living in a rural area alone is not significant (.116, $p=.764$), and the interaction term between rural residence and being married at 18 or older is also not significant (0.001, $p=0.963$). This means there is no clear evidence that rural women who married later differ from urban women in contraceptive use based on this model. The model is statistically significant overall (Wald chi-square = 22.70, $p < .001$), but the pseudo R-squared is very low (0.0034), meaning it explains very little of the variation in contraceptive use.

6 Discussion

This section discusses how the findings help answer the research question about the correlation between age at marriage, fertility, and contraceptive use, while considering socio-economic factors. The analysis uses BDHS 2022 data to show clear patterns that connect marriage with reproductive behavior. The following discussion highlights key relationships and compares them with previous studies.

Table 2 represents a multiple linear regression analysis examining how age at first marriage is associated with fertility among currently married individuals in Bangladesh, controlling for age group, education, region, wealth, and place of residence. The most important finding is the negative relationship between age at first marriage and fertility. The results show that women who marry at older ages tend to have fewer children, with each one-year delay in marriage linked to about 0.083 fewer children. This suggests that encouraging later marriage could be a key strategy for lowering fertility rates in Bangladesh. For instance, Islam and Rahman (2020), conducted a meta-analysis across 15 developing countries, including Bangladesh, and found that women marrying at age 18 or older have a 53% lower likelihood of high fertility compared to those marrying earlier. Similarly, Chaudhury (1984) found that women who married before 15 had over 4 children on average, those who married at 20-21 had fewer than 2. My results align with previous research, indicating that delayed marriage is linked to lower fertility, adding to the evidence supporting later marriage as a strategy to reduce population growth in Bangladesh.

My study found that fertility outcomes increase with age among women aged 15 to 49 in Bangladesh, with the older age groups showing higher numbers of children compared to the youngest group (15-24). This trend indicates that as women get older, they tend to have more children, and the strength of this relationship grows with age. These results are aligned with previous research conducted in Bangladesh by Roy and Hossain (2017) also found that over 90% of women had at least one child by 49, with an average of about 2.3 children per woman

Education also shows a strong and consistent negative relation with fertility. My results found that women with higher education have about 0.532 fewer children on average than women

with no education (**see Table 2**). This aligns with previous studies, such as Islam and Nesa (2009) utilized the BDHS 2004 data and found that women with higher education have fewer children, and the fertility rate is 2.6, which is lower than the national average of 3.0. However, Arends-Kuenning and Amin (2001) argued that although education reduces fertility, the effect may vary depending on urban-rural residence and access to family planning services, suggesting education alone does not predict fertility outcome. He also mentioned that the paper lacks contextual differences and social norms. This can happen due to the older data, while my data uses more recent and nationally representative data, offering more support to the evidence that education has a negative relation with fertility outcomes, promoting female education as a long-term strategy to keep the population balance.

The regression also reveals region differences in fertility. Compared to women from Barisal, women in Sylhet (0.375) and Chattogram (0.301) tend to have more children. These results align with a previous study by Islam, Rob, and Chakroborty (2003), which found that Chattogram (4.0) and Sylhet (4.1), based on BDHS 2002. My results show that the fertility rate of Khulna (-0.248), Rajshahi (-0.282), and Rangpur (-0.124) have lower fertility, which aligns with previous results by Mahmud and Mumin, (2024) using BDHS 2018 found that Khulna, Rajshahi, and Rangpur have lower fertility, which is the reason for high urbanization, but his findings also included that Mymensingh (2.873) had high fertility, which does align with my result, where the coefficient for Mymensingh (0.118) is statistically significant. My results show that for Dhaka (-0.031, $p = 0.289$), the association with fertility is negative but not statistically significant. This partially aligns with the previous results by Islam, et al. (2003) found that instead of Dhaka's rapid urbanization, the fertility rates remained stable.

For wealth status, the coefficients for the poorer (-0.135), middle (-0.204), and richer (-0.230) groups are statistically significant, indicating little difference from the poorest group (see Table 2). However, women in the richest group have a coefficient of -0.296, showing a statistically negative relation with fertility. This result is notable as it fills a gap in the literature, as there has been no prior research specifically focusing on the relationship between wealth and fertility in Bangladesh. While my results provide a new perspective on this relationship, this does not align with the work by Hackman and Hruschka (2020), suggesting that wealthier women in similar low-income countries tend to have higher fertility because they feel they can afford more children with more economic resources. This contrast suggests that country-specific factors may shape the relationship between wealth and fertility.

Regarding place of residence, the coefficient for rural women is 0.096, indicating they tend to have more children compared to urban women, and this result is statistically significant (**see Table 2**). These results align with the previous study by Khan and Raeside (1994) found that using the 1989 Bangladesh Fertility Survey, rural areas have higher fertility than urban areas. Similarly, Adhikari et al. (2023) found that higher fertility in rural areas could be due to factors like limited access to contraceptive use, cultural beliefs that encourage larger families because rural areas often have more agricultural lifestyles where children are seen as valuable for labor (Kundu et al., 2022)

Table 3 represents the results of a logistic regression analysis examining how age at first marriage is associated with contraceptive use among currently married individuals in Bangladesh, controlling for age group, education, region, wealth, and place of residence.

Women who marry at older ages are less likely to use modern contraception. Specifically, each additional year in age at first marriage is associated with about a 2% decrease in the odds of using modern contraceptives (**see Table 3**). This negative association is statistically significant. My results align with the previous study by Musa Khan et al. (2012) found that women marry later after 15 years of using contraception less, and the odds ratio for those marrying after 15 years is 0.575, meaning they are less likely to use contraception compared to those who marry at or before 15 years. While previous studies did the same analysis, they often lacked precise quantification of this relationship. My study fills this gap by providing a specific estimate: each additional year in age at marriage is associated with a 2% decrease in the odds of using modern contraceptives.

My findings show women aged 25-34 were 44% more likely to use contraception compared to those aged 15-24, which aligns with the similar results previously done by (Islam *et al.*, 2016). My study also found women aged 35 to 44 had 23% higher odds, and those between 45-49 were 59% less likely to use contraception. This contrasts with the findings by (Kundu et al., 2022) who reported women aged between 35 to 49 were less likely to use a contraceptive method compared to those group between the 15 and 24. However, the author used BDHS 2018 data, while mine is more up-to-date and contributes to the evidence.

Educational attainment is positively associated with modern contraceptive use. Compared to women with no education, those with primary education are about 29% more likely to use modern methods, while those with secondary education have about 19% higher odds. Although

women with higher education also show increased odds (about 11%), is not statistically significant (**see Table 3**). My result partly aligns with a previous study by Goni and Rahman, (2012) found that using BDHS 2007 data found that educated women and those who watch TV at least once a week were more likely to use contraception. However, (Psaki et al., 2019) argued that education alone does not influence contraceptive use in low- and middle-income countries, and the effect size was near zero. Since few studies have focused on the direct link between education and contraceptive use in Bangladesh, my findings fill this gap by providing more recent and detailed evidence.

Contraceptive use varies across different regions in Bangladesh. Women in Chattogram and Sylhet are significantly less likely to use modern contraception compared to those in Barisal, with reductions of around 17% and 28% respectively. In contrast, women in Khulna, Mymensingh, Rajshahi, and Rangpur show higher usage, ranging from 13% to 36% more likely than in Barisal (**see Table 3**). Dhaka shows no meaningful difference. These findings are consistent with previous studies, such as (Islam, et al. 2020), which highlighted similar regional patterns using BDHS 2014. However, my study extends the literature by utilizing more recent data and focusing exclusively on modern contraceptive methods.

Surprisingly, wealth is negatively associated with contraceptive use (**see Table 3**). Compared to the poorest women, those in richer quintiles are significantly less likely to use modern contraception, with declines ranging from about 17% to nearly 32% in the richest group. This unexpected pattern might reflect complex socio-cultural dynamics where wealthier women have lower fertility desires, different access to private healthcare, or face social stigma around contraception. However, there has been no research done previously between wealth and contraception use, analyzing BDHS 2022. Adebawale et al., (2014) found that country such as Malawi shows women in the richest wealth quintile were more likely to use contraceptives than their counterparts in the poorest quintile.

Urban-rural differences in contraceptive use remain clear. Women living in rural areas are around 20% less likely to use modern contraception than their urban counterparts (**see Table 3**). This result likely reflects disparities in access to family planning services, differences in exposure to health information, or varying social norms between rural and urban settings. In contrast, Mostafa et al.(2010) found that almost 49 % of rural women who discussed family planning with their husbands were much more likely to use modern contraceptives. Though the study relied on BDHS 2004 data, my study uses more current data, which may reflect changes

in access to services, health information, and evolving social norms that influence contraceptive use differently today.

Using the Life Course Theory as a guiding lens, my results of **Hypothesis 1 (See table 5)** with the idea that timing of marriage shapes later life outcomes, including fertility. The theory explains that early life events, such as marrying before 18, can limit future opportunities and lead to higher fertility. My result shows that women married at age 18 or older had, on average, 0.35 fewer children than those who married earlier. This difference is statistically significant, showing that later marriage is linked to lower fertility. These results support earlier studies by Huinink and Kohli (2014) and Avogo and Somefun (2019), which also found that delaying marriage is related to fewer children, mainly because it gives women more time for education and work. Similarly, a cross-national study across 15 countries by Onagoruwa and Wodon (2018) found that ending early marriage could reduce total fertility by 0.24 to 1.06 children per woman, highlighting broader demographic benefits beyond individual situations. On the other hand, Zettermark (2024) offers a different view, suggesting that fertility is more influenced by gender inequality and lack of reproductive rights. While my study does not measure these factors directly, the clear connection between later marriage and fewer children is still logically consistent with the idea that timing is an important factor in fertility.

In line with the Demographic Transition Theory (DTT), which suggests that as societies modernize, fertility rates decline due to improvement in education, urbanization, and health, my **Hypothesis 2** aligns with these ideas. The findings show that older age at marriage and higher education levels are significantly associated with lower fertility, supporting the theory's argument that these factors lead to reduced family sizes. Specifically, women with higher education have, on average, 1.6 children. This result is consistent with a previous study by Simmons (1996) in Bangladesh, where education and family planning led to lower fertility. However, Fujii and Shonchoy (2020) found that access to electricity in rural areas led to a decrease in fertility by about 0.2 children over five years, suggesting that infrastructure can also influence fertility. While that study highlights rural electrification, my research contributes by highlighting that education, especially in rural areas, plays a crucial role in fertility decisions, which earlier studies have not fully explored, showing that rural areas tend to have more children.

In the context of the Theory of Planned Behavior (TPB), which emphasizes the influence of attitudes, subjective norms, and perceived behavioral control on behavior, my **Hypothesis 3**

(see **Table 5**) suggests that women who marry at age 18 or older are 21% less likely to use modern contraceptives compared to those who marry before 18 (coefficient = -0.214). This finding is statistically significant and fits within the TPB framework, suggesting that even with increased autonomy, social expectations and perceived control still shape contraceptive behavior. However, this result contradicts earlier research like Kiene et al., (2014), which found higher contraceptive use among women who marry later. My study suggests that cultural and structural barriers may ignore positive intentions, offering a new perspective into TPB applications in Bangladeshi Contexts.

Through the lens of modernization theory, urbanization enhances women's autonomy and access to reproductive health services, encouraging modern contraceptive use (Goorha, 2010). My **Hypothesis 4** (see **Table 5**) aligns with this. Among women who married at age 18 or older, those in urban areas were about 4% more likely to use modern contraceptives- a statistically significant result. This aligns with Murphy (2005), who found that urban women benefit from delayed marriage, education, and greater exposure to family planning. However, the lack of significant interaction effects suggests that rural women who marry later are not adopting modern contraceptives at the same rate. Compared to Bhowmik et al. (2024), who showed a strong difference between rural and urban women, my results suggest that this gap may be getting smaller. This could mean we may need to study more specific groups within the country to understand these patterns better.

6.1 Limitations

This study explores how age at marriage correlates with fertility and contraceptive use among married women in Bangladesh. However, several limitations must be acknowledged when interpreting the findings:

The analysis is based on only current married women, excluding groups such as separated, divorced, or widowed women. These groups may have different reproductive patterns and contraceptive needs, and their absence because of the missing microdata limits the study's ability to represent diverse marital and reproductive paths

Another important limitation is the lack of data on spousal characteristics, especially the husband's attitudes toward family planning. Fertility and contraceptive decisions are often shaped by both partners, and excluding these variables restricts a more holistic view of household dynamics. Including the partner's profile, such as communication patterns or support for contraceptive use, could have provided a more balanced view of how household relationships influence reproductive choices.

The study also does not account for intergenerational and family-level influences that often determine the timing of marriage, especially in rural or traditional settings. While it is discussed theoretically, having microdata on parental decision-making or household generational structures would have strengthened the analysis. For example, knowing whether marriage was arranged by parents or influenced by extended family could help assess how autonomy affects fertility outcomes.

Cultural and religious norms also significantly shape both marriage timing and reproductive behavior, but these influences are difficult to measure quantitatively and were not included in the dataset. This creates a crucial gap in how cultural norms impact this matter.

An additional limitation is the absence of caste-related data. In contexts like South Asia, caste plays an important role in shaping marriage practices and access to reproductive health resources. The inability to analyze caste-based differences in this issue, which often interact with socioeconomic factors, fails to provide a detailed analysis.

Lastly, the study relies on self-reported data, which might not always be accurate. Since topics like age at marriage and contraceptive use are sensitive, especially where early marriage is

discouraged or family planning is encouraged, some women may give answers they think are more acceptable. This can lead to underreporting the timing of marriage or overstating contraceptive use, affecting how trustworthy the results are.

7 Conclusion and Considerations

Delayed Marriage but Low Contraceptive Use

My analysis reveals that women in Bangladesh who marry at older ages tend to have fewer children, indicating that delayed marriage plays a strong role in reducing fertility. However, these women are also less likely to use modern contraception, suggesting that while fertility is falling naturally, access to or demand for family planning services may still be limited for this group. This study suggests that an integrated approach that combines delayed marriage initiatives with targeted reproductive health education and voluntary contraceptive counseling may be beneficial. For instance, Ethiopia's Health Extension Program has effectively utilized community health workers to provide complete reproductive health education and services, leading to increased contraceptive use in rural areas (Assefa et al., 2019). Bangladesh's efforts, such as the Quality Family Planning (QFP) project implemented by Ipas, have focused on improving the quality and accessibility of family planning services (Chowdhury et al., 2021). Building upon these programs by incorporating community-based outreach and education can ensure that all women, including those marrying later, have the necessary information and resources to make informed reproductive choices.

The Government of Bangladesh has taken steps, such as the Child Marriage Restraint Act 2017, which sets the minimum age of marriage at 18 years for women and 21 for boys. It works alongside development partners like UNFPA to implement the Adolescent Health and Wellbeing Strategy (2017-2030), which promotes awareness and youth-friendly health services (UNFPA, 2022). Despite these efforts, early marriage remains existence, especially in rural areas, due to poverty and social norms. The government might explore the potential of should conditional cash transfer (CCT) program that provides financial incentives to families who keep their daughters unmarried and enrolled in school until age 18, as suggested by evidence from a similar program (Krishnan et al., 2014). Similar schemes, such as Malawi's Zomba Cash Transfer Program, have shown success in delaying marriage and increasing school retention among girls (Baird et al., 2012). Introducing a localized CCT scheme in Bangladesh could

strengthen current initiatives by directly addressing economic pressure and engaging families in the process of change.

Education and Rural Fertility Gaps

My results also highlight that women who marry later and have a higher level of education tend to have fewer children. Also, women from rural areas are more likely to have higher fertility. These findings highlight that education and place of residence play a major role in determining fertility outcomes in Bangladesh. The government of Bangladesh has taken several steps to promote girls' education through programs like the Secondary Education Sector Investment Program (SESIP) and the Reaching Out of School Children (ROSC) project, which help improve the quality of education, efficiency in primary education for the disadvantage students, especially in rural and marginalized areas (Asadullah, 2016; Bhatta et al., 2019). These initiatives are important because increasing education levels directly imply later marriage and lower fertility rates. However, access to education and awareness in remote rural regions, especially in areas like Bandarban, Rangamati, and Khagrachhari, remains limited. Bangladesh's Government can look at how Ethiopia's Girls' Education Challenge program (Ahmed, 2016) and Uganda's Health Action Project (Boydell et al., 2018) combined education support with nutrition and reproductive health messaging, successfully reducing early marriage and improving family planning behaviors. Based on these findings, implementing family planning education within the school curriculum and expanding mobile outreach services in rural areas to ensure women receive both formal education and reproductive health awareness alongside formal education.

Later Marriage and Contraceptive Uptake

Findings from my analysis also show that married women who entered marriage at or after the age of 18 are significantly less likely to use modern contraceptive methods compared to those who married earlier. This seeks to highlight the importance of enhancing contraceptive uptake among women in Bangladesh. Bangladesh has undertaken several initiatives to improve family planning services. The Family Planning Strategy for the Rohingya Refugee Humanitarian Crisis focuses on boosting the use of modern contraceptives through community outreach and health facility services for women and girls in both Rohingya and host communities (United Nations, 2023). Additionally, the Social Marketing Company (SMC) has been instrumental in providing to boost the health and well-being of women, children, and families through social marketing

of products and better services across the country (Hasan, 2016). Bangladesh could consider adopting successful models from other developing countries to further enhance contraceptive use. For instance, Nepal's Family Planning Service Strengthening Program (FPSSP) focuses on increasing access to and using quality family planning services, specifically among populations with high unmet needs (Kabra et al., 2022). Bangladesh should start implementing these approaches, which can help to strengthen its family planning programs.

Urban-Rural Inequality in Contraceptive Access

While one of my hypotheses about the urban-rural difference in contraceptive use among married women after 18 was not statistically supported, the result still highlights an important issue: access and choices of contraceptives vary between urban and rural areas. Rural women may still face limited access or social barriers, even when marrying later. In Bangladesh, the Community Clinic Project and the National Population Policy aim to bring reproductive health services closer to rural populations (El-Saharty, et al., 2014; Riaz *et al.*, 2020). The Operational Plan for Family Planning (2021-2025) under the Ministry of Health is another major step, focusing on training health workers and distributing modern contraceptives through field-level services. However, challenges remain due to the provider shortages, weak follow-up, and low awareness. To strengthen these efforts, Bangladesh can consider learning from Rwanda's home-based contraceptive delivery model, where trained community health workers regularly visit homes and distribute methods, which has significantly improved rural uptake (Nishimwe and Mchunu, 2022). Similarly, Indonesia's Kampung KB (Family Planning Villages) combines family planning with education and economic support for rural women (Idris et al., 2021), which could be adapted for Bangladesh's union councils. Moreover, mobile health (mHealth) platforms can also help rural women access information anonymously and safely, a model used effectively in Kenya's 'm4RH' (mobile for reproductive health) program (Maina, 2010). Improving service delivery and localized outreach will help ensure rural women, regardless of marriage age, have better contraceptive access and autonomy like urban women.

References

Adebowale, S.A. et al. (2014) 'Differential effect of wealth quintile on modern contraceptive use and fertility: evidence from Malawian women', *BMC Women's Health*, 14, p. 40. Available at: <https://doi.org/10.1186/1472-6874-14-40>.

Adhikari, S., Lutz, W. and K. C., S. (2023) Rural/urban fertility differentials in the Global South: Is female education the key driver of declining birth rates? Laxenburg, Austria: WP-23-004. Available at: <https://pure.iiasa.ac.at/id/eprint/18729/>, <https://iiasa.dev.local/> (Accessed: 17 April 2025).

Ahmed, A. (2016) AN ASSESSMENT OF THE FACTORS CONTRIBUTING TO THE EDUCATIONAL BACKWARDNESS OF RURAL GIRLS IN AFAR REGION: THE CASE OF AYSAITA AND AMIBERA WOREDAS. Thesis. St. Mary's University. Available at: <http://repository.smuc.edu.et/handle/123456789/1247> (Accessed: 1 May 2025).

Ahmed, A.U. (1986) 'Socioeconomic Determinants of Age at First Marriage in Bangladesh', *Journal of Biosocial Science*, 18(1), pp. 35–42. Available at: <https://doi.org/10.1017/S0021932000006477>.

Akram, R. et al. (2020) 'Factors associated with unmet fertility desire and perceptions of ideal family size among women in Bangladesh: Insights from a nationwide Demographic and Health Survey', *PLOS ONE*, 15(5), p. e0233634. Available at: <https://doi.org/10.1371/journal.pone.0233634>.

Akter, R. (2020) 'Contraceptive Use among Slum Women in Slums of Dhaka City', *American International Journal of Social Science Research*, 5(3), pp. 29–35. Available at: <https://doi.org/10.46281/aijssr.v5i3.667>.

Antu, J.F. et al. (2022) 'Effect of Rural-Urban Migration on Age at Marriage Among Adolescent Girls in Bangladesh', *Frontiers in Public Health*, 10, p. 840145. Available at: <https://doi.org/10.3389/fpubh.2022.840145>.

Arends-Kuenning, M. and Amin, S. (2001) 'Women's Capabilities and the Right to Education in Bangladesh', *International Journal of Politics, Culture, and Society*, 15(1), pp. 125–142. Available at: <https://doi.org/10.1023/A:1011124018138>.

Asadullah, M.N. (2016) 'Do Pro-Poor Schools Reach Out to the Poor? Location Choice of BRAC and ROSC Schools in Bangladesh', *Australian Economic Review*, 49(4), pp. 432–452. Available at: <https://doi.org/10.1111/1467-8462.12180>.

Assefa, Y. et al. (2019) 'Community health extension program of Ethiopia, 2003–2018: successes and challenges toward universal coverage for primary healthcare services', *Globalization and Health*, 15(1), p. 24. Available at: <https://doi.org/10.1186/s12992-019-0470-1>.

Avogo, W.A. and Somefun, O.D. (2019) 'Early Marriage, Cohabitation, and Childbearing in West Africa', *Journal of Environmental and Public Health*, 2019, p. 9731756. Available at: <https://doi.org/10.1155/2019/9731756>.

Baird, S.J. et al. (2012) 'Effect of a cash transfer programme for schooling on prevalence of HIV and herpes simplex type 2 in Malawi: a cluster randomised trial', *The Lancet*, 379(9823), pp. 1320–1329. Available at: [https://doi.org/10.1016/S0140-6736\(11\)61709-1](https://doi.org/10.1016/S0140-6736(11)61709-1).

Bangladesh - Demographic and Health Survey (2022). Available at: <https://microdata.worldbank.org/index.php/catalog/6290> (Accessed: 21 April 2025).

Bangladesh government steps up efforts to end child marriage, reaching over 6 million nationwide, supported by UNFPA and UNICEF (2024). Available at: <https://www.unicef.org/bangladesh/en/press-releases/bangladesh-government-steps-efforts-end-child-marriage-reaching-over-6-million> (Accessed: 16 April 2025).

Belachew, T.B. et al. (2023) 'Prevalence of married women's decision-making autonomy on contraceptive use and its associated factors in high fertility regions of Ethiopia: a multilevel analysis using EDHS 2016 data', *BMC Public Health*, 23(1), p. 83. Available at: <https://doi.org/10.1186/s12889-023-15009-y>.

Bhatta, S.D. et al. (2019) Bangladesh Education Sector Public Expenditure Review. World Bank. Available at: <https://doi.org/10.1596/35956>.

Bhowmik, J. et al. (2024) 'Women's decision-making power can influence modern contraceptive use: Evidence from Bangladesh', *The International Journal of Health Planning and Management*, 39(5), pp. 1503–1515. Available at: <https://doi.org/10.1002/hpm.3822>.

Bhowmik, J., Biswas, R.K. and Hossain, S. (2021) 'Child Marriage and Adolescent Motherhood: A Nationwide Vulnerability for Women in Bangladesh', *International Journal of Environmental Research and Public Health*, 18(8), p. 4030. Available at: <https://doi.org/10.3390/ijerph18084030>.

Boserup, E. (1989) 'Population, the Status of Women, and Rural Development', *Population and Development Review*, 15, pp. 45–60. Available at: <https://doi.org/10.2307/2807921>.

Boydell, V. et al. (2018) 'Closing the gap between people and programs: lessons from implementation of social accountability for family planning and reproductive health in Uganda', *African Journal of Reproductive Health*, 22(1), pp. 73–84.

Budu, E. et al. (2021) 'Child Marriage and Sexual Autonomy among Women in Sub-Saharan Africa: Evidence from 31 Demographic and Health Surveys', *International Journal of Environmental Research and Public Health*, 18(7), p. 3754. Available at: <https://doi.org/10.3390/ijerph18073754>.

'Changes in Age at Marriage, Birth Order, and Fertility Preference: A Study on a Flood Prone Area in Bangladesh' (2018) *Romanian Journal of Population Studies*, 12(1), pp. 71–102.

Chaudhury, R.H. (1977) 'Education and Fertility in Bangladesh', *The Bangladesh Development Studies*, 5(1), pp. 81–110.

Chaudhury, R.H. (1984) 'The influence of female education, labor force participation, and age at marriage on fertility behavior in Bangladesh', *Social Biology*, 31(1–2), pp. 59–74. Available at: <https://doi.org/10.1080/19485565.1984.9988562>.

UNFPA, Child marriage (2022) UNFPA-Bangladesh. Available at: <https://bangladesh.unfpa.org/en/topics/child-marriage> (Accessed: 1 May 2025).

Chowdhury, M.E. et al. (2021) 'Assessment of Ipas Initiatives for Promoting Long-acting Reversible Contraceptive and Permanent method'.

Colleran, H. et al. (2015) 'Fertility decline and the changing dynamics of wealth, status and inequality', *Proceedings of the Royal Society B: Biological Sciences*, 282(1806), p. 20150287. Available at: <https://doi.org/10.1098/rspb.2015.0287>.

Conner, M. (2020) 'Theory of Planned Behavior', in *Handbook of Sport Psychology*. John Wiley & Sons, Ltd, pp. 1–18. Available at: <https://doi.org/10.1002/9781119568124.ch1>.

Couch, K.A., Daly, M.C. and Zissimopoulos, J.M. (2013) *Lifecycle Events and Their Consequences: Job Loss, Family Change, and Declines in Health*. Stanford University Press.

UNICEF, Data on the situation of children in Bangladesh | UNICEF Bangladesh (2020). Available at: <https://www.unicef.org/bangladesh/en/data-situation-children-bangladesh> (Accessed: 9 April 2025).

Elder Jr., G.H. (1998) 'The Life Course as Developmental Theory', *Child Development*, 69(1), pp. 1–12. Available at: <https://doi.org/10.1111/j.1467-8624.1998.tb06128.x>.

El-Saharty, S., Zunaïd-Ahsan, K. and May, J.F. (2014) *Population, Family Planning and Reproductive Health Policy Harmonization in Bangladesh*. Working paper. Washington, D.C.: The World Bank. Available at: <https://doi.org/10.11588/xarep.00003685>.

Fagbamigbe, A.F., Afolabi, R.F. and Idemudia, E.S. (2018) 'Demand and Unmet Needs of Contraception Among Sexually Active In-Union Women in Nigeria: Distribution, Associated Characteristics, Barriers, and Program Implications', *SAGE Open*, 8(1), p. 2158244017754023. Available at: <https://doi.org/10.1177/2158244017754023>.

Faroque, O. and Amin, R. (2017) 'Demographic and Socio-economic Determinants of Age at First Marriage of Women in Bangladesh: An Analysis'.

Fujii, T. and Shonchoy, A.S. (2020) 'Fertility and rural electrification in Bangladesh', *Journal of Development Economics*, 143, p. 102430. Available at: <https://doi.org/10.1016/j.jdeveco.2019.102430>.

Godha, D., Hotchkiss, D.R. and Gage, A.J. (2013) 'Association Between Child Marriage and Reproductive Health Outcomes and Service Utilization: A Multi-Country Study From South Asia', *Journal of Adolescent Health*, 52(5), pp. 552–558. Available at: <https://doi.org/10.1016/j.jadohealth.2013.01.021>.

Goni, A. and Rahman, M. (2012) 'The impact of education and media on contraceptive use in Bangladesh: a multivariate analysis', *International Journal of Nursing Practice*, 18(6), pp. 565–573. Available at: <https://doi.org/10.1111/ijn.12013>.

Goorha, P. (2010) 'Modernization Theory', in *Oxford Research Encyclopedia of International Studies*. Available at: <https://doi.org/10.1093/acrefore/9780190846626.013.266>.

Hackman, J. and Hruschka, D. (2020) 'Disentangling wealth effects on fertility in 64 low- and middle-income countries', *Evolutionary Human Sciences*, 2, p. e58. Available at: <https://doi.org/10.1017/ehs.2020.62>.

Haq, I. (2018) 'Relationship Between Age at Marriage, Education and Fertility Among Residence of Bangladesh', *American Journal of Social Science Research* [Preprint]. Available at: https://www.academia.edu/43613111/Relationship_Between_Age_at_Marriage_Education_and_Fertility_Among_Residence_of_Bangladesh (Accessed: 25 April 2025).

Haq, I., Sakib, S. and Talukder, A. (2017) 'Sociodemographic Factors on Contraceptive Use among Ever-Married Women of Reproductive Age: Evidence from Three Demographic and Health Surveys in Bangladesh', *Medical Sciences*, 5(4), p. 31. Available at: <https://doi.org/10.3390/medsci5040031>.

Hasan, M. (2016) 'Social marketing in Bangladesh: status, prospects and barriers', *International Journal of Society Systems Science*, 8(2), pp. 171–184. Available at: <https://doi.org/10.1504/IJSSS.2016.077004>.

- Hasan, M.R. et al. (2025) 'Investigating the Impact of Primary Education on Birth Control Practices in Bangladesh: A Primary Study'. Available at: <https://asidejournals.com/index.php/internal-medicine/article/view/29> (Accessed: 16 April 2025).
- Hertrich, V. (2017) 'Trends in Age at Marriage and the Onset of Fertility Transition in sub-Saharan Africa', *Population and Development Review*, 43, pp. 112–137.
- Hossain, M. et al. (2018) 'Identifying factors influencing contraceptive use in Bangladesh: evidence from BDHS 2014 data', *BMC Public Health*, 18(1), p. 192. Available at: <https://doi.org/10.1186/s12889-018-5098-1>.
- Hossain, M.A. et al. (2025) 'Socio-demographic determinants of sexual inactivity among reproductive married women in Bangladesh: Evidence of BDHS data 2022'. Research Square. Available at: <https://doi.org/10.21203/rs.3.rs-5823750/v1>.
- Hossain, S., Akter, T., Mohsin, M., Islam, M.M., et al. (2024) 'Contraceptive uses among married women in Bangladesh: a systematic review and meta-analyses', *Journal of Health, Population, and Nutrition*, 43(1), p. 10. Available at: <https://doi.org/10.1186/s41043-024-00502-w>.
- Hossain, S., Akter, T., Mohsin, M., Islam, Md.M., et al. (2024) 'Contraceptive uses among married women in Bangladesh: a systematic review and meta-analyses', *Journal of Health, Population and Nutrition*, 43(1), p. 10. Available at: <https://doi.org/10.1186/s41043-024-00502-w>.
- Huinink, J. and Kohli, M. (2014) 'A life-course approach to fertility', *Demographic Research*, 30, pp. 1293–1326.
- Idris, U. et al. (2021) 'Family planning (KB) practices and the impact on Papuan women reproductive health', *Gaceta Sanitaria*, 35, pp. S479–S482. Available at: <https://doi.org/10.1016/j.gaceta.2021.10.076>.
- Islam, A.Z. et al. (2016) 'Prevalence and Determinants of Contraceptive use among Employed and Unemployed Women in Bangladesh', *International Journal of MCH and AIDS*, 5(2), pp. 92–102. Available at: <https://doi.org/10.21106/ijma.83>.
- Islam, Md.A. and Rahman, A. (2020) 'Age at first marriage and fertility in developing countries: A meta analytical view of 15 Demographic and Health Surveys', *Clinical Epidemiology and Global Health*, 8(3), pp. 775–779. Available at: <https://doi.org/10.1016/j.cegh.2020.01.018>.
- Islam, Md.K., Haque, Md.R. and Hema, P.S. (2020) 'Regional variations of contraceptive use in Bangladesh: A disaggregate analysis by place of residence', *PLoS ONE*, 15(3), p. e0230143. Available at: <https://doi.org/10.1371/journal.pone.0230143>.
- Islam, M.M., Rob, U. and Chakroborty, N. (2003) 'Regional variations in fertility in Bangladesh', *Genus*, 59(3/4), pp. 103–145.
- Islam, R., Islam, A.Z. and Rahman, M. (2013) 'Unmet Need for Family Planning: Experience from Urban and Rural Areas in Bangladesh', *Public Health Research*, 3(3), pp. 37–42.
- Islam, S. (2014) 'Female Age at Marriage of Rural-Urban Areas in Bangladesh: An Evaluation', 3(2).
- Islam, S. and Nesa, M.K. (2009) 'FERTILITY TRANSITION IN BANGLADESH: THE ROLE OF EDUCATION'.

Jain, A. et al. (2019) 'Stigma as a barrier to family planning use among married youth in Ethiopia', *Journal of Biosocial Science*, 51(4), pp. 505–519. Available at: <https://doi.org/10.1017/S0021932018000305>.

Kabra, R. et al. (2022) 'Improving access to quality family planning services in Nepal and Sri Lanka: insights from a South-South learning exchange', *BMJ Global Health*, 7(5). Available at: <https://doi.org/10.1136/bmjgh-2022-008691>.

Khan, H.T.A. and Raeside, R. (1994) 'Urban and rural fertility in Bangladesh: A causal approach', *Social Biology*, 41(3–4), pp. 240–251. Available at: <https://doi.org/10.1080/19485565.1994.9988875>.

Khan, M.N. et al. (2024) 'Exploring the impact of perceived early marriage on women's education and employment in Bangladesh through a mixed-methods study', *Scientific Reports*, 14(1), p. 21683. Available at: <https://doi.org/10.1038/s41598-024-73137-w>.

Kibria, G.M.A. et al. (2016) 'Factors affecting contraceptive use among married women of reproductive age in Bangladesh', *Journal of Molecular Studies and Medicine Research*, 2(1), pp. 70–79. Available at: <https://doi.org/10.18801/jmsmr.020116.09>.

Kiene, S.M. et al. (2014) 'An empirical test of the Theory of Planned Behaviour applied to contraceptive use in rural Uganda', *Journal of Health Psychology*, 19(12), pp. 1564–1575. Available at: <https://doi.org/10.1177/1359105313495906>.

Kirk, D. (1996) 'Demographic Transition Theory', *Population Studies*, 50(3), pp. 361–387. Available at: <https://doi.org/10.1080/0032472031000149536>.

Krishnan, A. et al. (2014) "“No one says ‘No’ to money” – a mixed methods approach for evaluating conditional cash transfer schemes to improve girl children's status in Haryana, India", *International Journal for Equity in Health*, 13, p. 11. Available at: <https://doi.org/10.1186/1475-9276-13-11>.

Kundu, Satyajit et al. (2022) 'Prevalence and determinants of contraceptive method use among Bangladeshi women of reproductive age: a multilevel multinomial analysis', *BMC Public Health*, 22(1), p. 2357. Available at: <https://doi.org/10.1186/s12889-022-14857-4>. Launch of the Family Planning Strategy for Rohingya Refugees | United Nations in Bangladesh (2023). Available at: <https://bangladesh.un.org/en/219478-launch-family-planning-strategy-rohingya-refugees>, <https://bangladesh.un.org/en/219478-launch-family-planning-strategy-rohingya-refugees> (Accessed: 1 May 2025).

Mahmud, Md.N. and Mumin, K.M.A. (2024) 'Socioeconomic and Demographic Factors: Scenario of Fertility Differentials in Bangladesh', in M. Pal et al. (eds) *Public Health and Nutrition: The South Asian and Southeast Asian Landscape*. Singapore: Springer Nature, pp. 319–337. Available at: https://doi.org/10.1007/978-981-97-7890-4_22.

Maina, M.N. (2010) *Towards a model for mobile phone technology adoption in reproductive health in Kenya-a case of mobile for reproductive health (M4RH)*. Thesis. University of Nairobi, Kenya. Available at: <http://erepository.uonbi.ac.ke/handle/11295/5584> (Accessed: 1 May 2025).

Mannan, M.A. (1989) 'Family, Society, Economy and Fertility in Bangladesh', *The Bangladesh Development Studies*, 17(3), pp. 67–99.

Marphatia, A.A., Ambale, G.S. and Reid, A.M. (2017) 'Women's Marriage Age Matters for Public Health: A Review of the Broader Health and Social Implications in South Asia', *Frontiers in Public Health*, 5. Available at: <https://doi.org/10.3389/fpubh.2017.00269>.

Mim, M.S., Rahaman, L. and Sajib, A.H. (2025) 'Generalized Linear Mixed Model Approach for Analyzing Water, Sanitation, and Hygiene Facilities in Bangladesh: Insights from BDHS 2022 Data'. medRxiv, p. 2025.01.19.25320801. Available at: <https://doi.org/10.1101/2025.01.19.25320801>.

Mitra, M.P. et al. (2020) Does Child Marriage Matter for Growth? International Monetary Fund.

Mohsena, M. and Kamal, N. (2014) 'Determinants of Contraceptive Use in Bangladesh', Ibrahim Medical College Journal, 8(2), pp. 34–40. Available at: <https://doi.org/10.3329/imcj.v8i2.26676>.

Mostafa Kamal, S.M. and Aynul Islam, M. (2010) 'Contraceptive Use: Socioeconomic Correlates and Method Choices in Rural Bangladesh', Asia Pacific Journal of Public Health, 22(4), pp. 436–450. Available at: <https://doi.org/10.1177/1010539510370780>.

Moushumi, N.S. et al. (2025) 'Prevalence and Risk Factors of Malnutrition among Women of Reproductive Age in Bangladesh: A Secondary Data Analysis of BDHS 2022', Bioresearch Communications - (BRC), 11(01), pp. 1711–1727. Available at: <https://doi.org/10.3329/brc.v11i1.78885>.

Munshi, K. and Myaux, J. (2006) 'Social norms and the fertility transition', Journal of Development Economics, 80(1), pp. 1–38. Available at: <https://doi.org/10.1016/j.jdeveco.2005.01.002>.

Murphy, E. (2004) 'Diffusion of innovations: family planning in developing countries', Journal of Health Communication, 9 Suppl 1, pp. 123–129. Available at: <https://doi.org/10.1080/10810730490271566>.

Musa Khan, Md., Emdad Hossain, M. and Nazmul Hoq, M. (2012) 'Determinants of Contraception Use among Female Adolescents in Bangladesh', Asian Social Science, 8(12), p. p181. Available at: <https://doi.org/10.5539/ass.v8n12p181>.

NIPORT/Bangladesh, N.I. of P.R. and T.-, Associates/Bangladesh, M. and and Macro, O.R.C. (2005) 'Bangladesh Demographic and Health Survey 2004'. Available at: <https://dhsprogram.com/publications/publication-fr165-dhs-final-reports.cfm> (Accessed: 9 April 2025).

Nishimwe, C. and Mchunu, G.G. (2022) 'Exploring health provider's knowledge on the home-based maternal and neonatal health care package in Rwanda', BMC Pregnancy and Childbirth, 22(1), p. 107. Available at: <https://doi.org/10.1186/s12884-022-04435-2>.

Nyrop, R.F. (1975) Area Handbook for Bangladesh. U.S. Government Printing Office.

Onagoruwa, A. and Wodon, Q. (2018) 'MEASURING THE IMPACT OF CHILD MARRIAGE ON TOTAL FERTILITY: A STUDY FOR FIFTEEN COUNTRIES', Journal of Biosocial Science, 50(5), pp. 626–639. Available at: <https://doi.org/10.1017/S0021932017000542>.

Oppenheimer, V.K. (1988) 'A Theory of Marriage Timing', American Journal of Sociology, 94(3), pp. 563–591. Available at: <https://doi.org/10.1086/229030>.

Paul, B.K. (1990) 'Contraceptive Intention Behavior in Rural Bangladesh: Factors in the Diffusion of an Innovation', Economic Geography, 66(2), pp. 123–139. Available at: <https://doi.org/10.2307/143742>.

Akif Tanzim Hamza, Analyzing Bangladesh's Population Dynamics: Trends, Determinants, and Challenges from 1950 to 2025 (2025) ResearchGate. Available at: <https://doi.org/10.13140/RG.2.2.17539.62247>.

Sabina Islam, Fertility transition in Bangladesh: The role of education (2009). Available at: https://www.researchgate.net/publication/228652514_Fertility_transition_in_Bangladesh_The_role_of_education (Accessed: 16 April 2025).

Kumar Tapan, Income Diversification of Rural Households in Bangladesh (2022-23)' (2024) ResearchGate [Preprint]. Available at: <https://doi.org/10.38124/ijisrt/IJISRT24JUN1500>.

Jalandhar Pradhan, Why Unmet Need for Family Planning Remains High in Bangladesh: A Community Level Analysis' (2015) ResearchGate [Preprint]. Available at: https://www.researchgate.net/publication/289686942_Why_Unmet_Need_for_Family_Planning_Remains_High_in_Bangladesh_A_Community_Level_Analysis (Accessed: 17 April 2025).

Psaki, S.R. et al. (2019) 'Causal effects of education on sexual and reproductive health in low and middle-income countries: A systematic review and meta-analysis', *SSM - Population Health*, 8, p. 100386. Available at: <https://doi.org/10.1016/j.ssmph.2019.100386>.

Rahman, M.M. and Kabir, M. (2005) 'Do adolescents support early marriage in Bangladesh? Evidence from study', *JNMA; journal of the Nepal Medical Association*, 44(159), pp. 73–78.

Rashid, S. and Islam, M.Z.A. (2023) 'Fading Futures: Understanding the Connection of Early Marriage, Child Rights Violations, and Abusive Behaviors'.

Riaz, B.K. et al. (2020) 'Community clinics in Bangladesh: A unique example of public-private partnership', *Heliyon*, 6(5). Available at: <https://doi.org/10.1016/j.heliyon.2020.e03950>.

Roy, S. and Hossain, S.M.I. (2017) 'Fertility differential of women in Bangladesh demographic and health survey 2014', *Fertility Research and Practice*, 3(1), p. 16. Available at: <https://doi.org/10.1186/s40738-017-0043-z>.

Saha, U.R. and Bairagi, R. (2007) 'Inconsistencies in the Relationship between Contraceptive Use and Fertility in Bangladesh', *International Family Planning Perspectives*, 33(1), pp. 31–37.

Sahu, B. and Hutter, I. (2012) "'Lived Islam" in India and Bangladesh: negotiating religion to realise reproductive aspirations', *Culture, Health & Sexuality* [Preprint]. Available at: <https://www.tandfonline.com/doi/abs/10.1080/13691058.2012.672652> (Accessed: 24 April 2025).

Schuler, S.R. et al. (2006) 'The timing of marriage and childbearing among rural families in Bangladesh: Choosing between competing risks', *Social Science & Medicine*, 62(11), pp. 2826–2837. Available at: <https://doi.org/10.1016/j.socscimed.2005.11.004>.

Shabuz, Z.R. et al. (2022) 'Link between unmet need and economic status in Bangladesh: gap in urban and rural areas', *BMC Women's Health*, 22(1), p. 176. Available at: <https://doi.org/10.1186/s12905-022-01752-8>.

Simmons, R. (1996) 'Women's Lives in Transition: A Qualitative Analysis of the Fertility Decline in Bangladesh', *Studies in Family Planning*, 27(5), pp. 251–268. Available at: <https://doi.org/10.2307/2137997>.

Streatfield, P.K. et al. (2015) 'Early marriage in Bangladesh: Not as early as it appears', *Asian Population Studies*, 11(1), pp. 94–110. Available at: <https://doi.org/10.1080/17441730.2015.1012785>.

Subedi, R., Jahan, I. and Baatsen, P. (2018) 'Factors Influencing Modern Contraceptive Use among Adolescents in Nepal', *Journal of Nepal Health Research Council*, 16(3), pp. 251–256.

‘The impact of marriage timing on women’s agency: Evidence from rural Bangladesh’ (2024) IFPRI, 22 January. Available at: <https://www.ifpri.org/blog/impact-marriage-timing-womens-agency-evidence-rural-bangladesh/> (Accessed: 21 May 2025).

Salauddin, The impact of marriage timing on women’s agency: Evidence from rural Bangladesh (2024) IFPRI. Available at: <https://www.ifpri.org/blog/impact-marriage-timing-womens-agency-evidence-rural-bangladesh/> (Accessed: 8 May 2025).

Todaro, M.P. and Smith, S.C. (2009) *Economic Development*. Pearson Education.

Uddin, M.E. (2015) ‘Family socio-cultural values affecting early marriage between Muslim and Santal communities in rural Bangladesh’, *International Journal of Sociology and Social Policy*, 35(3/4), pp. 141–164. Available at: <https://doi.org/10.1108/IJSSP-06-2014-0046>.

Uddin, M.M. et al. (1985) ‘Rural-urban differential in contraceptive use status in Bangladesh’, *Rural Demography*, 12(1–2), pp. 1–20.

Zettermark, S. (2024) “‘They all of a sudden became new people’”: Using reproductive justice to explore narratives of hormonal contraceptive experience in Sweden’, *European Journal of Women’s Studies*, 31(1), pp. 52–71. Available at: <https://doi.org/10.1177/13505068241230821>.

