The Nexus Between Early Marriage and Repeat Adolescent Pregnancy in Kenya: Evidence From the 2022 KDHS

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Abstract

Adolescent pregnancy and early marriage represent two of the most significant hindrances to the empowerment and well-being of young girls globally, especially in developing countries. However, previous research is vaguely opaque as to the relationship between repeated adolescent pregnancy and early marriage occurrence in developing country settings. In this study, I explore the hypothesized positive relationship between repeat adolescent pregnancy and early marriage occurrence in Kenya. Using data from the sampling survey KDHS 2022, the prevalence of repeat pregnancy and rapid repeat pregnancy (within 24 months) among adolescents in Kenya is determined. Structural Equation Modeling (SEM) is performed to analyze the direct relationship between repeat adolescent pregnancy and early marriage occurrence in Kenya.

The study sample was women aged 15-24 and considered pregnancies that occurred during adolescence. Repeat adolescent pregnancy prevalence stood at 5% of all adolescent pregnancies, with 20% of these occurring within 24 months of each other. The SEM model revealed a significant negative relationship between repeat adolescent pregnancy and early marriage occurrence. Early marriage, by itself, was less likely to increase the likelihood of repeat adolescent pregnancy occurrence. However, through higher education, adolescent girls were more likely to avoid early marriage, thus lowering the likelihood of adolescent (and repeat) pregnancy. These findings underscore the importance of understanding the interplay between repeat adolescent pregnancy and early marriage for the improvement of reproductive health outcomes, thus promoting gender equality and sustainable socio-economic development in Kenya. They also serve as a call to action for policymakers and researchers to continue their efforts in this area.

Keywords: *adolescent pregnancy, early marriage, repeat adolescent pregnancy*.

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Introduction

The World Health Organization defines adolescence as a phase of life between childhood and adulthood – between the ages of 10 to 19 (WHO, 2019). This is a pivotal period in a girl's life with immense opportunities for learning, growth, and self-discovery. Unfortunately, many adolescent girls end up facing severe challenges during this phase of life, challenges whose consequences are long-lasting. Adolescence marks the beginning of womanhood in females, with rapid physical changes such as menstruation and secondary sexual development of the human body. Without proper knowledge and information or even a support system, these changes can be daunting to an adolescent girl. Psychologically, adolescence is a time of identity formation and emotional exploration; a period where body image concerns, fueled by societal and peer pressure, may arise and propagate conflict and confusion among adolescent girls. Many adolescent girls fall into the temptation of sexual exploration that significantly affects their young livelihoods. Sexual intercourse among young adolescent girls results in adolescent pregnancies, a phenomenon oscillating about a myriad of causes and consequences.

Adolescent pregnancy and early marriage represent two of the most significant hindrances to the empowerment and well-being of young girls globally, especially in developing countries. Globally, adolescent child births constitute 11 percent of all maternal deliveries, and about 23 percent of the overall burden of disability and ill health are as results of pregnancy and childbirth (Holness, 2014). Reducing unintended adolescent pregnancy stands as an important target for the Sustainable Development Goals (SDGs) and the Millennium Development Goals (MDGs). This was made a global priority at the International Conference on Population and Development (ICPD) 2019 (UNFPA, 2020). In low- and middle-income countries, over 30% of girls marry before they are 18 years of age; around 14% before the age of 15.

Pregnancy during adolescence is challenging both to the adolescent mother and their support system. There are health risks, disruption of education and economic consequences associated with it. Early marriage, on the other hand, is seen both as a driver and consequence of adolescent pregnancy (Menon et al, 2018). It exacerbates the risks associated with adolescent pregnancy while causing new ones. The high prevalence of adolescent pregnancy and early marriage across developing countries is a main reason for joint intervention targeting both occurrences, given their similar cause and effect characteristics.

This study endeavors to study the relationship that potentially exists between repeat adolescent pregnancy occurrence and early marriage occurrence within the developing country context in

Kenya. Studying this relationship is vital for promoting gender equality, improving health and educational outcomes for adolescent girls and their offspring, and informing effective policy interventions.

Recent research around adolescent pregnancy and early marriage has highlighted the complex reciprocal influence of each on the other. Malhotra & Elnaggar (2014) discussed the role of cultural norms on early marriage and their impact on adolescent reproductive health. They discussed how early marriage precedes childbearing, which thereafter reinforces the cycle of early marriage to next generations. Another study by Wodon et al. (2017) stated that adolescents from poorer socioeconomic backgrounds were more likely to marry early and experience pregnancies in the process, during adolescence. The author emphasized that girls who married early were more likely to experience adolescent pregnancy, thus worsening their economic disadvantage. Research on the relationship between early marriage and adolescent pregnancy is multifaceted and influenced by other external factors, some of which are still yet to be researched.

Problem Statement

As with early marriage, repeat adolescent pregnancy can have immediate and lasting consequences for young women's health, education, and income-earning potential, which are often passed on to her offspring. As such, it alters the course of young women's entire life. Adolescent pregnancy, especially rapid repeat adolescent pregnancy in low- and middle-income countries, present a severe impediment to development. The risk factors that are the key significant predictors of RRP are still subject of much research (Boardman et al., 2006). Notwithstanding, linkages between socio-demographic, behavioral factors, past life experiences, contraceptive and socioeconomic indices with repeat adolescent pregnancy are not well understood, as interaction among these factors are mostly not included in research on repeat adolescent pregnancy (Crittenden et al., 2009). However, previous research is vaguely opaque as to whether repeated adolescent pregnancy among adolescent girls is a problem in and of itself, or merely symptomatic of a deeper, ingrained disadvantage.

Despite the growing body of literature highlighting the adverse effects of early marriage and adolescent pregnancy, there remains a critical gap in understanding the specific relationship between early marriage and the incidence of repeat adolescent pregnancy. These two occurrences, though somehow correlated (Mehra et al., 2018) should be analyzed in terms of which one causes which with an intention to inform measures aimed at addressing both

occurrences. This study, therefore, aims to investigate how early marriage influences the likelihood of repeat adolescent pregnancy occurrence among adolescent girls in Kenya. By examining and outlining the interplay of socioeconomic and demographic factors, this study shall provide insights into the mechanisms that link early marriage to repeat adolescent pregnancies. Understanding this relationship is imperative in developing interventions and policies that promote the overall health and empowerment of adolescent girls for a better future.

Statistics Trends on Adolescent Pregnancy

Dating back to the 1960s, there were 90 births recorded in 1961 for every 1000 women aged 15-19, a statistic that remained relatively high till the 1970s when it reduced to 73 per 1000 adolescent girls in 1992. It continued to reduce with the onset of the new millennium age to 65 per 1000 in 2000. Since then, adolescent fertility worldwide has steadily declined – from 52 births per 1000 women (15-19 years) in 2010 to 43 births per 1000 women in 2021 (*World Bank Gender Data Portal*, (n.d.); UNDESA, 2022). According to this statistical report by the UN, Sub-Saharan Africa and the Latin America and Caribbean regions continue to experience slower adolescent fertility declines. It highlights that about 95 percent of the world's adolescent births take place within low- and middle-income countries (UN, 2019). A recent report by Statista (Dyvik, 2023) highlights West and Central Africa regions as having the highest adolescent birth rates globally. East and Southern Africa follow in second place with 96 births per 1000 adolescent girls in the area. Africa has a higher youthful population compared to any other continent. With a rising population in this region, the total number of adolescent girls giving birth is expected to continue rising as well. Niger, Mali, Angola, Mozambique, Guinea, Chad, and Cote d'Ivoire are some of the African countries with the highest adolescent pregnancy rates in sub-Saharan Africa (UN, 2019).
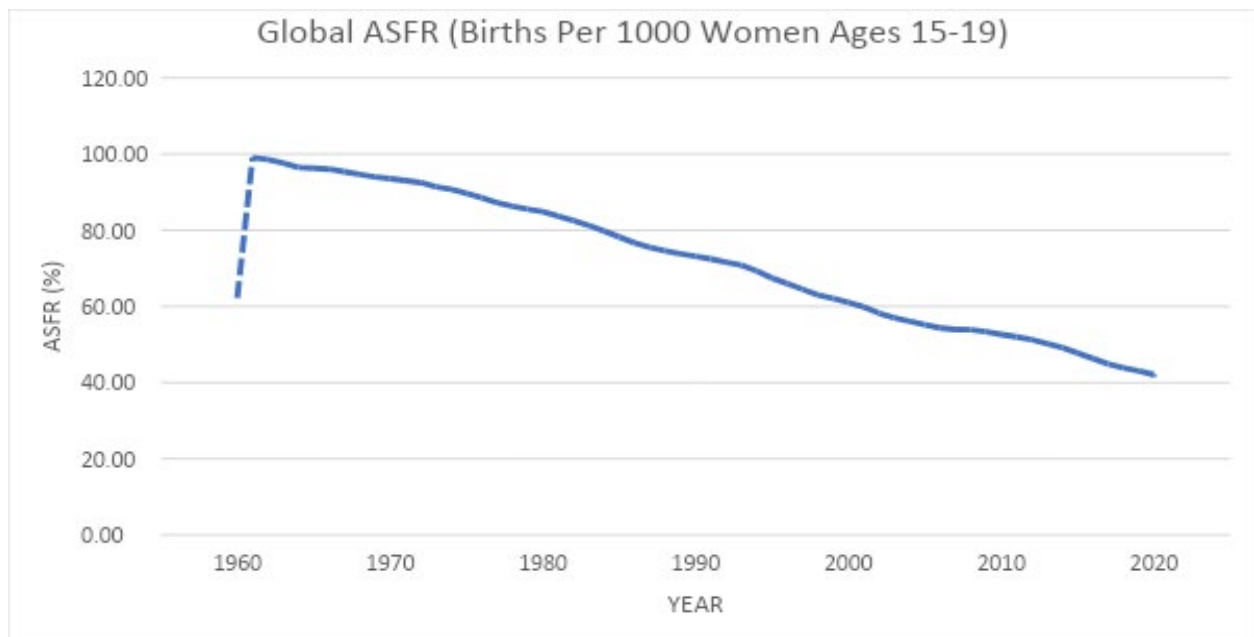
Figure 1: Trends in Adolescent fertility worldwide from 1960 to 2021. Source: World Bank[1]

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In the developing world, an estimated 21 million girls aged 15-19 become pregnant yearly, with about 12 million giving birth (Sully et al., 2019). If pregnancies are included, not just births, then the number of adolescent pregnancies is much higher, depicting the true magnitude of this problem.

The Enigma of Adolescent Fertility in sub-Saharan Africa

Since the 1994 International Conference on Population and Development, the protection of adolescents' sexual and reproductive health has been a social and policy priority for many governments and nongovernmental organizations in Sub-Saharan Africa. However, with persisting poverty facing many African countries, combined with the weakened cultural and religious gatekeepers, much of what was gained in the 1990s in promoting adolescent sexual and reproductive health in Africa has shown signs of reversal over time (Okonofua, 2007). While African governments view with concern the region's continued rapid population growth, high TFRs, and persistent HIV infection rate, there exists little to no political will to address the issue realistically and sustainably.

Adolescents are a critical cohort in shaping the sub-Saharan Africa fertility transition, according to Caldwell (1992). The African continent has a higher youthful population compared to any other continent. This means that adolescent pregnancy rates within the region

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[1] https://data.worldbank.org/indicator/SP.ADO.TFRT

would most likely increase further compared to other regions of the world. This projected increase in incidences of adolescent pregnancies is mostly going to be experienced in sub-Saharan Africa – Western, Central, Eastern, and Southern Africa - where the world's highest adolescent pregnancy and child marriage rates are highest (Petroni et al., 2017). This, in turn slows down the fertility transition by contributing to larger family sizes, perpetuating poverty, and exposing adolescent mothers (and their children) to adverse reproductive and health outcomes (Bongaarts, 2017).

 The causal factors for adolescent pregnancy are heterogeneous and differ amongst the different countries in the region. However, adolescent pregnancy mainly occurs when adolescents are exposed to vulnerable situations – socially, economically, physically, and mentally – at most. The vulnerability of these adolescent girls is thus transferred to their young ones and the incoming generation to an extent. This poses an unending loop of challenges and setbacks to the fight against adolescent pregnancy (Akella & Jordan, 2014).

As Garbett et al. (2021) stated, adolescent fertility and its dynamics have remained under-studied in sub-Saharan Africa. Existing research on adolescent fertility is limited by a lack of methodological advancement and excessive reliance on the age-specific fertility rate (ASFR) of women aged 15-19. This measure does not convey parity-specific information yet accounts for the fertility status of adolescents.

Although there is abundant data on the sexual and reproductive behaviors of older adolescents and young adults (aged 15–24) in Sub-Saharan Africa, little is known about younger adolescents (12–16 years). Among them, evidence from four countries in Sub-Saharan Africa suggests that a significant minority of young people aged 12–14 is already sexually active (Okonufa, 2007; Bankole et al., 2007). In addition, a sizable proportion of young people become sexually mature between the ages of 12 and 16, when females typically have their first menstruation, and males experience pubertal physical changes (Awusabo et al., 2006; Neema et al., 2004).

Repeat Adolescent Pregnancy

When an adolescent experiences a second or higher-order birth during adolescence, it is referred to as a repeat adolescent pregnancy. Once an adolescent has one child, she is at an increased risk of having another. Sangalang, Barth, and Painter (2006) predict that 30- 50 percent of adolescent mothers who have a first birth before age 18 will have a second child within 12 to 24 months. Adolescent mothers have an increased risk of experiencing a repeat

pregnancy two years after their first pregnancy (Stevens-Simon et al.,1998). A complete understanding of adolescent pregnancy is impossible without insight into the occurrence of repeat adolescent pregnancies.

As with adolescent pregnancy, repeat adolescent pregnancy compounds problems both for the mother and her children. In general, the occurrence of a repeat adolescent pregnancy is a result of prior predisposition to the factors that lead to the occurrence of an initial adolescent pregnancy. Research on repeat adolescent pregnancy highlights factors associated with the occurrence of repeated adolescent pregnancy, including young age at first birth, low income, low education level, and low use of contraceptives (Zanchi et al., 2017; Galvao et al., 2018), inadequate knowledge about contraception, history of abortion and depression (Maravilla et al., 2017), and history of spontaneous abortion (Mphatswe et al., 2016). Manlove, J (2000), among others, found that factors such as lower educational expectations, the intention of first birth, and whether the adolescent mother was unemployed or not enrolled in school after the first birth were likely preemptors to repeat adolescent pregnancy.

Other essential factors that have been associated with repeat adolescent pregnancy include having low educational aspirations (Biney & Nyarko, 2017), dropping out of school before falling pregnant, and failing to enroll in school after the birth of the first child (Matsuhashi et al., 1989). Adolescents whose partners are older or whose partners want another child (Bull & Hogue, 1998) and being married before or after the first birth (Kalmuss & Namerow, 1994) are also associated with repeat adolescent pregnancy. Characteristics such as having a weak or non-existent mother-daughter relationship (Bull & Hogue, 1998), an unsupportive family, and a mother who never completed high school (Kalmuss & Namerow, 1994) or who was an adolescent parent herself (Maynard & Rangarajan, 1994) are also linked to repeat pregnancies during adolescence.

While the issue of adolescent pregnancy has been studied by so many scholars around the world, little to no attention has been given to studying the effect of an additional pregnancy on an already pregnant and parenting adolescent. The challenges compound as soon as the possibility of a repeat adolescent pregnancy is evident because the adolescent is still technically a child and thus unable to take care of themselves fully, and because not one but two (or more) children become entirely dependent on the adolescent as soon as they are born. This creates an unending loop of dependency and poverty among such bloodlines. The measures taken once

an adolescent has been confirmed pregnant and eventually given birth do not fully suffice to protect them from experiencing a repeat pregnancy (Govender et al., 2018).

Repeat adolescent pregnancy prevalence and trends vary around the world, with some of the highest rates in developing countries. Repeat adolescent pregnancy rates stand at 20 percent in Thailand (Talungchit et al., 2017) and 53 percent in Brazil (Zanchi et al., 2017). Data on repeat adolescent pregnancy in Africa is sparsely available. Studies on this topic in South Africa reported the prevalence as 17 percent (Govender, 2019) and 55 percent in Uganda (Amongin et al., 2020). However, this statistic has been reduced, thanks to measures aimed at addressing adolescent pregnancy occurrence. Recent comparative research on this topic revealed the highest prevalence rate of repeat adolescent pregnancy to be in Gabon (20.93%) and the lowest in South Africa (4.82%) (Ahinkorah et al.,2023).

Early Marriage/ Forced Marriage

Across diverse cultures and religions, early marriage continues to shape the lives of young adolescents globally. This has profound implications for their health, well-being, and prospects. Despite international efforts to curb the practice, early marriage persists in many parts of the world, especially in the developing world, where traditional norms and customs often prevail.

The relationship and interconnectedness between early marriage and adolescent pregnancy is complex and multifaceted, influenced by social, cultural, economic, and individual factors. This section explores the phenomenon of early marriage, its cultural and social determinants, the role of gender norms and inequalities in its occurrence, its relationship to the occurrence of repeat adolescent pregnancy, and its impact on adolescent reproductive health and development.

Marriage takes different forms in different cultures and societies. The Universal Declaration of Human Rights recognizes the rights of all humans, including the right to free and full consent on matters of marriage. Unfortunately, in many developing countries, especially in poorer regions, the decision to marry or get married is often faced with coercion from parents, guardians, or the community (Hosseini & Asadisarvestani, 2022). Marriage in the African context is a social construct necessary for the continuity of a generational line and the human life course. It is a formalized binding agreement between two consenting adults.

The age of first marriage has generally increased globally, except for some parts of Sub-Saharan Africa and Asia, where a significant proportion of adolescent girls still get married

before their 18th birthday (Lloyd CB, 2005). More than 51 million adolescent girls aged 15-19 are already married, bearing the burden of domestic responsibility and facing risks associated with early sexual activity such as STIs, HIV, unsafe abortion, and pregnancy (ICRW, 2003).

Early marriage encompasses the occurrence of marriage to a girl (or boy) before they attain the age of 18 years. Forced marriage is a marriage involving one and/or both parties having not expressed their free and full consent to the union. Child marriage is considered a form of forced marriage, given that one of the parties, usually the girl, is under the legal marriage age of 18 years, thus unable to give informed consent to the marriage. According to the UN Convention on the Rights of the Child, a child is anyone under the age of eighteen years. Child marriages in many societies within developing countries are used to strengthen or form alliances between families, communities, or kingdoms. This could also include the betrothal of young children to potential future mates. Marriage marks the sexual debut of many women, and sex within the confines of marriage is accepted and considered safe. In this essence, some parents and community members tend to actively advocate for early marriage as a protective strategy from the occurrence of dangers associated with premarital sex, such as unintended adolescent pregnancy, STIs, and HIV/AIDS. This is the case in Malawi, as explained by Bracher et al. in 2003.

Historically, adolescent girls were married off at young ages for a couple of reasons. First, since high mortality, especially high maternal and infant mortality has existed for much of human history, marrying adolescent girls is deemed necessary for maximizing fertility within marriage. Early marriage was crucial to securing critical social, economic, and political alliances for a family, lineage, or community. However, due to global development and advancement in industrialization, the essence of early marriage has reduced across most parts of the globe. Globalization has shifted the value of women and girls to more than just being wives and home carers. The advancement in industrialization means that strength and power within a nation or community are not measured by livestock received from dowry negotiations alone but by cash and gold reserves obtained from trade and commerce.

 In the developing world, numerous mechanisms (such as education, employment, political participation, and the two-thirds gender rule) have supplanted marriage for social, economic, and political influence or alliance formation. Nonetheless, established norms and social structures that encourage marrying off adolescent girls have been challenging to eradicate and

change, especially in societies and regions with the slowest demographic and socioeconomic change.

Early marriage defined the traditional "pronatalist nuptiality regime" that was commonly practiced in Sub-Saharan Africa years back. Hertrich records the median age at first marriage for women under 18 in most African countries in the 1960s. The standard median age at first marriage moved to 19.5 by the 1990s. The median age at first union for women rose to 21.2 years, with the difference in age at union between males and females in sub-Saharan Africa significantly higher than in the rest of the world (Hertich, 2017). Nonetheless, this age distribution was not geographically heterogeneous. In sub-Saharan Africa, over 40 percent of young women are either married or in sexual unions by the age of 18 (Guttmacher Institute, 1998). Early marriage is more prevalent in Central (40 percent) and West Africa (49 percent), respectively, while East Africa (27 percent), North and Southern Africa (20 percent) have lower early marriage rates. Most of these young brides become second or third wives in polygamous households.

Current Status of Early Marriage

According to UNICEF data, about 650 million women alive today were married as children[2]. At least 12 million girls are married before the age of 18; this translates to 28 girls every minute. This number doubles in developing countries, such that 40 percent of girls are married before age 18 and 12 percent before age 15. The graph below shows the prevalence and burden of child marriage globally.

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[2] https://www.ohchr.org/en/women/child-and-forced-marriage-including-humanitarian-settings#:~:text=One%20in%20every%20five%20girls,union%2C%20before%20reaching%20age%2018.

Global distribution of the number of girls and women first married or in union before age 18, by region

Eastern Europe and Central Asia
20M (3%)

Other regions
13M (2%)

Middle East and North Africa
37M (6%)

Latin America and the Caribbean
58M (9%)

East Asia and the Pacific
95M (15%)

South Asia
290M (45%)

Sub-Saharan Africa
127M (20%)
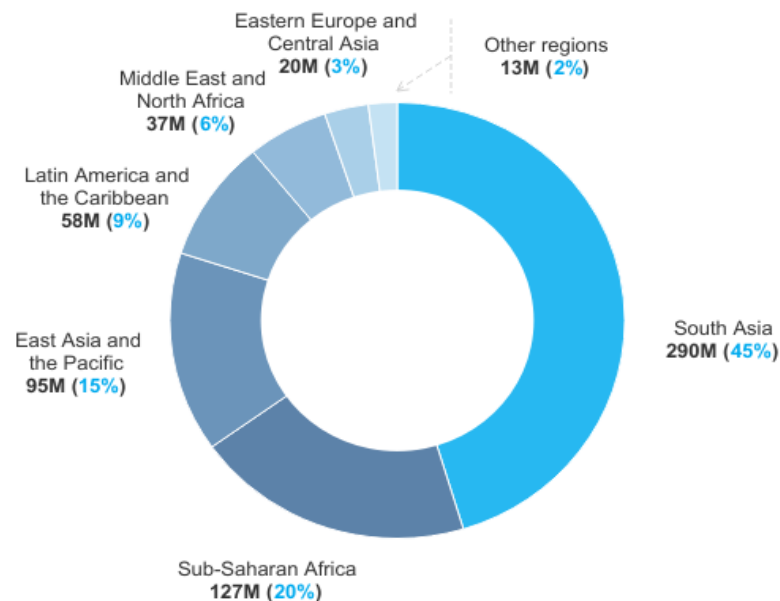
Note: Values do not sum to total due to rounding.
Source: United Nations Children's Fund, *Is an End to Child Marriage within Reach? Latest trends and future prospects. 2023 edition,* UNICEF, New York, 2023.

Figure 2: Global Distribution of the number of girls and women first married or in union before 18 by region

Sub-Saharan Africa currently hosts the second-largest share of child brides. At its current pace, it needs about 200 years to eradicate this practice (UNICEF, 2023). With rapid population growth, especially among the youthful population, coupled with the ongoing global crises that heavily impact the continent, we are looking at an increase in the number of child brides within the region, contrary to the declines expected in the rest of the world. The ongoing climate change has exacerbated the situation within the Horn of Africa countries, i.e., Ethiopia, Somalia, and Kenya. For pastoralist communities, climate change has brought an unending drought that has dried up water sources, thus leaving the people and their livestock without water (Hassani, 2023). The domino effect of the recent Russia/Ukraine war also led to an increase in food and fuel processes globally. All these crises caused a strain on the naturally available resources among communities and families, leaving the destitute families with no option but to marry off their adolescent girls as a way of earning some income through dowry

and reducing the required mouths to feed in the household during these trying times (Dadush et al., 2022).

Early Marriage: Pathways to Adolescent Pregnancy?

Child/early marriage is always accompanied by early and frequent pregnancy and childbirth, resulting in higher-than-average maternal morbidity and mortality rates of both mother and child. It is known that sexual activity among adolescent girls occurs most frequently within marriage. Bruce and Clark, in 2003, analyzed data from 31 developing countries and established that more than 80 percent of adolescent girls aged 15-19 who reported being sexually active were also married. Early marriage tends to occur because of adolescent pregnancy. It is seen as a safeguard against immoral behavior and the ultimate protection from inappropriate male sexual attention. Some families tend to marry off their pregnant adolescents to protect their family status and name and to receive dowry and extra payment as collateral from the man responsible for the pregnancy. Young pregnant adolescent girls are also married off to enable the children to be born and grow up in accepted family structures. This improves the children's acceptability since they are born to married parents.

Several factors underpin adolescent pregnancy as the primary driver of early marriage. First, early sexual debut stands as a precursor to experiencing adolescent pregnancy. Peer pressure from friends, access to pornographic material or content, lack of self-control to handle the sexual urges of puberty, and opposite-sex sleeping arrangements within households are among some of the factors that could trigger early sexual debut. The earlier an adolescent begins practicing sexual acts, the more likely they are to fall pregnant.

Lack of access to contraceptives and inadequate information on their usage could also lead to adolescent pregnancy. The reluctance from SRH service providers that has led to restricted access to contraceptives for adolescents leaves them no option but to engage in unprotected sexual intercourse. Furthermore, some countries, such as Kenya, restrict access to contraceptives to those above 18 years and parental consent to those below 18 years. The lack of enough contraceptives, especially in remote areas, has also contributed to the increasing adolescent pregnancy levels. Since abstinence as a contraceptive works for a few adolescents who have not initiated sexual activity, it becomes a challenge to prevent the occurrence of a pregnancy – and even a repeat pregnancy - during adolescence.

The unwillingness to use some contraceptives among sexually active adolescents could also lead to an adolescent pregnancy. For instance, the social belief that the use of condoms is not

sexually satisfying or that one does not necessarily have to use protection on the first sexual encounter is detrimental to the fight against the occurrence of adolescent pregnancy. The unsupervised use of drugs and alcohol, watching and imitating pornographic content, and too much free time among young people are also potential threats to the fight against adolescent pregnancy.

The Relationship Between Early Marriage and Repeat Adolescent Pregnancy

The relationship between early marriage and repeat adolescent pregnancy is somehow complex and bidirectional. Research has identified the direct relationship between early marriage and repeat adolescent pregnancy to be positive, meaning that early marriage significantly increases the likelihood of the occurrence of repeat adolescent pregnancy (Ngoda et al., 2021). The International Journal of Gynecology and Obstetrics 2020 published a study that justified early marriage as a significant predictor of repeat adolescent pregnancy (Amogin et al., 2020). In the study, emphasis on the role of educational and social interventions to delay marriage till later ages and to improve reproductive health access for improved outcomes was paramount. A journal article by BMC Pregnancy and Childbirth also highlighted that adolescent girls who get married early are more likely to experience multiple pregnancies during adolescence compared to unmarried adolescents. In this study that examines the correlates of repeat adolescent pregnancy among adolescent girls and young women in Sub-Saharan Africa, one plausible reason for the occurrence of multiple adolescent pregnancies was the fact that marriage and cohabitation create some sort of legitimacy to sex within the sub-Saharan Africa context, thereby increasing the desire of adolescent girls for more children (Ahinkorah et al., 2021). This article further recommends putting more emphasis on early marriage interventions as a way of reducing repeat adolescent pregnancies. Seidu et al. (2021) reiterate that married and cohabiting adolescents tend to lack the capacity to negotiate for safer sex practices such as contraception and abstinence with their partners, thus increasing the likelihood of them experiencing multiple pregnancies during adolescence. A report by UNICEF also highlights child marriage as a significant factor in the occurrence of adolescent pregnancies – and their recurrence (UNICEF, 2015). The report notes that married adolescents face the pressure to bear children soon after marriage due to the societal pressure of childbearing bestowed upon them. They also have less access to reproductive health services such as contraceptives.

As highlighted previously in this chapter, both early marriage and repeat adolescent pregnancy are driven by a combination of social, cultural, economic, and societal factors. Adolescents who marry early are more likely to experience multiple pregnancies in rapid succession

(Elnakib et al., 2022). This is primarily due to limited access to contraception and family planning services, especially in the Kenyan context, where contraception is only legally available to women above 18 years of age. These married adolescents also face the pressure of proving they are fertile. The urge to work towards meeting their family size expectations notwithstanding, the dynamics surrounding early marriages, such as power balance and lack of autonomy, hinder these adolescent girls from safely negotiating for contraceptive use, thus creating a higher likelihood for rapid repeat adolescent pregnancies to occur (Raneri & Wiemann, 2007). Married adolescents are more likely to succumb to the societal pressure of conceiving soon after marriage and continue successive childbearing, thus experiencing multiple pregnancies (Hur et al., 2020). Early marriage and adolescent pregnancy also restrict access to economic and educational opportunities for these adolescent girls. This situation catalyzes continual poverty and worsens contraceptive and family planning use and uptake among adolescent girls.

All these disadvantages of early marriages and repeat adolescent pregnancy point to the greater need for targeting interventions towards addressing both issues with the best precision possible. This can only be achieved once the contextual causal relationship between early marriage and rapid repeat adolescent pregnancy is established. It is, however, important to highlight that this study hypothesizes that early marriage significantly leads to rapid repeat adolescent pregnancy. This leads to the question, could there be a reverse bidirectional relationship between rapid repeat adolescent pregnancy and early marriage?

While it is well documented that early marriage increases the likelihood of the occurrence of rapid repeat adolescent pregnancies, little to no research evidence exists on the direct causal effect of rapid repeat adolescent pregnancy on early marriage. Nonetheless, there exist some contextual factors and indirect pathways through which rapid repeat adolescent pregnancy could potentially influence early marriage occurrence. The interplay between social, economic, and social factors suggests that adolescent pregnancy could lead to early marriage – especially in settings where pregnancy outside of wedlock is associated with societal stigma and where economic opportunities for adolescent mothers are limited.

UNICEF reports that early marriage, in some cases, happens because of family and cultural expectations. Most families try to mitigate the stigma and economic burden associated with adolescent childbearing outside of marriage by willingly marrying off their adolescent girls (UNICEF, 2015). This often creates a cycle where adolescent girls, once pregnant, feel

pressured into marriage as a way of legitimizing their pregnancy and securing economic support for them and their unborn child. Further research on this relationship by the Guttmacher Institute indicates that adolescents who become pregnant are more likely to get married off early to manage the social and economic costs associated with early motherhood (Raneri & Wiemann, 2007). This predisposes adolescent girls to early marriage and, further, rapid repeat adolescent pregnancies. In other scenarios, the family may encourage or even pressure pregnant adolescents to marry to uphold family honor and allow the unborn child to be born within a recognized union - marriage (Aziato et al., 2016). This cultural norm can lead to early marriage following an initial adolescent pregnancy (Efevbera & Bhabha, 2020).

Once pregnant, adolescent girls tend to drop out of school to be able to nurture their young ones (Sobgnwi-Tambekou et al., 2022). This predisposes them to experience repeat adolescent pregnancy and even marriage since they remain 'idle' at home. Those adolescent girls who further experience rapid repeat adolescent pregnancy often have limited to no access to reproductive health services and most likely lack autonomy in decision-making on their reproductive health (Maharjan, 2019). The lack of financial and decision-making autonomy could lead to a likening of the idea of early marriage, thus subsequent pregnancies, with these adolescent girls resorting to early marriage for economic stability and support from their spouses.

Rationale for Focusing on Kenya: Addressing Adolescent Pregnancy and Early Marriage Interlinkages

Adolescent pregnancy and early marriage are interlinked challenges that significantly impact the lives of young individuals, particularly girls, in various societies. While research on rapid repeat adolescent pregnancy has been conducted in several sub-Saharan African countries, the specific connection between fast repeat adolescent pregnancy and early marriage remains a crucial area that warrants in-depth investigation.

As we mentioned before, Kenya grappled with deep-rooted gender inequalities and cultural norms that restricted the rights and opportunities available to women and young individuals. Recognizing the need for transformative change, Kenya initiated a journey to establish a comprehensive legal and policy framework to uplift the status of women and youth within the societal fabric. Over the years, Kenya's legal and policy framework has evolved significantly to address gender disparities and pressing issues such as adolescent pregnancy and early marriage. This evolution represents a proactive step towards safeguarding the rights and well-

being of its women and youth. The progress in Kenya's policy framework has been steered by acknowledging the critical importance of empowering women and youth.

Despite these efforts in developing and revising laws and policies, implementation must be more substantial and consistent. Notably, forced marriage needs to be sufficiently criminalized as a distinct offense under the Marriage Act of 2014. There are gaps in coverage, especially concerning areas where consent is lacking. The Kenyan government has not yet ratified the Convention on Consent to Marriage and Registration of Marriages, 1964. Weak implementation and monitoring of these policies and laws are partly due to a poor linkage between government structures and communities. Also, deeply entrenched cultural practices contribute to the challenges in implementing and monitoring these policies and laws.

The objective of this study is to shed light on the causal relationship between rapid repeat adolescent pregnancies and early marriages, a relationship largely unexplored in the Kenyan context. While data and information on adolescent fertility are available thanks to the KDHS data, there is little to no research on the repetitiveness of the occurrence of adolescent pregnancy among already adolescent mothers. It is, therefore, becoming relevant to focus on understanding the risk factors of and incidences of rapid repeat adolescent pregnancy and its relation to early marriage in Kenya.

These issues carry profound socio-economic and health implications. By understanding this relationship, we aim to recommend policy interventions that effectively address both issues and benefit Kenya's current and future adolescent girls. This study seeks to fill this knowledge gap by analyzing the time spacing between the first and second births during adolescence, providing insights into the prevalence of adolescent pregnancies. We can garner a more comprehensive understanding of the issue by including a variable that measures the total number of adolescent pregnancies rather than solely relying on the number of births.

In conclusion, focusing on Kenya for this study is timely and essential in informing policy changes. By investigating the interlinkages between adolescent pregnancy and early marriage, we strive to pave the way for revamped laws and policies, ensuring smoother implementation processes and, ultimately, better outcomes for the adolescent population.

Theoretical Framework

Introduction

In the study of adolescent pregnancy, the Bongaarts Proximate Determinants framework remains one of the most influential in offering a clear structure for analyzing the direct and indirect factors that affect fertility. The Bongaarts framework predicts how factors such as early marriage and contraceptive use, among others, interact to influence the likelihood of successive pregnancies among adolescents. This understanding informs interventions aimed at reducing adolescent fertility by targeting the most influential proximate determinants, such as increasing access to contraceptive methods or delaying the age at first marriage. This framework not only provides a comprehensive understanding of the factors driving repeat adolescent pregnancies but also of how early marriage plays a central and significant role in this process. While it focuses on proximate determinants such as marriage and contraception, it allows for the integration of other factors such as the educational level and socioeconomic status of the respondent, which stand to be critical in this study. The SEM model allows this study to explore the direct and indirect effects of early marriage on repeat adolescent pregnancy. It shall incorporate variables mentioned in the Bongaarts framework since the relationships specified in this model are based on theoretical considerations of how these demographic factors interact.

Conceptual Framework

By using the Bongaarts framework, this study effectively ties the social and biological determinants of fertility together, thus providing a comprehensive understanding of how early marriage leads to repeat adolescent pregnancies – and vice versa. To outline the relationship between early marriage and repeat adolescent pregnancy using Bongaarts' proximate framework, it is imperative to identify the proximate determinants of fertility that Bongaarts highlights and connect them with the DHS dataset variables that measure these factors.
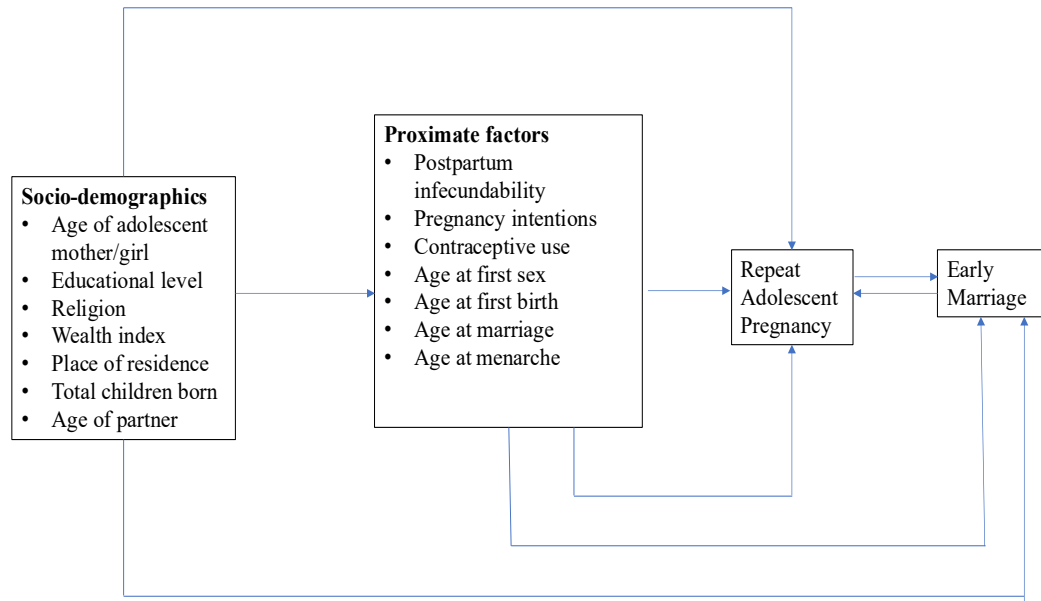
Figure 3: Simplified conceptual framework outlining the relationship between repeat adolescent pregnancy and early marriage occurrence across underlying demographic and socioeconomic factors.

The figure above attempts to describe how socio-demographic factors with underlying proximate factors lead to repeat adolescent pregnancy and early marriage. The bidirectional arrow between early marriage and repeat adolescent pregnancy indicates the bi-directional cause-effect that these two outcomes have on each other, a phenomenon that this study is set to address. The demographic factors related to adolescent pregnancy (and subsequent pregnancies during adolescence) and early marriage outlined in the conceptual framework are informed by the literature review.

Research Objectives and Questions

The main aim of this study is to analyze the relationship between repeat adolescent pregnancy and early marriage occurrences among adolescent girls in Kenya. These two occurrences, though somehow correlated (Mehra et al; 2018) should be analyzed in terms of which influences which to inform measures aimed at addressing both occurrences. The specific research objectives of this study are:

1. To obtain the prevalence and geographic distribution of rapid repeat adolescent pregnancy incidences and early marriage incidences in Kenya

2. To construct a structural equation model that illustrates the relationship between early marriage and repeat adolescent pregnancy outcomes in Kenya

From these objectives, the study developed the following research questions:

1. What is the prevalence and geographic distribution of rapid repeat adolescent pregnancy incidences and early marriage incidences in Kenya?

2. What is the relationship between repeat adolescent pregnancy and early marriage as depicted in a structural equation model?

Study Methodology

Study Population and Data Sources

This study draws on data from the 2022 Kenya Demographic and Health Survey (KDHS). This nationally representative survey provides comprehensive insights into fertility, family planning, maternal and child health, and socio-economic factors in Kenya. The 2022 KDHS serves as the seventh iteration of this critical survey and is designed to offer estimates at both national and county levels, capturing variations across urban and rural areas.

The survey sampled 42,025 women aged 15-49 years and 14,116 men aged 15-54 years, selected from 42,022 households across 1,692 clusters throughout the country. This includes 1,026 rural clusters and 666 urban clusters, ensuring broad coverage. The sampling design was structured to provide reliable, disaggregated data for different regions, making it suitable for analyzing geographic variations in adolescent pregnancy and early marriage.

For this study, the focus is on adolescent girls aged 15-24 years, with particular attention to those in the 20-24 age group whose pregnancies occurred during their adolescent years (ages 15-19). This focus allows the study to examine patterns of repeat adolescent pregnancy and the impact of early marriage on adolescent reproductive health outcomes.

Sampling Design and Survey Methodology

The 2022 KDHS employed a two-stage sampling process. In the first stage, clusters were selected from a national sampling frame, with a deliberate inclusion of both urban and rural

areas. In the second stage, 25 households per cluster were randomly selected, yielding a final sample that is representative of the national population.

Data were collected through structured questionnaires that captured detailed information on fertility levels and contraceptive use, marriage and birth histories, child mortality, maternal and child health, HIV and STI transmission, domestic violence and female genital mutilation (FGM). Women aged 15-49 who were usual residents or had spent the night before the survey in the selected households were eligible to participate. The survey's emphasis on fertility and marriage patterns is central to this study's analysis of rapid repeat adolescent pregnancies and the relationship with early marriage.

Response Rates and Data Quality

The 2022 KDHS achieved exceptionally high response rates, ensuring the data's reliability. Of the 42,022 households surveyed, 38,731 were occupied, and interviews were successfully conducted in 37,911 households, yielding an overall response rate of 98%. The response rates were consistent across urban (96%) and rural (99%) areas.

From these households, 33,879 women aged 15-49 were identified as eligible for individual interviews, of whom 32,156 were successfully interviewed, resulting in a 95% response rate. The high response rates for both households and individual women across regions further validate the robustness of the dataset, making it ideal for a detailed analysis of the socio-demographic predictors of adolescent pregnancy and early marriage.

This dataset forms the backbone of the study, enabling a thorough and credible examination of the prevalence of rapid repeat adolescent pregnancies, the impact of early marriage, and the socio-economic factors that influence these outcomes across Kenya.

Study Variables and Definitions

Understanding the complex phenomenon of rapid repeat adolescent pregnancy requires careful examination of various socioeconomic, demographic, and reproductive factors. This section outlines the critical variables utilized in the study, all drawn from the 2022 KDHS dataset. These variables were selected based on their theoretical importance and empirical relevance to adolescent pregnancy outcomes, ensuring that the analysis addresses the study's key research questions (DHS Program, 2007).

The variables include demographic characteristics such as age, education level, and region of residence, as well as socioeconomic indicators like household wealth, employment status, and

access to healthcare services. Reproductive health variables include age at first pregnancy, use of contraceptives, and pregnancy history, while partnership dynamics cover variables such as marital status and age at marriage.

Each variable is clearly defined and operationalized to ensure consistency in the analysis. These definitions provide clarity on how the variables are measured, categorized, and utilized within the study's analytical framework. The use of precise definitions as outlined in the table below supports the study's rigor, helping to ensure that the variables are interpreted consistently across the analysis. By delineating these variables, this section lays the groundwork for a robust examination of the factors associated with rapid repeat adolescent pregnancy and early marriage.

Table 1: Study Key Variables from the 2022 KDHS Dataset and Their Operational Definitions

Variable	Definition/Description	Coding
Demographic Data		
V012	Age of the respondent (measured in years)	0: 15-19
		1: 20-24
V501	Current marital status of women in the sample	0: Never in Union
		1: Married
		2: Living with partner
		3: Widowed
		4: Divorced
		5: Separated
V106	Level of education completed	0: No Education
		1: Primary Education
		2: Secondary Education
		3: Higher Education
V025	Geographic region within Kenya	0: Urban
		1: Rural
V130		1:Christian
		2:Muslim
		3:No religion/atheists

		4:Other religion
V131	Ethnicity	

Household Information		
V701	Highest level of education of the respondent's partner for those in a sexual union	1: No Education
		2: Primary Education
		3: Secondary Education
		4: Higher Education
V190a	Wealth index of the household (categorized into quintiles)	
Decision-Making Power	Composite indicator developed with 2* education and 1* decision making power for women with partners in the dataset.	
AGE-GAP	The age difference between the respondent and her partner. For those respondents with partners.	

Women's reproductive health information		
V511	Age at which the respondent entered marriage or union	
V212	Age at which the respondent experienced her first birth	
V201	Total number of children ever born	
HEALTH_ACCESS	Availability and accessibility of healthcare services (measured by proximity and use of services)	
V525	Age of respondent at first sexual intercourse	
V313	Use of any form of contraception (current use and history of use)	0: Not Using
		1: Folkoric Method

		2. Traditional Method
		3: Modern Method
PREG_HISTORY	Number and timing of previous pregnancies, including repeat pregnancies	
Pregnancy Interval	Duration of months between pregnancies as recorded within the adolescent years.	
RRAP	The occurrence of a repeat adolescent pregnancy within 24 months of the corresponding pregnancy up to the age of 19 years among women 15-24 years.	
AP	Total Pregnancy Outcomes up to age 19 for women 15-24 years	

These variables form the core of the analysis and will be used to assess how demographic and socioeconomic factors influence adolescent pregnancy outcomes. The age at first pregnancy, use of contraceptives, and marital status are particularly relevant for understanding repeat adolescent pregnancies, while socioeconomic indicators such as education and household wealth provide critical insights into broader contextual factors influencing early marriage and adolescent fertility (Guttmacher Institute, 2019).

By clearly defining and operationalizing each variable, this section ensures consistency in the data analysis and interpretation, setting the stage for the subsequent exploration of the prevalence and determinants of rapid repeat adolescent pregnancy in Kenya.

Statistical Data Analysis Methods

This section outlines the statistical methods applied to investigate the prevalence and determinants of rapid repeat adolescent pregnancy and its association with early marriage in Kenya. A series of statistical techniques, including descriptive statistics, geographical mapping, and structural equation modeling (SEM), are used to analyze the relationships between key variables. These methods allow for both the direct and indirect exploration of factors affecting adolescent fertility patterns.

Descriptive Analysis

Descriptive statistics was employed to summarize the key characteristics of the study population, focusing on demographic and socioeconomic variables such as marital status, education level, wealth index, and place of residence. The primary goal of this analysis was to provide an overview of the population and highlight the distribution of variables that are relevant to adolescent pregnancy and early marriage.

Categorical variables were presented as frequency distributions, while continuous variables summarized using means, medians, and interquartile ranges (IQRs) to describe their central tendency and variability. This initial analysis set the stage for deeper statistical testing and modeling. Each variable was recoded to ensure consistency and facilitate interpretation. This process ensured that the data is correctly prepared for further regression and SEM.

Structural Equation Modeling (SEM)

The study utilized a structural equations model to assess the direct and indirect effect of rapid repeat adolescent pregnancy on early marriage of young women based on the 2022 KDHS. Tarka (2018) describes structural equation modelling as a technique used to describe relationships between variables. Using a structural equations model helps to measure the direct, indirect, and total effect of exogenous (independent) and endogenous (intermediate and dependent) variables on an outcome variable. The advantage of using a structural equations model rather than a traditional regression model can be seen if we consider, for example, the exogenous variable: occurrence of a rapid repeat adolescent pregnancy. If we use a traditional (linear) regression model to test the effect of this variable on the occurrence of early marriage, only the direct effect can be measured. In the structural equations model, the direct and indirect effect of the occurrence of a rapid repeat adolescent pregnancy can be measured. The reason is that this variable affects factors associated with the occurrence of early marriage (endogenous variables), which in turn also affect the occurrence of a rapid repeat adolescent pregnancy. By considering both direct and indirect effects, we obtain the total effect of the occurrence of RRP on the occurrence of early marriage.

Structural Equation Modelling (SEM) works as a combination of the Confirmatory Factor Analysis (CFA) and multiple regression analysis – known as the factor modelling approaches. CFA is what this study will base its decision to confirm or reject the defined theorized model that assumes a relationship between the observed and the underlying latent (unobserved) variables (Hair, et al; 2009).

The CFA model can be summarized as follows: First, the observed variables x's are collected into a vector x for each individual subject, with x_i denoting the observable variable i, for $i = 1,2,….,m$.

That is,

$$x = \begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_m \end{pmatrix}$$

Secondly, the vector of variables x is assumed to be a random vector sampled from a population with a mean vector μ, where μ is defined as

$$\mu = \begin{pmatrix} \mu_1 \\ \mu_2 \\ \vdots \\ \mu_m \end{pmatrix}$$

Here, the unobserved common factors f_i are collected into a vector f as follows:

$$f = \begin{pmatrix} f_1 \\ f_2 \\ \vdots \\ f_m \end{pmatrix}$$

On the other hand, the factor modelling part of the SEM is a series of multiple regressions that predict each of the observable variables x_i from the values of the unobserved common factors f_i. The regression coefficients are obtained as follows:

$$X_1 = \mu_1 + l_{11}f_1 + l_{12}f_2 + \cdots + l_{1m}f_m + \varepsilon_1$$

$$X_2 = \mu_2 + l_{21}f_1 + l_{22}f_2 + \cdots + l_{2m}f_m + \varepsilon_2$$

$$\equiv$$

$$X_p = \mu_p + l_{p1}f_1 + l_{p2}f_2 + \cdots + l_{pm}f_m + \varepsilon_p$$

Where μ_i to μ_p are the intercept terms of the regression equation and ε_1 to ε_p are the error terms. The regression coefficients i_{ij}, for $i = 1,2,….p$ and $j = 1,2,….m$ are referred to as the factor loadings, which can be written in a matrix format as:

$$L = \begin{pmatrix} l_{11} & l_{12} & . & . & . l_{1m} \\ l_{21} & l_{22} & . & . & . l_{2m} \\ . & . & . & . & . . \\ . & . & . & . & . . \\ l_{p1} & & . & . & . l_{pm} \end{pmatrix}$$

The error terms can also be collected into a vector ε as follows:

$$\varepsilon = \begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \\ . \\ . \\ \varepsilon_p \end{pmatrix}$$

Here, the error terms (ε_i) are often referred to as the specific factors of variable *i*. Thus, the regression coefficients in the factor modelling can be written in matrix notation as

$$X = \mu + Lf + \varepsilon$$

In this study, the SEM model was fitted to identify the underlying structural relationship between the indirect and direct relationship between early marriage and rapid repeat adolescent pregnancy, as well as their compounding determinants. To be precise, the CFA part of the SEM was used to test the theorized model of the proximate and non- proximate determinants of (adolescent) fertility as per Bongaarts (1978) classification, and the factor modelling part to assess the relationship between the determinants of both rapid repeat adolescent pregnancy and early marriage, and afterwards model their effects on the expected correlation outcome.

Application of SEM in Adolescent Pregnancy Studies

In recent years, SEM has been widely used to explore complex relationships between demographic, behavioral, and social factors in studies related to adolescent fertility. For example, Miller et al. (1998) applied SEM to analyze how psychological and behavioral factors, such as peer influence and contraceptive use, interact to predict adolescent sexual behavior leading to pregnancy. Similarly, Kirby et al. (2001) used SEM to examine the role of socioeconomic status and family structure in influencing sexual initiation and pregnancy among young adolescents. Their model captured both the direct and indirect pathways between these variables and adolescent pregnancy outcomes.

Building on these approaches, Buho & Goodson (2007) utilized SEM to investigate how perceptions of susceptibility to pregnancy, alongside perceived benefits and barriers to contraception, impacted sexual behavior and pregnancy risk among adolescents. DiClemente et al. (2008) also employed SEM to explore the interplay of individual, cultural, and peer factors in shaping pregnancy risk, specifically among African American adolescents. Finally, Manlove et al. (2006) applied SEM to assess the relationship between adolescent pregnancy and educational outcomes, demonstrating how complex socio-educational factors contribute to pregnancy rates.

By drawing on these established approaches, this study aims to model the complex interactions between rapid repeat adolescent pregnancy, early marriage, and other socio-demographic factors. The insights gained from SEM will provide a more nuanced understanding of the determinants of adolescent fertility in Kenya.

In conclusion, SEM is a critical tool for this study as it allows for the simultaneous examination of multiple variables and their direct and indirect effects on adolescent pregnancy and early marriage. This technique provides a robust framework for understanding how different factors interact to influence these outcomes, offering a deeper level of analysis than traditional methods.

Software and Tools

All statistical analyses were conducted using R software, including descriptive statistics, bivariate analysis, multivariable logistic regression, and SEM. The R platform was selected for its advanced capabilities in handling large datasets and performing complex statistical modeling, ensuring the accuracy and efficiency of the data analysis process.

Results

Study Variables

Dependent Variable

The DHS dataset contains data on a woman's month-to-month history of contraceptive use, births, and pregnancies for the six-year period preceding the survey. Using calendar data on the months within which a woman reported being pregnant, we classified women aged 15-24 years as having experienced an adolescent pregnancy if they recorded any pregnancies up to the age of 19 years. The dependent variable of interest was further calculated to be rapid repeat adolescent pregnancy, defined as pregnancy occurring within 24 months after a live birth. In this context, a rapid repeat adolescent pregnancy was determined as the pregnancy occurring within 24 months of a previous pregnancy incidence since a significant number of pregnancies do not necessarily end up in a live birth. As such, if the interval between any recorded pregnancy interval was 24 months or less, or the interval between a reported non-live pregnancy outcome and the onset of a subsequent pregnancy was less or equal to 24 months, it was considered a rapid repeat adolescent pregnancy.

Independent Variables

The study included several socioeconomic and reproductive variables identified during the literature review as influencing rapid repeat adolescent pregnancy. Standard social and demographic variables included respondent's age, level of education, type of place of residence, wealth quintile, religion, and region of residence. These variables were categorized according to DHS classifications to ensure robust cross-tabulations and regression analyses without encountering sparse data issues.

Additionally, the study examined fertility and sexual activity variables such as age at first union, age at first sexual intercourse, marriage-to-pregnancy interval, age at first birth, and age at first pregnancy. Marriage-to-pregnancy interval was defined as the months between a respondent's first union and her first pregnancy. Respondents whose first pregnancy occurred before their first marriage were assigned a marriage-to-pregnancy interval of 0 months.

Descriptive Statistics

The first step in our analysis is to present descriptive statistics for the sample's demographic characteristics. This provides a foundational understanding of the data. The following table presents these statistics, including age, education level, and type of residence among others. Presenting these summary statistics is crucial as it helps to contextualize the subsequent analyses and highlights key demographic trends within our sample.

Table 2: Summary Statistics

Variable	Categories	Weighted Frequency (N)	Weighted Percentage (%)	Rapid Repeat Adolescent Pregnancy Proportions (24 months)		
				No	Yes	p-value
Age Group	15-19	6404	52.6	50	57	0.400
	20-24	5762	47.4	724	697	
Educational Level	No Education	789	6.5	36	66	<0.001
	Primary Education	3524	29	389	371	
	Secondary Education	6470	53.2	314	261	
	Higher Education	1383	11.4	35	57	
Type of place of residence	Urban	4579	37.6	240	244	0.570
	Rural	7587	62.4	534	510	
Wealth Index	Poorest	2812	23.1	226	231	0.219
	Poorer	2351	19.3	163	168	

|						
	Middle	2439	20	144	112	
	Richer	2647	21.8	147	1341	
	Richest	1917	15.8	94	110	
Current Marital Status	Never in Union	8381	68.9	93	55	<0.001
	Married	2834	23.3	584	700	
	Living with partner	520	4.3	90	86	
	Widowed	12	0.1	5	4	
	Divorced	78	0.6	9	16	
	Separated	341	2.8	69	56	
Partner's education level	No education	487	14.7	37	66	0.005
	Primary	1013	30.6	244	262	
	Secondary	1173	35.4	244	202	
	Higher	641	19.3	77	83	
Religion	Catholic	2126	17.5	118	112	0.001
	Protestant	4021	33.1	301	263	
	Evangelical churches	2573	21.1	222	185	
	African Instituted Churches	933	7.7	60	76	
	Orthodox	30	0.2	0	0	
	Islam	2035	16.7	40	84	
	Hindu	6	0	0	0	
	Traditionalists	33	0.3	3	1	
	No religion/atheists	120	1	11	14	
	Other religion	289	2.4	18	18	
Ethnicity	Embu	36	0.86	11	25	0.1067
	Kalenjin	858	20.23	309	549	
	Kamba	361	8.5	137	224	
	Kikuyu	542	12.77	312	230	
	Kisii	270	6.37	118	152	
	Luhya	788	18.55	270	518	
	Luo	606	14.27	185	421	
	Maasai	152	3.57	82	70	
	Meru	275	6.47	75	200	
	Mijikenda/Swahili	226	5.32	79	147	
	Other	21	0.50	5	16	
	Somali	90	2.13	10	80	
	Taita/Taveta	20	0.47	0	20	

Adolescent Pregnancy Statistics

The analysis obtained the total number of pregnancies for each woman experienced only during adolescence. From the dataset, out of 12,166 women aged 15-24, 21.8% were found to have experienced at least one pregnancy during the adolescent years. A total of 4459 women aged 15-24 were recorded as ever being pregnant during adolescence from the survey. From the total sample, 63.3% (7707) had no pregnancy at the time of the survey. The pregnancies varied among the women in the sample, with more women having at least one pregnancy and some having more than one pregnancy, i.e., up to 6 pregnancies at the time of the survey. As shown in the table below, the total number of pregnancies experienced during adolescence ranged from 1 to 6. 5.2% of women reported having experienced a repeat adolescent pregnancy (more than one pregnancy during the adolescence period). The table below shows the distribution of all pregnancies among the sample.

Table 1: Pregnancy Distribution

All Pregnancies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	7707	63,3	63,3	63,3
	1	2689	22,1	22,1	85,5
	2	1183	9,7	9,7	95,2
	3	429	3,5	3,5	98,7
	4	112	,9	,9	99,6
	5	33	,3	,3	99,9
	6	9	,1	,1	100,0
	7	1	,0	,0	100,0
	8	2	,0	,0	100,0
	10	1	,0	,0	100,0
	Total	12166	100,0	100,0	

The graph below shows the distribution of the above pregnancies among these women aged 15 to 24.
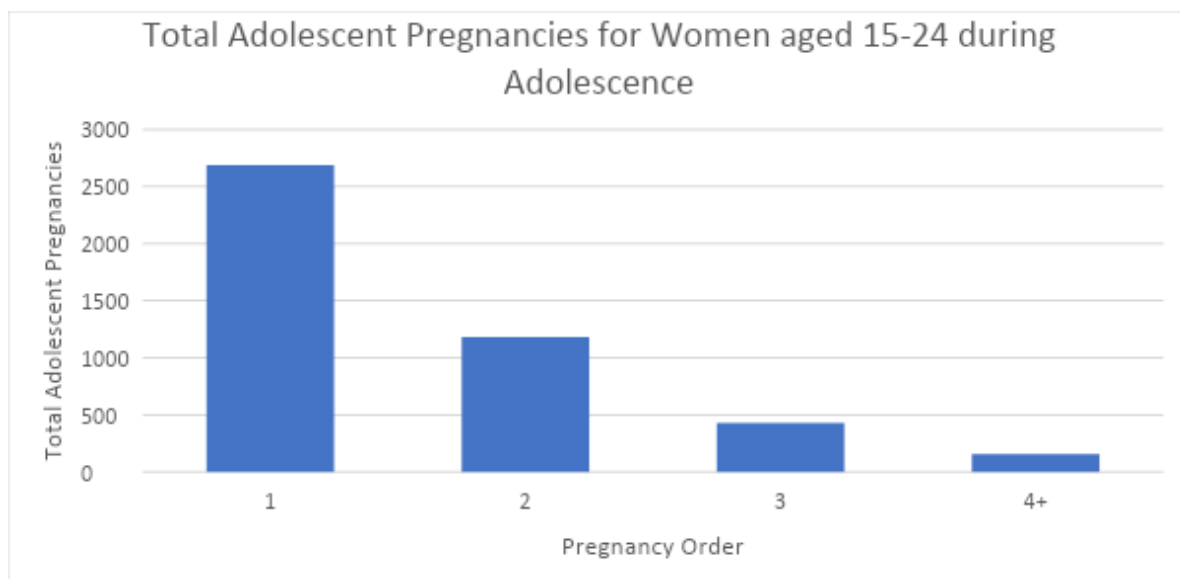
Figure 3: All Pregnancies among Women aged 15-24 From the 2024 KDHS

Rapid Repeat Adolescent Pregnancy

The primary outcome of this analysis was to obtain the rapid repeat adolescent pregnancy statistic from among women 15-24 years during adolescence. While considering the repeat adolescent pregnancies that occurred to 4459 women from the sample, the study found out that 51% of the sampled women experienced rapid repeated adolescent pregnancy within 24 months of a preceding pregnancy. Repeat adolescent pregnancies tended to happen in the late adolescent years, i.e., 16-18, as observed from the data. A further 19% of the sampled women experienced rapid repeat adolescent pregnancies within 12 months of a preceding pregnancy. The table below highlights the frequencies of repeat adolescent pregnancy within 24 and 12 months as calculated.

Table 3: Frequencies of women with repeat adolescent pregnancy as calculated from the KDHS 2022 Dataset

Adolescent Pregnancy Outcomes		Frequency	Proportion (%)
Repeat Adolescent Pregnancies	0(No)	1680	37.68
	1(Yes)	2779	62.32
Rapid Repeat Adolescent Pregnancy at 24 months	0(No)	850	48.10
	1(Yes)	917	51.90
Rapid Repeat Adolescent Pregnancy at 12 months	0(No)	509	80.92
	1(Yes)	120	19.08

Early Marriage Prevalence

Out of 12166 women aged 15-24, 1454 experienced early marriage, i.e., marriage before 18. This represents 12% of all women in the sample. The mean age at marriage for the women in the sample who married before 18 was 15.5 years, with a median of 16 years. Women aged 40-49 in the same DHS dataset recorded a mean and median age at first marriage of 19 years, proving that the age at first marriage among adolescent girls keeps reducing over the years.

Mapping Incidences of Early Marriage and Rapid Repeat Adolescent Pregnancy in Kenya Using 2022 DHS Data

Data

Data was extracted from the 2022 Kenya Demographic and Health Survey, both individual records data and geospatial data. The 2022 DHS dataset for Kenya contains geographical identifiers at different administrative levels namely regions and counties that can be used in mapping the incidences of early marriage and rapid repeat adolescent pregnancy in Kenya. The key variables for rapid repeat adolescent pregnancy and early marriage were calculated for further analysis from within the dataset. The GIS (Geographic Information System) dataset that contains all cluster-level GPS coordinates for all the sampling locations in the DHS collection process was also downloaded. These geographical coordinates were then combined with the DHS variable dataset such that each unique case ID matches their corresponding data collection counties in Kenya. For each county, the proportion of respondents who underwent early marriage and rapid repeat adolescent pregnancy were calculated. New binary columns were created in the dataset, with 1 signifying the occurrence of the event and 0 signifying no occurrence of the event. A summary of the results are as shown in the table below. This provided two additional columns in the main dataset, enriched with data on rapid repeat adolescent pregnancy and early marriage by county. These two additional columns would thereafter be used to plot the incidences of both rapid repeat adolescent pregnancy and early marriage on the Kenyan map.

The Mapping Process

The mapping of rapid repeat adolescent pregnancy and early marriage incidences was conducted in R software using the ggplot package, an R software package that allows for the visualization of spatial data and the plotting of descriptive maps based on specific variables of interest. A shapefile of Kenya's administrative boundaries was downloaded and imported into R software. This shapefile contained detailed geographic information on Kenya, including the

administrative boundaries of the 47 counties within Kenya. The DHS dataset was then merged with the Kenya shapefile data using a common identifier, the case ID numbers for each respondent. At this, each incidence of early marriage and rapid repeat adolescent pregnancy became associated with its corresponding geographical unit. These incidences were thereafter plotted on the map of Kenya basing on those case IDs corresponding to value number 1, i.e. those signifying the occurrence of each event (early marriage and rapid repeat adolescent pregnancy), to indicate where both occurrences overlapped.

figure 4 below visualizes the joint dispersion of both early marriage and rapid repeat adolescent pregnancy incidences in Kenya.

Outcomes:
- ⊙ Early Marriage incidences
- ● Rapid Repeat Adolescent Pregnancy (24 months)
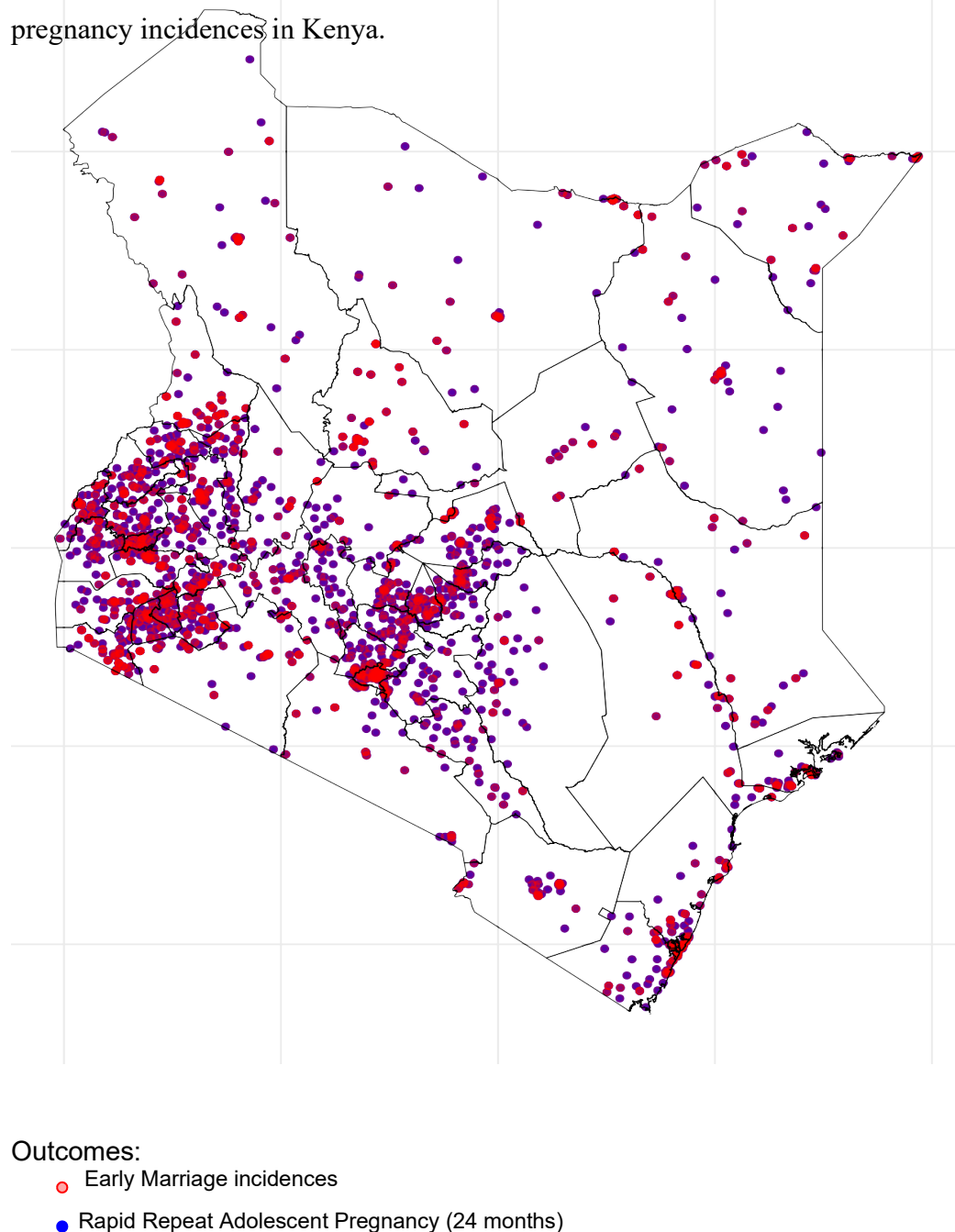
Figure 5: Dispersion of Early Marriage and Rapid Repeat Adolescent Pregnancy Incidences in Kenya Using the 2022 KDHS

The map revealed spatial patterns of occurrence of both early marriage and rapid repeat adolescent pregnancy patterns across Kenya. Early marriage rates differed significantly across different counties in Kenya, mainly due to the regional disparities because of the cultural, socio-economic and educational factors across the country. Higher incidences were typically observed in rural regions and counties with lower access to education and lower socio-economic development. From the 47 counties in Kenya, Muranga, Nyandarua,Siaya, Wajir, Tana River, Nairobi, Nakuru and Lamu counties had the highest rapid repeat adolescent pregnancy prevalence (within 24 months). Urban areas and more developed counties such as Nairobi, Nakuru, Kisumu, Mombasa and Uasin Gishu tended to have equally higher rates of rapid repeat adolescent pregnancy. Counties with the least rapid repeat adolescent pregnancy rates were Kiambu, Vihiga, Nandi, Laikipia and Kitui counties. Kericho, Nyandarua, Nyeri and Kitui counties recorded no rapid repeat adolescent pregnancy occurring within the 12-month interval but had prevalence of this occurrence in the 24-month interval. Nyeri county had a zero prevalence of rapid repeat adolescent pregnancy at both 12- and 24-month intervals. It, however, had a few cases of early marriage incidence.

Early marriage incidences were less than those for rapid repeat adolescent pregnancy in the sample as proven by the lower prevalence rates recorded in table 6 above. Counties with the highest early marriage prevalence were Baringo, Bomet, Bungoma, Busia and Elgeyo Marakwet counties. Those with the lowest prevalence of early marriage were West Pokot, Wajir, Vihiga, Uasin Gishu, Turkana, Trans Nzoia. Machakos and Kitui counties showed moderate levels of early marriage, as poverty and the rural setting within these counties significantly contributed to the continued practice of early marriage. Among the Maasai, Kajiado (0.548) and Narok (0.305) county residents show continued practice of early marriage. However, the rates seem to be getting lower as these areas have been previously known for their otherwise high early marriage rates. Counties such as Nairobi (0.316), Mombasa (0.323), Kisumu (0.424) and Kiambu (0.459) that have consistently benefitted from better access to education, healthcare and social services have proven to have less prevalence of early marriage as expected.

To construct a structural equation model that illustrates the relationship between early marriage and repeat adolescent pregnancy in Kenya.

The second objective of this study was to illustrate the relationship between early marriage and repeat adolescent pregnancy occurrence. The main hypothesis was that early marriage is positively related with repeat adolescent pregnancy occurrence. This study utilised a structural equation model (SEM) analysis to investigate and establish this phenomenon. SEM is a robust statistical technique that is used to examine complex relationships between latent and observed variables while accounting for both direct and indirect effects. This approach was particularly useful in this context because it allowed the study to incorporate a range of socio-economic, empowerment, and demographic factors – all of which influence both early marriage and repeat adolescent pregnancy in Kenya.

Variables Used in the SEM Analysis

The SEM model employed several models theoretically inferred from their association with the focus of the study. The final ideal model consisted of two latent variables; one on early marriage that was developed using three observed variables – mean age at first sex, mean age at first birth, and age at first marriage (DHS Program, 2007; Raj, 2010). Literature on early marriage in developing countries highlighted education as one of the major determinants of early marriage occurrence among adolescent girls (Anggreni et al., 2023). Thus, the second latent variable was for education; it was constructed using the respondent's education level and the partner's education level variables. The outcome result in the model, repeat adolescent pregnancy, was an observed variable calculated from the pregnancy history of the adolescent girls in the sample, and coded as 0 for those with no repeat pregnancy and 1 for those with repeat pregnancy during adolescence. The analysis was modelled as a structural equation model to assess the relationship between early marriage occurrence and repeat adolescent pregnancy likelihood.

R software's Lavaan package was used in the SEM analysis.

In the SEM analysis, all the variables used to develop the model were assigned specific acronyms in the model development phase as below:

R. Preg   - Repeat adolescent pregnancy

EM   - Early Marriage

EDU   - Education level

AFB   - Age at first birth

AFS   - Age at first sex

AFM   - Age at marriage

R. Edu   - Respondent education level

P. Edu   - Partner's educational level

Model Specification

To model the relationship between repeat adolescent pregnancy and early marriage using SEM model, this study employed the variables highlighted above as follows:

The measurement model equations involved the relationship between the latent and observed variables that define them. For the latent variables, the following measurement equations outline their relationship to the observed variables:

Early Marriage (EM) = Mean age at first birth + Mean age at first Sex + Age at Marriage

Education (EDUC) = Respondent's education level + Partner's education level

The structural equation shows the effect of both latent variables on repeat adolescent pregnancy occurrence. The model hypotheses the following relationship:

Repeat Adolescent Pregnancy = β_1*EM + β_2*EDUC + ε

Where β_1 and β_2 are the regression coefficients for the effect of EM and EDUC, respectively and ε represents the error term.

The observed variable on repeat adolescent pregnancy was regressed on both early marriage and educational level in the model. To ensure all adolescents were included in the sample for the SEM analysis, the analysis employed the FIML (Full Information Maximum Likelihood) procedure to handle missing data

Model Fit

The model fit the data well after 53 iterations (CFI and TLI > 0.90, RMSEA < 0.60), although chi-square was significant, which is common in large samples. This model's SRMR value (0.031) was well below the 0.08 threshold, indicating a good model fit. The results rejected the hypothesis that early marriage and repeat adolescent pregnancy are positively correlated. The

R-squared value for the outcome variable, repeat adolescent pregnancy was 0.283, meaning that the SEM model in this study explains about 28.3% of the variance in repeat adolescent pregnancy. This statistic is reasonable when modelling in social science.

The study also assessed the convergent and discriminant validity of the measures by following Fernell and Larcker's (1981) criterion. Both convergent validity and discriminant validity are essential components of construct validity, a way of establishing whether the latent variables in the model are valid representations of the underlying theoretical concepts they intend to measure. Convergent validity was established as high and significant from the table above. For each latent variable, the Average Variance Extracted (AVE) was calculated. A good convergent validity should have a 0.50 and above threshold. Thus, the convergent validity for the education latent variable was 0.756 and for early marriage 0.632, indicating that both latent variables account for a significant proportion of the variance in their respective observed indicators. For discriminant validity, the study assessed whether the constructs in the model were all distinct and unrelated. The correlation between the two latent variables was -0.066, a very weak negative correlation indicating that the two latent constructs were not significantly related. This characteristic is favourable for discriminant validity since as one variable increases, the other does not necessarily increase or decrease significantly, signifying the independence of the latent variables used in the model.

Latent Variables

The model comprised two latent variables, early marriage and education. The validity of the measures of each latent variable was assessed for both samples. A confirmatory factor analysis was performed for each latent variable to assess the unidimensionality of the measurement items. The factor loadings displayed high loadings, indicating that each set of observed variables was a strong indicator of the respective latent variables. The R-squared values of each latent variable construct also prove that the variance explained by the latent variables is sufficient. The table below shows the factor loadings for the specific variables for each latent variable.

Table 4: Confirmatory factor analysis of Latent Variables

Constructs	Standardised Factor Loading	R-Square	Standard Error
Early Marriage:			
Mean age at first Birth	0.929	0.863	1.000 (R.I)
Mean age at first Sex	0.735	0.540	0.014***

Age at marriage	0.755	0.571	0.017***
Education:			
Respondent's education level	0.584	0.341	1.000 (R.I)
Partner's education level	0.660	0.436	0.236***

Model fit statistics: (Chi-square = 116.867, df = 7; CFI = 0.98, TLI = 0.97, RMSEA = 0.06, SRMR = 0.031); R.I = Reference Indicator

Regression Results

The model analysed the direct relationship between early marriage and repeat adolescent pregnancy. This consisted of regression analysis indicating the effect of the outcome variable (repeat adolescent pregnancy) on the latent variable of early marriage. The standardised coefficient of repeat adolescent pregnancy on early marriage (-0.534) was statistically significant at the $p<0.001$ level. This negative and significant relationship indicates that there is not a direct positive relationship between repeat adolescent pregnancy and early marriage. This contradicts the null hypothesis of the study which stated a direct positive relationship between early marriage and repeat adolescent pregnancy. This result also coincides with the Pearsons' correlation coefficient between early marriage and repeat adolescent pregnancy occurrence mentioned earlier in this chapter. The negative regression coefficient of repeat adolescent pregnancy on education (-0.152) was also significant at the $p<0.001$ level. This indicates that as early marriage incidence increases, the likelihood of repeat adolescent pregnancy decreases.

The two latent variables on early marriage and repeat adolescent pregnancy were allowed to covary during this analysis, producing a negative estimate (-0.196) that was significant at the $p<0.001$ level. The significant negative covariance between early marriage and education implies an inverse relationship between them, meaning that higher levels of education are associated with lower likelihood of early marriage.

There being an inverse relationship between early marriage and education levels, and an equally inverse relationship between education levels and repeat adolescent pregnancy, the study established that the relationship between early marriage and repeat adolescent pregnancy is not direct but could be indirectly inferred through education as a mediator and/or a covariate factor. From the statistical results of this analysis, it is evident that early marriage negatively

impacts education, and (higher) education reduces the likelihood of repeat adolescent pregnancy. Lower education increases the vulnerability of adolescent girls to experiencing repeat pregnancies during adolescence. Thus, through education, early marriage significantly influences repeat adolescent pregnancy occurrence

Table 5: Regression Intercepts, Covariances and Variances of the SEM Model analyzing Early Marriage and Repeat Adolescent Pregnancy Relationship

Regressions:	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
Repeat adol. Pregnancy ~						
EM	-0.082	0.002	-34.278	0.000	-0.186	-0.534
EDUC	-0.094	0.013	-7.210	0.000	-0.053	-0.152
Covariances:	**Estimate**	**Std.Err**	**z-value**	**P(>|z|)**	**Std.lv**	**Std.all**
EM ~~EDUC	-0.196	0.029	-6.710	0.000	-0.155	-0.155
Intercepts:	**Estimate**	**Std.Err**	**z-value**	**P(>|z|)**	**Std.lv**	**Std.all**
Mean age at first Birth	9.33	0.037	254.911	0.000	9.330	3.841
Mean age at first sex	9.449	0.034	275.809	0.000	9.449	4.130
Age at marriage	9.007	0.041	218.377	0.000	9.007	3.548
Respondent Educational level	3.162	0.014	219.304	0.000	3.162	3.284
Partner's Educational level	3.871	0.021	187.478	0.000	3.871	3.413
Repeat Adolescent Pregnancy	0.141	0.005	27.061	0.000	0.141	0.405
Variances:	**Estimate**	**Std.Err**	**z-value**	**P(>|z|)**	**Std.lv**	**Std.all**
Mean age at first birth	0.807	0.07	11.58	0.000	0.807	0.137
Mean age at first sex	2.407	0.064	37.666	0.000	2.407	0.460
Age at marriage	2.767	0.086	32.027	0.000	2.767	0.429
Respondent Educational level	0.611	0.057	10.804	0.000	0.611	0.659
Partner's Educational level	0.726	0.101	7.154	0.000	0.726	0.564
Repeat Adolescent Pregnancy	0.087	0.002	43.034	0.000	0.087	0.717
Early Marriage (EM)	5.093	0.142	35.762	0.000	1.000	1.000
Education (EDUC)	0.316	0.057	5.541	0.000	1.000	1.000

Model fit statistics: (Chi-square = 116.867, df = 7; CFI = 0.98, TLI = 0.97, RMSEA = 0.06, SRMR = 0.031)

Path Diagram

The path diagram below shows a directional relationship between the variables used in the SEM model that explains the relationship between early marriage and repeat adolescent pregnancy occurrence.

Squares represent the observed variables while circles represent the latent variables. The single-headed arrows represent causal relationships, where the variable at the tail of the arrow influences the variable at the head. The direction of the arrows indicates the hypothesised relationships between the constructs, i.e. the source construct affects the target construct. For instance, the latent variables on education and early marriage influence repeat adolescent pregnancy as represented in the model. The values assigned to each directional arrow represent the strength and direction of the relationship between the variables. Positive values indicate a positive relationship while negative values indicate an inverse relationship between variables. For instance, the relationship between early marriage and repeat adolescent pregnancy (-0.08) and that between education and repeat adolescent pregnancy (-0.09) indicate an inverse relationship between these two sets of variables. The double-headed arrow between early marriage and education variables in the model indicates a negative correlation between these two latent variables. However, no assumptions can be made on the direction of the influence between these two variables. The numbers on the arrows connecting latent variables to their indicators represent factor loadings as presented in table 10 above. These values represent how well the observed variables reflect the latent constructs, thus higher factor loadings infer a strong relationship between the latent variable and its observed indicator. Finally, the numbers within the small circle-like arrows on each variable represent the residuals, i.e. the amount of explained variance in the observed variable that's not captured in the model.

From the path diagram below, the study can understand and interpret the relationship between early marriage and repeat adolescent pregnancy. There exists a negative relationship between early marriage and repeat adolescent pregnancy, implying no direct causal relationship between the two. Early marriage influences repeat adolescent pregnancy with a path coefficient of -0.08, thus an inverse relationship between the two. Education influences repeat adolescent pregnancy with a path coefficient of -0.09. This means that higher education levels are associated with a lower likelihood of repeat adolescent pregnancy. A double-headed arrow between education and early marriage with a correlation coefficient of -0.20 indicates that less educated adolescents are more likely to experience repeat adolescent pregnancy. Thus, the path

relationship between early marriage and repeat adolescent pregnancy is best explained through education. The path diagram is shown below.
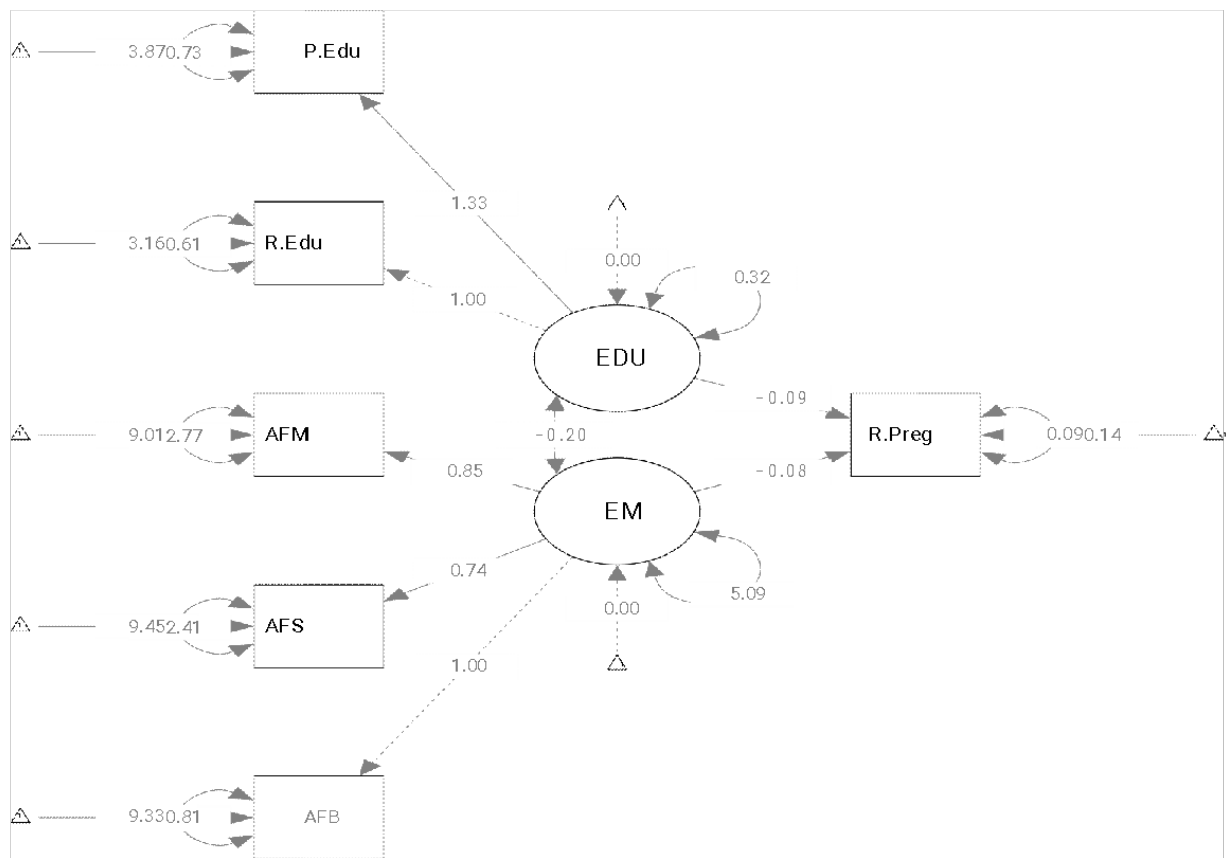

Figure 6: Path diagram showing the relationship between early marriage and repeat adolescent pregnancy using 2022 KDHS Data

Discussion

This study focused on establishing the relationship between repeat adolescent pregnancy and early marriage occurrence in Kenya based on the 2022 KDHS data. This study saw it important to selectively address the issue of adolescent pregnancy by separating those adolescents who experienced only one pregnancy from those who experienced more than one pregnancy. This is because those who experience repeated pregnancy during adolescence were found to be more predisposed to getting pregnant again due to their socio-demographic and economic settings, and as such, need targeted interventions. According to the 2022 Kenya DHS, the adolescent fertility rate was 15%. This statistic comprised all adolescent pregnancies from adolescent girls aged 15-19, whether as a first pregnancy or a repeat pregnancy. The prevalence of repeat adolescent pregnancy, and rapid repeat adolescent pregnancy (successive pregnancies 24 months from each other during adolescence) was calculated. 26.7% (4459) of all sampled women (12166) aged 15-24 experienced at least one or more pregnancy during adolescence. 62% of this proportion experienced repeat adolescent pregnancies. Of these repeat adolescent pregnancies, 52% were rapid repeat pregnancies.

The study also analyzed the prevalence and dispersion of early marriage incidences within the 47 counties in Kenya. The DHS defines the age at first marriage as the age at which the respondent began living with their first partner. Since early marriage is illegal in Kenya, most of them tend to occur outside the framework of Kenyan law, i.e., illegally. According to the 2022 KDHS, 23% of women aged 20-24 were married by age 18 compared to 29% of women aged 25 – 49 who reported being married by age 18, and 48% by age 20. In this study, 12% of sampled women recorded being married by age 18. The median age of marriage among the study sample was 16 years. Compared to older women aged 40-49, whose median age at first marriage was 19 years, the key takeaway is that age at first marriage has reduced among the younger generations.

The study hypothesized a positive relationship between the likelihood of the occurrence of repeat adolescent pregnancy to that of early marriage in Kenya. Previous literature alluded to the likelihood of early marriage acting as a catalyzing factor to the occurrence of repeat adolescent pregnancy. As such, the dispersion of early marriage incidences was plotted against those of rapid repeat adolescent pregnancy. The results were displayed on the Kenyan map. Results showed that the Western part of Kenya had the most incidences of both early marriage and rapid repeat

adolescent pregnancy. Counties with the highest rapid repeat adolescent pregnancy rates included Murang'a, Nyandarua, Siaya, Wajir and Tana River, whereas Kiambu, Nandi, Vihiga, Nandi and Laikipia counties had the least -rates. Nyeri county had no rapid repeat adolescent pregnancy incidents reported in this study.

On early marriage prevalence, Baringo, Bomet and Busia counties recorded the highest rates while Turkana, Uasin Gishu and Vihiga counties recorded among the lowest rates. From this analysis, Vihiga county recorded low rates of both rapid repeat adolescent pregnancy and early marriage. The Maasai community represented by Kajiado and Narok counties had prevalence of both occurrences, showing continued practice of early marriage as a communal practice within the tribe. Urban counties such as Nairobi, Kisumu, Mombasa and Kiambu that have consistently benefitted from better access to education, healthcare and social services revealed minimal prevalence of early marriage. The study revealed that counties with high prevalence of rapid repeat adolescent pregnancies did not necessarily have high prevalence of early marriage. Nonetheless, all the 47 counties recorded rapid repeat adolescent pregnancy and early marriage incidences in varying ratios.

Structural Equation Modeling was used to analyze the positive relationship that was hypothesized to exist between repeat adolescent pregnancy occurrence and early marriage occurrence in Kenya. The SEM model included two latent variables, one for early marriage and the other education. These two latent variables displayed a significant negative covariance (-0.155), indicating an inverse relationship between the latent variables, i.e. higher education levels signified a lower likelihood of early marriage among adolescent girls. This is similar to a study by Sakwa (2020) who studied the effects of early marriage on the education of primary school girls in Wajir County in Kenya. He not only reported the existence of early marriage practice among the Somali community in the region, but that the practice negatively affected the education of girls. When an adolescent girl gets married, she is more likely to discontinue her education, thus reducing her opportunities for further learning and personal development. Early marriage subsequently limits socio-economic expertise and mobility (Parsons et al; 2015), consequently reducing the adolescent girl's access to current and future employment prospects – even including healthcare access (Fan & Koski, 2022).

The results of the SEM analysis produced some key findings. The relationship between early marriage and the occurrence of repeat adolescent pregnancy in Kenya was significantly non significant, indicating an indirect relationship. The study initially hypothesized a positive and direct relationship between early marriage and repeat adolescent pregnancy. However, based on the results of this analysis, the study failed to reject the null hypothesis, as the coefficient for the direct path was negative but statistically significant. This finding revealed that early marriage is not the sole direct influence on repeat adolescent pregnancy in Kenya, indicating the presence of other contributing factors or pathways influencing this relationship. This explains the inclusion of a second latent variable on education in the model, based on its well-documented effect on influencing both adolescent pregnancy and early marriage in this context.

The second result from the SEM model was on the direct relationship between education and repeat adolescent pregnancy outcome. The variable on education, derived from data collected on the adolescent girls and their respective husbands/partners, measured the educational level within households, which would indirectly predict the economic and financial capabilities of such households. The study found out that education significantly reduced the likelihood of repeat adolescent pregnancy. This finding emphasizes the critical role of education in delaying subsequent pregnancies during adolescence. Evidence by Kiptanui et al; (2015) revealed that adolescents who remained in school longer generally delayed falling pregnant during this time. This result was also corroborated by Govender et al.; (2019), whose study associated higher educational attainment with a lower risk of repeat adolescent pregnancy. The direct impact of educational level on the likelihood of rapid repeat adolescent pregnancy was significant. It, however, lost its significance when it was included in the multivariable logistic regression model. Education acts as a protective factor against repeat adolescent pregnancy as it enhances knowledge and awareness of contraception and reproductive health access, it delays marriage and childbearing through extended schooling, and increases the likelihood of economic independence (Sakwa, 2020).

The resulting inference from this analysis was that early marriage, by itself, did not cause repeat adolescent pregnancy. While the predictors of both these occurrences seemed similar, the fact that an adolescent was married early did not increase their likelihood of experiencing repeat adolescent pregnancy. This study established that education levels played a significant role in married

adolescents' likelihood of experiencing repeat adolescent pregnancy. While education reduced the likelihood of early marriage, it also reduced the likelihood of repeat adolescent pregnancy, as portrayed in the model. Education therefore served as a critical covariate and/or mediator in this relationship, playing a significant role in influencing repeat adolescent pregnancy. The inclusion of education as a mediator clarified the interplay between repeat adolescent pregnancy and early marriage in this context. Adolescent girls with higher educational attainment were more likely to delay marriage and subsequent pregnancy during adolescence, including repeat pregnancy.

Early marriage has often been linked to various adverse reproductive health outcomes for adolescent girls. However, enhancing the educational levels of adolescents could have a more significant impact in addressing the risks involved - including repeat adolescent pregnancy. Several studies show that adolescents who remained in school and pursued higher levels of education were less likely to experience adolescent pregnancy, even repeat adolescent pregnancy. Through enhancing education as a protective factor, the likelihood of experiencing repeat adolescent pregnancy could be reduced. Education provides knowledge about reproductive health, contraception, and autonomy in decision-making that significantly empowers adolescents to make informed choices about their current and future reproductive health.

Parent intervention is crucial, especially in adolescent pregnancy prevention (Silk et al., 2013). Parents who invested in their adolescent children's lives were less likely to predispose them to adolescent pregnancy and early marriage. In fact, investing in an adolescent girl's education is a sure way of not just securing their future, but preventing adolescent pregnancy and early marriage. Keeping adolescent girls in school also leads to better economic opportunities for adolescents thus reducing the pressures that may be associated with early marriage (Gupta & Mahy, 2003). Economically independent women are also more likely to delay childbearing and space their children appropriately, thus lowering the likelihood of repeat adolescent pregnancies, even among married adolescents. In some cultural contexts, societal pressure still force educated women to marry early. Through the knowledge obtained from education on their rights and laws concerning marriage, they could stand a higher chance of resisting these pressures and seeking alternative assistance in their quest for justice.

Conclusion

Adolescents are critical in shaping the fertility transition of a country (Bongaarts & Hodgson, 2022). Among the world regions, sub-Saharan Africa, Latin America and the Caribbean regions have continued to experience slower adolescent fertility decline (UNDESA, 2022). This could be attributed to the rising younger population in these regions. With a higher youthful population compared to any other continent, sub-Saharan Africa feels the most impact of the effects of adolescent fertility and early marriage among its youthful population. The net result is a slower fertility transition with increased poverty and health complications both for the young mothers and their children (Bongaarts, 2017). Within these regions are an estimated 21 million girls aged 15 – 19 who become pregnant yearly (Sully et al, 2019). Adolescent pregnancy, especially rapid repeat adolescent pregnancy in low and middle-income countries, presents a big challenge to development at all levels. Early marriage, on the other hand, is seen both as a driver and consequence of adolescent pregnancy (Menon et al, 2018).

This study set out to explore the relationship between repeat adolescent pregnancy occurrence and early marriage occurrence in Kenya. This study had two objectives to achieve this goal. First, the study aimed to assess the prevalence and geographic distribution of repeat (and rapid repeat) adolescent pregnancies and early marriage incidences in Kenya. The second objective was to analyse the relationship between early marriage and repeat adolescent pregnancy outcomes in Kenya using a structural equation model. The main data source for this study was the 2022 Kenya demographic and health survey dataset, with the sample comprising of women aged 15-24. This study ensured to analyze only those pregnancies that occurred to these women during the adolescence period, i.e. up to age 19.

The results from the SEM model revealed no direct causal relationship between early marriage and repeat adolescent pregnancy in Kenya. The path from early marriage to repeat adolescent pregnancy was found to be significant but negative. This finding implied that the higher the likelihood of early marriage, the less the likelihood for repeat adolescent pregnancy. The relationship between these two outcomes was positively mediated by education. The inclusion of education as a mediator in the SEM model provided an understanding of the interplay between repeat adolescent pregnancy occurrence and early marriage occurrence in Kenya. Studies have found a significant relationship between the education level of the adolescent girl (Gupta & Mahy,

2003) and that of their respective sexual partners (Adjiwanou et al., 2018) to the likelihood of both early marriage and adolescent pregnancy. In summary, early marriage does not directly lead to early marriage. Mediating factors such as education as revealed in this study play a role in influencing repeat adolescent pregnancy occurrence. Further research is needed to analyze the magnitude and strength of other possible mediating factors that impact the direct effect of early marriage on repeat adolescent pregnancy outcomes in developing countries.

In summary, these findings highlight the urgent need for multi-sectoral interventions that target education, economic empowerment and sexual reproductive health services for adolescent girls in Kenya. Policies need to address male involvement and the role of partners /husbands in addressing adolescent reproductive outcomes. Strengthening access to quality education, family planning services, and gender empowerment initiatives among adolescent mothers especially in the rural areas of Kenya could greatly reduce repeat adolescent pregnancy occurrence.

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