

Adolescent Fertility in Low- and Middle-Income Countries: Effects and Solutions

Kate McQueston, Rachel Silverman, and Amanda Glassman

Abstract

Adolescent fertility in low- and middle-income countries presents a severe impediment to development and can lead to school dropout, lost productivity, and the intergenerational transmission of poverty. However, there is debate about whether adolescent pregnancy is a problem in and of itself or merely symptomatic of deeper, ingrained disadvantage. To inform policy choices and create a revised research agenda for population and development, this paper aggregates recent quantitative evidence on the socioeconomic consequences of and methods to reduce of teenage pregnancy in the developing world. The review finds variable results for all indicator types with the partial exception of knowledge-based indicators, which increased in response to almost all evaluating interventions, though it is not clear that such interventions necessarily lead to short- or long term-behavior change. The evidence base supporting the effectiveness of conditional cash transfers was relatively strong in comparison to other interventions. Similarly, programs that lowered barriers to attending school or increased the opportunity cost of school absence are also supported by the literature. On the basis of these findings, the authors argue that donors should adopt a rights-based approach to adolescent fertility and shift their focus from the proximate to distal causes of pregnancy, including human rights abuses, gender inequality, child marriage, and socioeconomic marginalization. Further research should be conducted to strengthen the evidence base by 1) establishing causality, 2) understanding the differential impacts of adolescent fertility in different contexts, and 3) investigating other the impact of adolescent fertility on other socioeconomic outcomes, such as labor participation, productivity, and the intergenerational transmission of poverty.

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Chapter 1: Introduction

In 2005, the Center for Global Development brought together a group of researchers, economists, demographers, and policymakers in an attempt to better understand the relationships between reproductive health, population dynamics, and economic development. The result of this meeting was a self-described list of “best guesses” for a research agenda that could inform economic and health-sector decision-making in the coming years, with a narrow focus on policy variables that could inform better allocation of scarce resources. This agenda noted three key areas for evaluation: (i) the implications of fertility and mortality trends on macro-economic growth and development; (ii) the impact of reproductive health investments on micro-economic outcomes; and (iii) the impact of reproductive health investments for vulnerable populations.

Seven years later, we are testing some of these “guesses” to see if the identified gaps in the literature have been filled, and if so what policy conclusions can be drawn from them. We examine two aspects of the 2005 research agenda relating to adolescent fertility. The first considers the impact of adolescent childbearing on girls’ wellbeing, focusing on school continuation, human capital accumulation, and productivity. The second chapter evaluates the impact of a range of interventions to reduce adolescent fertility. Both chapters review the existing literature on their respective research questions; assess the quality of this evidence; and discuss how the current research base should inform donors’ approach to adolescent fertility.

Adolescence, as a distinct life phase characterized by both sociological and biological benchmarks, has been identified by many public health experts and policymakers as central to lifelong health and psychological wellbeing (Sawyer et al., 2012). Still, the connotations and expectations of adolescence, as an intermediate period between childhood and adulthood, may vary wildly by social context, and correlate only loosely with the teenage years. For practical reasons, both chapters equate adolescent pregnancy with teenage pregnancy, using age as a proxy for life stage. Nonetheless, we recognize the challenges in applying such a universal definition, which we attempt to address throughout our analysis.

The first chapter (Silverman) identifies several trends between adolescent childbearing and socioeconomic outcomes. While the review finds strong correlations between adolescent fertility and school drop-out, the question of causation remains far more ambiguous, as effect sizes decrease sharply with more rigorous research methods. Moreover, the study also finds that in some contexts, high numbers of women continue education after child birth—suggesting that childbirth and education (and other related outcomes) may not be incompatible.

Similarly, the review of interventions to reduce adolescent fertility (McQueston et al) finds variation across studies, but also notes some general findings. The evidence base for conditional cash transfers, though somewhat variable, is by far the most robust when

compared to the other interventions. Additionally, programs that lowered barriers to attending school or increased the opportunity costs of not attending school were also found to be effective—suggesting that education may substitute for adolescent fertility. Notably, the most effective interventions appeared to be outside of the typical reproductive health sphere.

The implications of these reports are particularly relevant due to (1) the general consensus that adolescent fertility is a major problem for the developing world, and (2) the resources that have followed this assumption. Of course, as reviews, both chapters are limited by the quality and scope of the studies they include—from which the authors note gaps and suggest new research agendas. Further, adolescent fertility and its causes are complex, nuanced issues that are affected by a range of motivations and external factors. Nonetheless, this research reframes the conversation about adolescent fertility and the policies and interventions that might be used to reduce its frequency.

Among other findings, the first study suggests that adolescent fertility is more consequence than cause of socioeconomic disadvantage. While fertility is often correlated with school dropout, other factors – current school enrollment, marital status, anticipated economic returns to education, family attitudes, and other related context — drive both school continuation and the likelihood of experiencing an adolescent pregnancy. The review found insufficient evidence to conclude that adolescent fertility is a (major) development problem, but confirms that underdevelopment is an enormous impediment to reducing adolescent fertility. This finding suggests that a more holistic (and possibly complex) approach may be needed to address the foundational causes of adolescent fertility. Creating economic opportunities for women, reducing adolescent marriage, and changing gender norms are likely to be more effective in the quest to accelerate economic development than merely reducing adolescent fertility.

These findings are consistent with the results of the second study. While interventions that focused on increasing knowledge and changing attitudes about sexual and reproductive health appeared successful in the short term, there was little evidence of any long term impact. On the contrary, interventions that encouraged school attendance proved more effective in reducing overall adolescent fertility. This evidence suggests that policymakers should expand educational opportunities for girls and create incentives for school continuation, such as conditional cash payments or the expectation of a worthwhile job following graduation. Reproductive health services are important for many young women, but increasing contraceptive access and uptake may not, on its own, be sufficient to change fertility trends.

This is not to underplay the health and rights dilemmas caused by adolescent fertility. The dangerous health consequences of adolescent pregnancy and childbirth are real and well-documented, though they may originate in adolescents' socioeconomic rather than biological vulnerability. Further, adolescent pregnancy can be an enormous human rights concern, particularly when it results from sexual coercion or forced child marriage. Still, the focus of

the original research agenda on reproductive health services is representative of common assumptions, which can conflate the proximate causes of pregnancy with the underlying drivers of fertility trends. Similarly, intuitions about the economic consequences of adolescent fertility can be misleading. Together, the findings of these reviews rebut popular wisdom—a cautionary example that a sound research base is necessary both to ask and answer the right policy questions.

Chapter 2: How Does Adolescent Childbearing Impact School Continuation Rates, Human Capital Accumulation, and Productivity? A Review of the Evidence¹

Among advocates for reproductive health, there is widespread consensus that adolescent fertility in low- and middle-income countries presents a severe impediment to development. In addition to well-established health risks, these policymakers believe that adolescent pregnancy can lead to poor socioeconomic outcomes such as school dropout, lost productivity, and the intergenerational transmission of poverty. However, there is also a growing conversation about whether adolescent pregnancy is a problem in and of itself, or merely symptomatic of deeper, ingrained disadvantage. To inform policy choices and create a revised research agenda for population and development, this review aggregates recent quantitative evidence on the socioeconomic consequences of teenage pregnancy in the developing world. A comprehensive search strategy yielded eleven papers, all of which focused on school continuation. While all of the studies identified a correlation between adolescent fertility and school dropout, the effect size decreased significantly as more rigorous controls were introduced. Overall, there is insufficient empirical evidence to suggest that adolescent fertility per se represents a major development program. Based upon these findings, donors should adopt a rights-based approach to adolescent fertility and shift their focus from the proximate to distal causes of pregnancy, including human rights abuses, gender inequality, child marriage, and socioeconomic marginalization. Further research should be conducted to strengthen the evidence base by 1) establishing causality, 2) understanding the differential impacts of adolescent fertility in different contexts, and 3) investigating other the impact of adolescent fertility on other socioeconomic outcomes, such as labor participation, productivity, and the intergenerational transmission of poverty.

Background

In 2004, the Center for Global Development convened a Population and Development Working Group to review current evidence on the relationship between population dynamics and economic outcomes; to identify existing knowledge gaps in the evidence; and to outline an agenda of research priorities on those topics.

The working group issued a final report in July 2005, identifying three main substantive areas for which it recommended investment in empirical research to influence medium-term policy objectives. One of the three major categories related to the impact of investments in

¹ This chapter is written by Rachel Silverman

reproductive health on economic conditions at the household level, with one specific question asking how adolescent reproductive health – particularly fertility – related to school continuation rates, human capital accumulation, and enhanced job skills.

Despite declines in average fertility rates, an estimated 14 to 16 million children are born to adolescent mothers aged 15 to 19 each year, representing 11% of total births worldwide (Temin and Levine, 2009). Even within the developing world, the incidence of adolescent pregnancy varies dramatically by region; while over 50% of women in sub-Saharan Africa give birth before age 20, only 2% of Chinese children are born to teenage mothers (Temin and Levine, 2009; WHO, 2007). Many of these births are planned and take place within the context of early marriage, which is encouraged in some societies and remains common in developing countries. Approximately half of girls in sub-Saharan Africa are married by age 18, compared with 20-40% in Latin America and a staggering 73% of girls in Bangladesh. Still, a substantial portion of teenage pregnancies are unintended and unwanted, ranging from 10-16% in India and Pakistan to a high of 50% or more in several African countries (WHO, 2007).

Most policymakers view teenage fertility as a problem, which they have attempted to address through targeted interventions such as school-based sexual education, conditional cash transfers, and subsidized contraception (a complementary paper considers the effectiveness of such interventions in decreasing teenage pregnancy). To the extent that such interventions work, the corresponding reductions in fertility are likely to have a significant impact on adolescent and child health, as early childbearing is associated with severely heightened mortality and morbidity risk for mothers and their children due to their disproportionate vulnerability to complications including anemia, fistulae, and low birth weight (Temin and Levine, 2009; WHO, 2007). Policymakers also worry that adolescent pregnancy can lead to poor socioeconomic outcomes such as school dropout, lost productivity, and the intergenerational transmission of poverty. Indeed, the Center for Global Development's 2009 report *Start With a Girl* cites an astronomic estimate that in India alone, "adolescent pregnancy results in nearly \$100 billion of lost potential income" (Temin and Levine, 2009). However, as of the 2005 working group report, the connections between teenage fertility in developing countries and socioeconomic outcomes – particularly poverty, schooling, human capital accumulation, and productivity – remained under-researched and poorly understood.

In the United States and industrialized countries, the question of teenage pregnancy has received longstanding attention from researchers. According to a 2005 review by Greene and Merrick, early conclusions about the grave impact of adolescent childbirth later evolved into a more nuanced understanding after subsequent research incorporated more sophisticated controls for socioeconomic background. A few landmark studies, including Geronimus and Korenman (1992), find that the negative outcomes attributed to teenage pregnancy disappear when appropriate controls are put in place for the preexisting family and socioeconomic characteristics of teen mothers. Still, recent research has found that children of adolescent mothers are more likely to have grown up in poor or dangerous environments, become vulnerable to health risks and abuse, struggle in school, and experience incarceration (Greene

and Merrick, 2005). In contrast, when considering poor countries in particular, the same review finds that “the evidence base ... is still limited compared to research on adolescent childbearing within the U.S.” (12).

To build upon previous work (see Greene and Merrick, 2005) and help inform a revised research agenda for population and development issues, this review aggregates recent evidence (since 2000) on the socioeconomic consequences of teenage pregnancy in the developing world. In the following sections, this paper first outlines a conceptual framework for the possible relationship between adolescent pregnancy and negative socioeconomic outcomes. Next, it describes the search methodology and presents the findings of a literature review on the relationship between adolescent childbearing in low- and middle-income countries and socioeconomic outcomes including poverty, schooling, human capital accumulation, and productivity. The final section considers the implications of the current research base and issues revised recommendations for further study.

Conceptual Framework

While the connection between adolescent fertility and poor health outcomes is well-documented, much of the advocacy for prevention efforts also assumes a relationship between teenage motherhood and poor socioeconomic outcomes. Particularly, early childbearing is often thought to impact girls’ socioeconomic status through two primary pathways. First, pregnancy might disrupt girls’ schooling and limit their human capital accumulation, which would consequently lower their later-life job prospects, productivity, and earnings (Madhavan and Thomas, 2005). Second, depending on the norms of a particular society, out-of-wedlock childbearing by adolescent girls could be highly stigmatized and thus lead to social exclusion, alienation, and a higher likelihood of single parenthood, limiting girls’ access to social capital and family and community support (Greene and Merrick, 2005). Through such pathways, adolescent fertility might be responsible for persistent poverty, potential lost earnings, perpetuation of the gender gaps, and intergenerational transmission of poverty.

Such impacts might be mediated by the contextual factors present in developing country environments. Similar to adolescent pregnancy, child marriage has come under increasing scrutiny for its potential negative effect on school completion among married girls. However, as Lloyd and Mensch (2008) describe, early marriage is most common in countries with very low levels of educational attainment. Thus, girls are likely to experience a gap between the end of their schooling and marriage, even if they marry very early by Western standards. Accordingly, child marriage may have only a very minor impact on school completion in developing countries. In this respect one can draw parallels between early marriage and adolescent childbearing. If most girls have already dropped out of school at the time of their pregnancy, whether for early marriage or other reasons, then teenage motherhood is likely to have only a small effect on school completion rates and their lifetime earnings. Thus, as Eloundou-Enyegue and Stokes (2004) posit, adolescent fertility should be

relatively “innocuous (from the standpoint of girls’ schooling) in societies where the average duration of schooling is short or where reproductive norms prescribe early marriage and childbearing for girls” (307). In contrast, schoolgirl pregnancy would matter most in contexts where girls would otherwise continue their schooling beyond puberty, and where girls’ schooling is considered socially acceptable and/or desirable. In such settings, adolescent fertility could be the determining factor which leads to girls’ dropouts while boys stay in school, perpetuating gender inequality in human capital development (Eloundou-Enyegue and Stokes, 2004).

More generally, one must consider the appropriate counterfactual when assessing the impact of teenage childbearing on school completion. To assert that adolescent fertility causes school dropout is to assume that teenage girls, in the absence of pregnancy, would continue their education (Lloyd and Mensch, 2008). Even without experiencing a pregnancy, many girls in developing countries do not remain in school through adolescence; other reasons for dropout include poor school performance, financial hardship, early marriage, job opportunities, and poor health (Eloundou-Enyegue, 2004). Thus, while a pregnancy might coincide with dropout, it is not necessarily indicative of a causal relationship. Moreover, the relationship between adolescent motherhood and school dropout is likely to include some degree of endogeneity. Lloyd and Mensch (2008) note that “the same social and economic circumstances that predispose young women to engage in unprotected premarital sex (and subsequently proceed with the pregnancy rather than abort it)...are, in all likelihood, critical factors in early school leaving” (2). In the U.S., a body of qualitative research describes how adolescent pregnancy becomes part of an accelerated life course for girls with scant resources and economic prospects, offering “a pathway to adulthood and a sense of purpose and identity that can stabilize some girls lives” (SmithBattle, 2009 [125]). As demographic and health surveys show that a large portion of adolescent pregnancies worldwide are both desired and planned, including a substantial minority of extramarital pregnancies, the desire for an accelerated pathway to adulthood may also apply to disadvantaged girls in developing countries.

Additionally, while a schoolgirl pregnancy is perhaps likely to *disrupt* schooling, early childbearing need not necessarily present a *permanent* endpoint to a girl’s education, or even an immediate need to end schooling if the pregnancy is in its early stages. Again, contextual factors might strongly influence the long-term impact of teenage motherhood on the likelihood of school continuation. At one extreme, girls in many African countries are forced to leave school during a pregnancy and are prohibited from later return (Azarnert, 2009; WHO, 2007). Similarly, girls in Jamaica are expelled from school during a pregnancy, while in Chile girls are often pressured to leave school even though the official legal guidelines recommend continued education (WHO, 2007). Other societies, however, are more accommodating toward teenage mothers. South Africa is particularly progressive in this sense; schools are legally prohibited from dismissing female students due to pregnancy or childbirth, and the state offers child-care grants to help facilitate continued schooling (Madhavan and Thomas, 2005). Family environments could also be influential, as access to

free child care and ongoing financial support could assist adolescent mothers to continue their schooling after childbirth (Kaufman et al., 2000).

Even if adolescent pregnancy were to significantly impact girls' schooling, the long-term socioeconomic consequences would depend upon the return to girls' education in a particular societal context. Due to societal norms and biases, educated women could still be excluded from formal-sector employment or expected to take primary responsibility for childrearing. Additionally, rural or agricultural regions may offer limited employment opportunities for all job seekers, regardless of gender, and particularly if the quality of education is low (WHO, 2007). In such contexts, secondary school completion may offer limited economic returns. Consequently, secondary school disruption due to pregnancy would have limited long-term socioeconomic implications (WHO, 2007). South Africa once again presents a useful contrast; there, within a context of high inequality and widespread unemployment, education is considered the key determining factor in securing a competitive high-paying job in the formal sector (Kaufman et al., 2000).

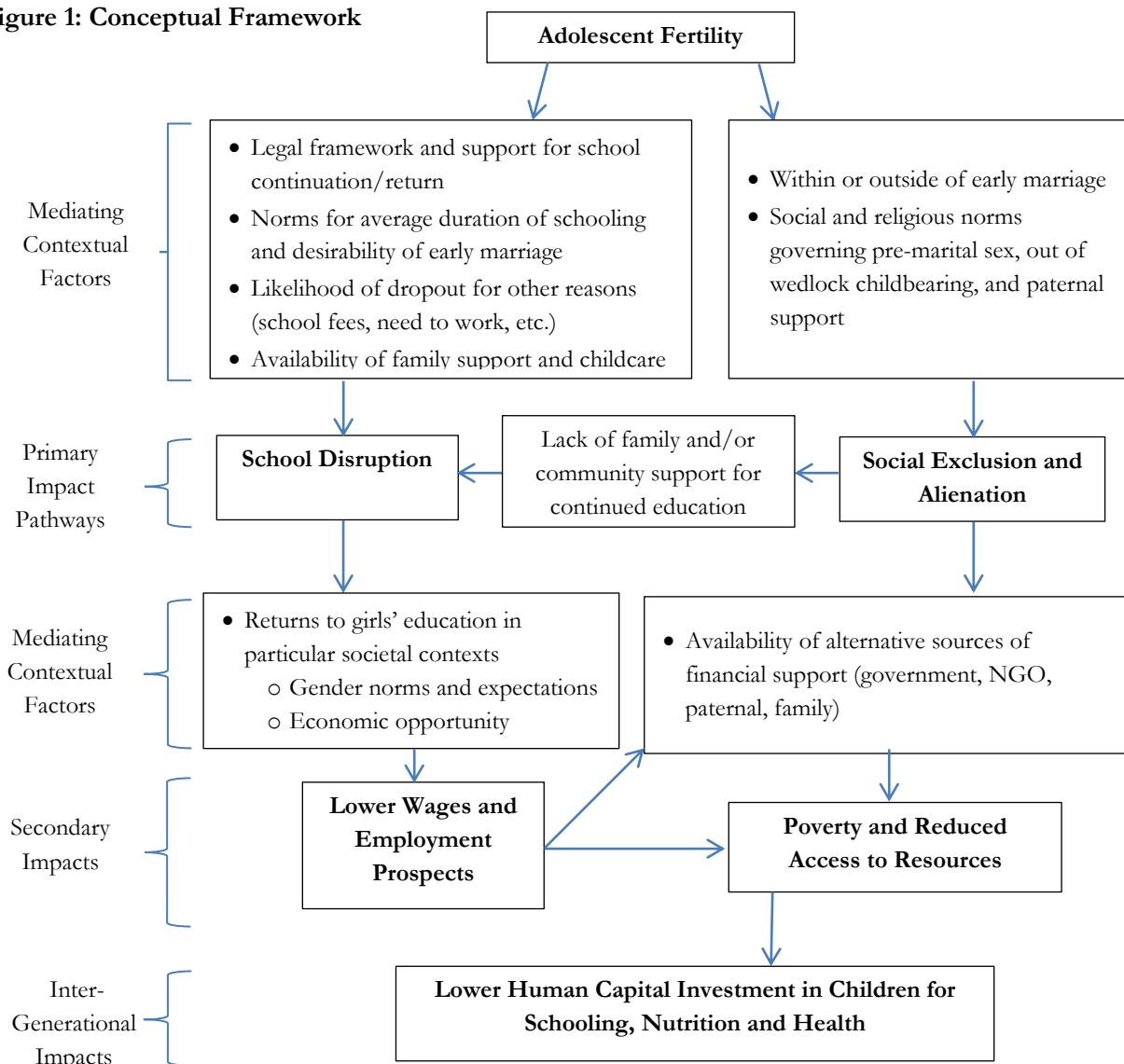
Further, as a 2007 WHO report explains, the "social and economic consequences of adolescent pregnancy and childbearing depend upon the adolescent's particular cultural, family, and community settings" (29). Far from a stigmatizing event, adolescent fertility within marriage can be an accepted and encouraged phenomenon that brings higher social status to the teenage mother (WHO, 2007). Moreover, pregnancy would not affect schooling for married girls because, overwhelmingly, they would have already withdrawn. For unmarried adolescents, outcomes could vary dramatically based upon cultural values and attitudes toward pre-marital sex and pregnancy. In some societies with high adolescent fertility rates, such as South Africa, out-of-wedlock pregnancy is sufficiently common to be accepted by most families, even if formally discouraged (Preston-White and Zondi, 1992, cited by Madhavan and Thomas, 2005). With family support, girls often (1) are better equipped to return to school and resume their educations, and (2) benefit from ongoing access to child care and other financial assistance. In contrast, particularly in more traditional or religious societies, a pregnant but unmarried adolescent could face social ostracism from her family and community, "left with no guaranteed means of support both for the child and herself" (WHO, 2007: 29).

For such socially alienated adolescent mothers, there is yet another layer of mediating contextual factors that could influence long-term impact. Cut off from family and/or community support, one might expect girls to have better long-term socioeconomic chances in contexts where they could draw from alternative channels of financial assistance, such as the government or civil society organizations. Perhaps most important is the role of the child's father, particularly whether he assumes financial responsibility for the child. Further, a subsequent marriage – either to the child's father or another supportive partner – could help restore the girl's long-term social capital and provide financial support for the mother and child alike.

If adolescent fertility leads to greater poverty and disadvantage for the mother, she could transmit her low socioeconomic status to her children through malnutrition, poor health status, and low educational attainment. If a teenage mother exits school early and subsequently earns a lower income, her children might suffer from limited human capital investment (in both health and education) due to inadequate resources. Moreover, *in utero* nutritional status is linked to cognitive and immune system development; children who experience prenatal malnutrition are likely to suffer from irreversible lifelong negative health effects (Bird, 2007). As teenage mothers are more likely to suffer from nutritional deficiencies than older mothers, their children could be vulnerable to lifelong health-related disadvantage, particularly if their poor health affects their educational attainment or productive work capacity. Through such avenues, adolescent fertility could contribute to the intergenerational transmission of poverty (Bird, 2007; WHO, 2007).

Figure 1 illustrates the conceptual framework linking adolescent pregnancy with potential negative socioeconomic outcomes in low- and middle-income countries.

Figure 1: Conceptual Framework



Search and Selection Methodology

Study Eligibility Criteria

Studies were included that met the following criteria: 1) considered target populations in low- or middle-income countries, as defined by the World Bank; 2) were published since January 1, 2000; 3) evaluated the impact of pregnancy and/or childbirth among youth or adolescents (identified broadly as girls aged 13 to 20); and 4) examined a range of socioeconomic outcomes variables including but not limited to poverty, schooling, and productivity. Health outcomes are outside the scope of this review, as the relationship between adolescent pregnancy and negative health effects is well-established within an

extensive literature base. In a number of cases, adolescent pregnancy was only a secondary or tangential topic of study; I include any paper with subject relevance, even if it is not the study's primary focus.

To be most inclusive of related research, I include papers across a wide range of study designs and methodologies. I include both peer-reviewed journal articles and grey literature, as appropriate. While rigorous quantitative evaluations are given greater weight, I also include papers based on survey data, focus groups, and cross-country analysis. I only include papers with original research or analysis. Accordingly, previous literature reviews and reports with undocumented claims are excluded.

Databases, Search Terms, and Special Strategies

To identify studies for inclusion, one researcher searched electronic databases EconLit, PubMed, and Social Sciences Research Network (SSRN) with a standardized search methodology. Search terms varied slightly depending on the particular design of each database, but consistently included search terms for adolescent, fertility, schooling, human capital, and education. Searches were performed in October to December 2011. Searches were limited to English-language papers and publication after January 1, 2000. In total, 1,793 potentially relevant studies were identified for review through the primary search strategy. Please see Appendix I for full search strategy and search terms.

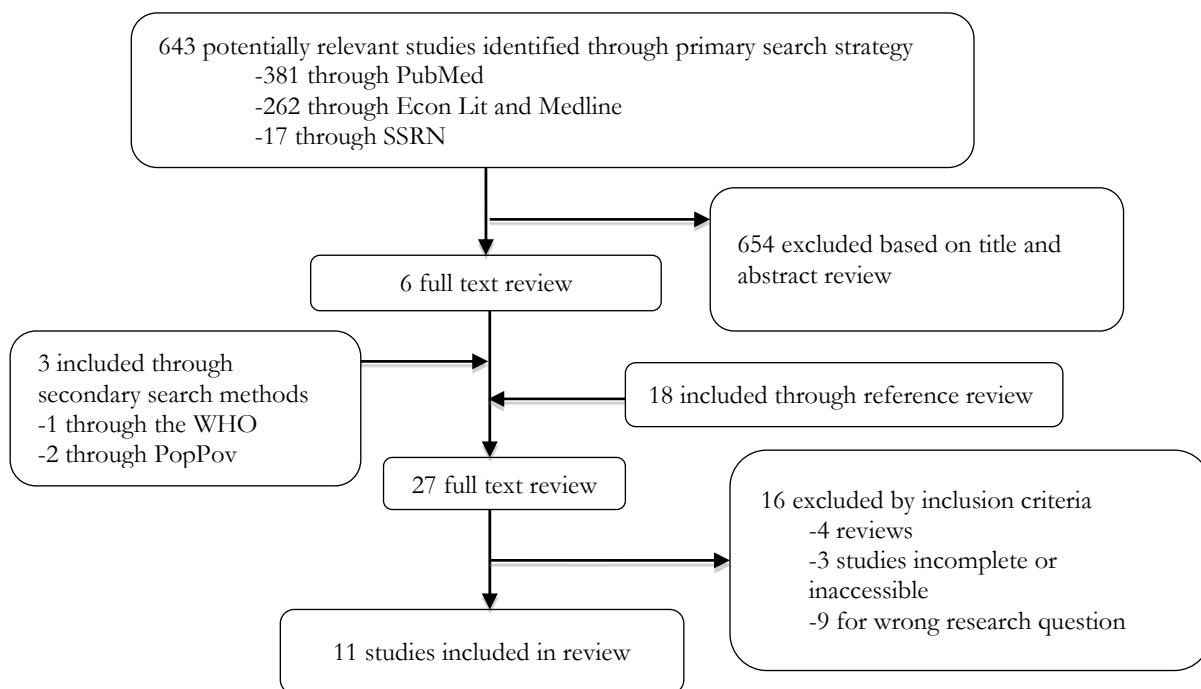
Additional Search Methods

After completing the first phase of my search strategy, a range of supplementary sources to identify additional published and unpublished studies were searched. These sources included PopLine, Google Scholar, the 3IE database, PopPov (<http://poppov.org/Research.aspx>), and other relevant libraries of international agencies, including the International Food Policy Research Institute (IFPRI), the World Health Organization (WHO), and the World Bank. Three additional papers were identified via secondary search methods. The reference lists of all included studies were manually reviewed and citations were reviewed for inclusion. An additional 18 papers were identified for full text review through reference lists.

Study Selection

Titles and abstracts were systematically screened for of all records identified through the standardized search strategy. After ineligible studies were excluded, the remaining 27 papers were evaluated based on a full text review. In total, 16 of the remaining studies were excluded for not meeting the paper's inclusion criteria, including four reviews, nine papers which did not address the research question, and three studies which were either incomplete or inaccessible. Eleven papers met all of the relevant criteria and are included in this review. Figure 2 provides a flow diagram of the study selection methodology.

Figure 2: Prisma Flow Diagram of Search Strategy



Limitations

The selection methodology introduces several noteworthy limitations to this review. First, by limiting search results to English-language papers, this paper *de facto* excludes much of the Latin American literature. Due to that region’s relatively high out-of-wedlock teenage childbearing rate, one would expect a sizeable body of topical literature. Second, by limiting selection criteria to studies after 2000, it is possible that foundational literature on this subject may be excluded.

Results

In total, eleven papers were selected for inclusion in this review. A full summary of each paper, including its results and limitations, can be found in Appendix III.

Some common trends among the selected papers are immediately evident. Ten of the eleven studies focus exclusively on Sub-Saharan African countries; the remaining paper is a cross-national analysis of 38 nations in Africa, South Asia, Latin America, the Middle East, and North Africa. In particular, South Africa was the setting for a majority (six) of the selected papers. All 11 studies focus on school continuation as their outcome of interest; no papers were identified which looked at long-term consequences of adolescent pregnancy on poverty, productivity, or job market prospects. Only a few of the studies examine the relationship between adolescent pregnancy and school continuation as their primary

outcome of interest, rather than as a secondary outcome, control variable, or input from which to draw other conclusions.

Further, the selected papers vary widely in their quality. For the purposes of this review, “quality” is defined as the level of rigor with which the paper treats the research question. If the connection between adolescent fertility and school continuation is only a secondary or tangential outcome, it may be considered to be low quality evidence; this should not necessarily be considered a judgment of a paper’s overall quality.

Does Adolescent Pregnancy Impact School Continuation/Dropout Rates? Micro-Level Perspectives

The selected papers found widely varying effects of pregnancy on school continuation and dropout rates at the micro-level (see Table 1). Among the high quality studies, Ranchod et al. (2011) use a propensity score weighted regression to generate an appropriate counter-factual control group for teen mothers in Cape Town, South Africa. They find that while girls who experience adolescent fertility are 30% less likely to graduate from high school by age 20 in simple estimates, this effect reduces to a much smaller but still significant 6% difference when propensity matching and other controls are introduced. Conversely, Madhavan and Thomas (2005) find a stronger effect through their analysis of census data in Limpopo province (also in South Africa). According to their estimates, girls who experienced a live birth were 56% less likely to be enrolled in school after controlling for a range of socioeconomic factors. An earlier study by Marteleto et al. (2008) found that when controlling for a number of relevant variables, a pregnancy was correlated with an increased likelihood of dropout of 12% for Africans and 22.3% for Coloreds.

A few lower-quality studies also addressed this question, but only reported simple correlations between adolescent fertility and school achievement. Among 14-19 year old girls who experienced pregnancy while still enrolled in school in Kwazulu-Natal, Grant and Hallman (2008) report that 74% dropped out of school in the year of their pregnancy. However, girls were almost twice as likely to drop out in the year of their pregnancy if they had already repeated a grade in the past, indicating that many pregnancy-related dropouts were among girls with a high likelihood of dropout in the counterfactual. Mensch et al. (2001) investigated the reported reason for dropout among young mothers in Kenya; of their sample, only 6 of 27 pregnant schoolgirls blamed their school exit on either pregnancy or marriage, with the majority citing financial constraints. Finally, Hunter and May (2001) estimate that 59% of “ever pregnant” girls had experienced a dropout, and 41% repeated at least one grade.

Table 1: Impact of Adolescent Pregnancy on Dropout (Micro-Level)

Paper	Location	Impact on Dropout
Madhavan and Thomas, 2005	Limpopo Province, South Africa	56% less likely to be enrolled in school*** after live birth
Marteletto et al., 2008	Cape Town, South Africa	Pregnancy increased risk of dropout 12% for Africans*, 22.3% for Coloreds**
Ranchod et al., 2011	Cape Town, South Africa	Girls who experienced adolescent fertility 6%** less likely to graduate from high school by age 20
Grant and Hallman, 2008	Kwazulu-Natal, South Africa	Of those enrolled at time of pregnancy, 74% of 14-19 year olds and 72% of 20-24 year olds dropped out of school in the year of their pregnancy. Girls were 1.97*** times as likely to drop out after becoming pregnant if they had previously repeated a grade and 2.61** times more likely to drop out if they had previously withdrawn from school temporarily.
Mensch et al., 2001	Rural Kenya	Of the 8% of girls (27 total) that reported a pregnancy, all had dropped out. Four listed child care and two listed marriage as the reason for their dropouts; others dropped out for non-pregnancy related reasons.
Hunter and May, 2001	Durban, South Africa	59% of “ever” pregnancy girls had experienced a dropout and 41% repeated at least one grade.

Studies listed in order of declining quality category. Green studies are high quality; yellow studies are medium quality; red studies are low quality.

*Result significant at 10% level

**Result significant at 5% level

***Result significant at 1% level

Overall, a mixed picture emerges. Clearly, there are strong correlations between adolescent fertility and childbearing across studies. However, the effect size varies considerably based on methodology and specific formulation of the research question, and it remains tenuous to draw causal conclusions from the existing literature. Ranchod et al.’s 2011 paper comes closest to implying causality by constructing a convincing counterfactual group through weighted propensity score matching; notably, it provides by far the smallest estimate for impact. Still, even that analysis is unable to overcome the endogeneity problem of this research question with respect to confounding variables that may drive both adolescent motherhood and school dropout, such as the desire to become a mother or low societal expectations for women. To the extent that such outcomes may be jointly determined, true causal effects are likely to be below the estimates described in this section. Moreover, the lack of variation in study location (five of six took place in South Africa) demands extreme caution for inferring external validity to other contexts.

Do Teenage Mothers Continue their Education After Childbirth?

Even if pregnancy does cause a school dropout, it need not be the permanent endpoint for a girl’s education. Accordingly, a number of papers consider the likelihood of returning to

school after childbirth, and, consequently, the cumulative effect of adolescent fertility on a girl's overall educational achievement (see Table 2).

In Cape Town, Marteleto et al. (2008) find that over 50% of African women who became pregnant at age 16-17 return to school in the following year. Similarly, Grant and Hallman (2008) find that 29% of 14-19 year olds who dropped out of school in the year of their pregnancy had returned by the time of the survey; that proportion grows to 51.8% for those between age 20 and 24 (the authors attribute most of the difference to the additional time between childbirth and the survey among the older cohort). Not surprisingly, perhaps, their return holds long-term implications for cumulative educational achievement. As noted above, Ranchod et al. (2011) find that adolescent girls who experienced pregnancy are 6% less likely to graduate high school by age 20. However, by age 22 that differential has been cut in half to 2.7%, and is no longer statistically significant. This suggests a catch-up effect, whereby girls' education is delayed in the immediate aftermath of childbirth but is often resumed at a later point. Still, not all studies present such optimistic findings. Though many girls in their sample do return to school following childbirth, Madhavan and Thomas (2005) estimate that, on average, girls who experience an adolescent pregnancy complete 1.02 years less of cumulative schooling when compared with their peers.

Two papers conducted further analysis of the factors associated with school return for young mothers. According to the 2005 study by Madhavan and Thomas, unmarried young mothers were 3.61 times more likely to return to school than their married peers. Moreover, girls who had their children at an older age were less likely to be enrolled in school for each additional year of age, but completed slightly more years of cumulative schooling per each additional year of age at the time of pregnancy (all results were highly statistically significant). These findings are supported by Grant and Hallman (2008), who find that teenage mothers were less likely to return to school with each subsequent year out of school, and if they had dropped out of school while in a higher grade. Together, the results indicate that girls place a high priority on completing a minimum number of years of school, but are less likely to return and work towards higher educational achievement.

Table 2: School Continuation/Return after Childbirth

Paper	Location	School Continuation after Childbirth
Madhavan and Thomas, 2005	Limpopo Province, South Africa	Completed 1.02 years less ^{***} of cumulative schooling. Among young mothers, unmarried girls were 3.61 times more likely to be enrolled in school ^{***} and had completed 1.09 years ^{***} of additional schooling than married girls. Girls who had their children at an older age were 9% ^{***} less likely to be enrolled in school for each additional year of age, but completed .18 years of additional cumulative schooling per each additional year of age.
Marteletto et al., 2008	Cape Town, South Africa	Over 50% of African women who had a pregnancy at age 16 or 17 were enrolled in school the following year.
Ranchod et al., 2011	Cape Town, South Africa	At age 20, adolescent girls who experienced pregnancy are 6%** less likely to have graduated high school. By age 22, the effect has reduced to a 2.7% differential and is no longer statistically significant.
Grant and Hallman, 2008	Kwazulu-Natal, South Africa	Of the 74% of 14-19 year olds (at the time of the survey) who had dropped out of school in the year of their pregnancy, 29% had returned to school by the time of the survey. Of the 72% of 20-24 year olds (at the time of the survey) who had dropped out in the year of their pregnancy, 51.8% returned to school by the time of the survey. Teenage mothers were less likely to return to school with each subsequent year ^{***} and if they had dropped out while in a higher grade at school ^{***} .
Kaufman et al., 2000	Soweto and Agincourt, South Africa	Many young mothers return to school after the birth of a child; however, returning is not a given and is dependent upon family support and ability to secure child care. Young mothers want to return to school and see being out of school as a punishment.

Studies listed in order of declining quality category. Green studies are high quality and include controls; yellow studies are medium quality and rely largely on self-reported reasons for leaving school; red studies are low quality and include only naïve calculations.

*Result significant at 10% level

**Result significant at 5% level

***Result significant at 1% level

On its face, the empirical data would appear to suggest that childbirth and education are not necessarily incompatible in the developing world. However, these results again come with a major caveat: every included paper studies a target population in South Africa, an outlier with regard to adolescent fertility and schooling along several critical dimensions. Perhaps most importantly, South Africa maintains extremely liberal laws which prohibit schools from dismissing female students due to pregnancy or childbirth. Moreover, the state offers child-care grants to help facilitate continued schooling (Madhavan and Thomas, 2005). For these reasons, results from South Africa are unlikely to be generalizable to other developing contexts with stricter legal frameworks, more conservative cultures, and/or no government-

supported childcare options. At the very least, however, these results suggest that under the right circumstances, appropriate policy instruments can mediate the effect of adolescent childbearing on long-term socioeconomic outcomes.

Does Adolescent Fertility Impact the Gender Gap in Educational Achievement? Macro-Level Perspectives

Among the papers included in this review, a second group of studies investigates the impact of adolescent fertility from a macroeconomic perspective, looking primarily at the relationship between early childbearing and gender-based disparities in educational achievement (Table 3). Rather than explicitly looking at the causal relationship between adolescent pregnancy and poor socioeconomic outcomes for an individual teenage girl, these studies rely largely on survey data that include self-reported reasons for school dropout.

For policymakers looking to understand the true global impact of adolescent fertility *per se*, these studies should be viewed with some skepticism. Specifically, the reliance on self-reported reasons for dropout can be extremely problematic due to endogeneity and reporting bias. In their paper investigating the relationship between adolescent fertility and the gender gap in education, Eloundou-Enyegue and Stokes (2004) issue the following disclaimer, which applies to most studies included in this section:

“...the accuracy of estimates for the dependent variable deserve note... We assume that whenever pregnancy is reported as a dropout reason, it is the sole and true reason for the dropout. If pregnancies are merely a symptom of underlying socioeconomic disadvantage (or even if they only represent one of several cofactors in the dropout), we would overestimate the contribution of teenage pregnancy to gender inequality. For this reason, our dependent measure is best viewed as an upper-bound estimate of the payoff of reducing pregnancy-related dropouts” (310).

Accordingly, all such estimates are likely to dramatically overstate the causal impact of adolescent fertility, as they make no attempt to extract causality from the correlative relationship between self-reported reason for dropout and their outcomes of interest.

Using such a methodology to analyze 38 developing countries around the world with DHS data, Eloundou-Enyegue and Stokes (2004) find that between 0 and 27.6% of female dropouts are associated with pregnancy at the country level. In Africa and to a lesser extent Latin America, they demonstrate that reducing adolescent fertility could help to close the gender gap in educational achievement. However, such efforts would have little effect in Asia and the Middle East, and few countries would completely close the gender gap solely by eliminating teenage childbearing. Interestingly, their analysis shows that adolescent fertility is most detrimental at the macro level in countries which are midway through the demographic transition, i.e. countries wherein teenage childbearing remains relatively common but girls' education is receiving increasing societal value and acceptance, thereby putting schooling in direct conflict with fertility behavior. Perhaps counter-intuitively, the highest rates of

adolescent fertility do not coincide with the highest negative *impact* of adolescent fertility, largely because high rates of early childbearing predominantly occur in societies with very low rates of girls' secondary education.

Looking at impact in a single country, Eloundou-Enyegue (2004) calculates that in Cameroon, pregnancies account for 13% of female dropouts in grade 6, 33-41% in grades 7-10, and 4-22% in grades 10-13. According to his estimates, pregnancies increased the gender gap by six percentage points during primary school, compared to a three percentage point differential from other factors. In secondary school, the fertility-related gender gap grew to 30 percentage points, in contrast to an 11 percentage point difference from other causes. Even so, eliminating fertility may be neither necessary nor sufficient to fully close Cameroon's gender gap in educational achievement.

Lloyd and Mensch (2007) use a similar methodology to investigate five Sub-Saharan African countries. At the country level, they estimate between a 3 and 10% chance of leaving school early as a result of childbirth, among girls still enrolled at age 12. While even this low estimate is likely to be upwardly biased for the reasons previously described, the authors also construct an "upper bound" estimate that includes both girls who reported leaving school due to pregnancy *and* girls whose pregnancy and school dropout occurred in coincident years. Using their ceiling estimate, girls who were still enrolled at age 12 experienced between a 5 and 17% chance of leaving school early due to childbirth. Mensch et al. find similar results in rural Kenya, where they estimate that only 3% of girls will leave school due to a teenage pregnancy.

Finally, Azarnert (2009) studies a different angle – investigating the relationship between national abortion laws and girls' secondary school enrollment. Dividing African countries into those with liberal, moderate, and strict abortion laws, he finds that girls' enrollment is 7% higher in countries with liberal abortion laws than in those countries with restrictive abortion laws after controlling for income, the total fertility rate, and boy's school enrollment. Notably, no corresponding effect is seen for boys' enrollment. It is difficult to translate Azarnert's estimates into results that are readily interpretable for this research question, but his findings probably hold strong relevance. If abortion availability primarily affects schoolgirl enrollment by allowing for the termination of pregnancy and therefore facilitating school continuation, his results indicate that adolescent fertility exerts a strong effect on educational achievement. However, his results should be viewed with caution; for example, if the liberalness of abortion laws is correlated with liberal attitudes about gender equality more generally, then the observed difference between states with liberal and highly restrictive abortion laws could arise more from differential societal attitudes towards girls' schooling rather than the impact of abortion *per se*. As the author makes no attempt to control for country-fixed effects or gender attitudes, we would expect such omitted variable bias to be quite high.

Table 3: Adolescent Fertility and the Gender Gap in Education (Macro-Level)

Paper	Location	Impact on the Gender Gap
Lloyd and Mensch, 2007	Burkina Faso, Cameroon, Cote d'Ivoire, Guinea, and Togo	A low estimate attributes a 3 to 10% chance of leaving school early, among girls still enrolled at age 12, as a result of childbirth. A “ceiling” estimate ranged between 5 and 17% in the five countries studied.
Eloundou-Enyegue and Stokes, 2004	38 countries (23 in Africa, 3 in South Asia, 7 in Latin America, 5 in the Middle East and North Africa.	Between 0 and 27.6 percent of female dropouts are associated with pregnancy at the country level. Reducing teenage fertility would help close the gender gap in many countries in Africa and to a lesser extent Latin America, but only a negligible impact in Asia and the Middle East. Few countries would close the gender gap solely by reducing unintended pregnancy. The estimated impact is larger for countries midway through the demographic transition.
Eloundou-Enyegue, 2004	Cameroon	Pregnancies account for 13% of all female dropouts in grade 6; 33-41% in grades 7-10; and 4-22% in grades 10-13. Pregnancies increase the gender gap by 6 percentage points during primary school, compared to about 3 percentage points from other causes. In secondary school, pregnancies increase the gender gap by 30 percentage points (11 percentage points due to other causes. However, elimination of pregnancy-related dropout may be neither necessary nor sufficient to eliminate the gender gap in schooling.
Azarnert, 2009	41 countries in Sub-Saharan Africa	More liberal abortion laws are significantly** associated with increased secondary school enrollment among girls; there is no effect for boys' enrollment. Girls' enrollment is approximately 7%** higher in countries with liberal abortion policies than countries with very restrictive abortion laws.
Mensch et al., 2001	Rural Kenya	Only 3 percent of girls would leave school before age 19 specifically because of pregnancy.
Hunter and May, 2001	Durban, South Africa	38% of female dropouts in the sample were attributed to pregnancy.

Studies listed in order of declining quality category. Green studies are high quality and include controls; yellow studies are medium quality and rely largely on self-reported reasons for leaving school; red studies are low quality and include only naïve calculations.

*Result significant at 10% level

**Result significant at 5% level

***Result significant at 1% level

To the extent that we can believe the naïve estimates discussed in this section, the results generate a relatively consistent picture of fertility's macro-level impact. Across studies, a non-trivial but still relatively small number of girls attribute their dropout to childbirth, with such reports comprising between zero and 41% of female dropouts at the country level at specific points in time. Self-reported pregnancies appear to contribute to the gender gap in Africa

and Latin America; however, in most cases gender inequality cannot be addressed solely by reducing adolescent fertility. In every study, girls are more likely to drop out of school for reasons other than pregnancy.

Analysis and Policy Implications

Among policymakers, there is widespread consensus that adolescent fertility in the developing world presents a severe problem which deserves urgent donor attention. However, there is also a growing conversation about whether adolescent pregnancy is a problem in and of itself, or merely a symptom of deeper, ingrained disadvantage. Indeed, early childbearing remains an enormous health challenge for the world's adolescent girls; each year maternal causes are the leading driver of mortality among girls aged 15 to 19 (Temin and Levine, 2009). Moreover, the United Nations recognizes women's ability to "decide the number, timing and spacing of children" through access to modern contraceptives as a basic human right (UNFPA, 2005). For these reasons alone, donors should continue to view adolescents' reproductive health as a funding priority.

Most advocates, however, also attribute a range of other detrimental effects to adolescent motherhood, including reduced educational attainment, lower earnings prospects, reduced social capital, and heightened risk of poverty (Greene and Merrick, 2005). This review shows that the empirical evidence to support such claims remains extraordinarily weak in the developing world. Only a few papers directly address the subject on the micro-level, and their methodologies lack sufficient rigor to demonstrate a causal impact. The evidence at the micro-level is also almost exclusively derived from a single country (South Africa) which should be considered an outlier within the developing world. Notably, the most empirically rigorous papers are also those that show the smallest negative effects from adolescent pregnancy, suggesting that early childbearing may be more a symptom than a cause of poverty and its related effects. Further research is clearly needed, and I provide recommendations for a revised research agenda below.

Though it is tenuous to draw any strong conclusions from the existing evidence base, a few trends emerge with implications for policymakers. First, given the mixed causal evidence and importance of contextual factors, donor attention on preventing adolescent pregnancy *per se* may be misplaced. This is not to claim that donors should revoke funding for contraceptive knowledge and accessibility programs; all women of all ages have the right to control their fertility with modern contraceptives. Though adolescent fertility may have ambiguous causal effects, basic human rights demand that girls be empowered to make informed choices about their reproductive health and fertility behavior. Rather, instead of focusing exclusively on the proximate causes of pregnancy, donors should also devote attention to addressing (1) the root causes of adolescent pregnancy and (2) mediating the consequences of early childbearing on a girl's life trajectory.

Chapter 3: The Efficacy of Interventions to Reduce Adolescent Fertility in Low- and Middle-Income Countries: A Systematic Review²

Purpose: This systematic review aims to inform policy choices on programs to reduce adolescent fertility in low- and middle-income countries by compiling evidence on the effectiveness of related interventions since 2000.

Methods: Studies were included that met the following criteria: 1) included an intervention targeted toward youth or adolescents (broadly identified as ages 10-25), or a broader population that evaluated adolescents or youth as a subset of the intervention; 2) evaluated an intervention to reduce adolescent fertility or a related outcome; and 3) measured outcomes including at least one indicator for fertility-related knowledge or attitudes, contraceptive use, sexual activity, marriage, or fertility. The primary search strategy yielded 486 study titles from key databases including MEDLINE, Social Sciences Research Network, EconLit, and 3ie, which was followed by a detailed abstract and title review.

Results: Twenty-one studies were included in the review. Overall, the scope of the included studies was broad and of mixed quality. There were variable results for every indicator type with the partial exception of knowledge-based indicators which increased in response to almost all evaluating interventions, though it is not clear that such interventions necessarily lead to short- or long term-behavior change. The evidence base supporting the effectiveness of conditional cash transfers was relatively strong in comparison to other interventions. Similarly, programs that lowered barriers to attending school or increased the opportunity cost of school absence are also supported by the literature.

Conclusions: These findings suggest that a variety of interventions may be successful at reducing fertility, including school-based interventions, health counseling, and cash transfers. To improve on the knowledge base and increase the quality of studies, impact evaluations should investigate longer-term outcomes such as fertility and adolescent pregnancy.

² This chapter is written by Kate McQueston, Rachel Silverman, and Amanda Glassman

Background

In 2004, the Center for Global Development convened working group on the topic of Population and Development. The purpose of this group was to better understand aspects of economic development and as they relate to poverty reduction and fertility. The group issued a final report in July 2005, entitled *Population Dynamics and Economic Development: Elements of a Research Agenda*, which offered preliminary findings and suggestions for how to move the field forward. Specifically, the working group identified three main substantive areas for which it recommended investment in empirical research to influence medium-term policy objectives—macroeconomic, poverty reduction, and health policy. The later of these research areas called for the examination of reproductive health programs, specifically an assessment of how these programs affect the outcomes of women, children, the poor, and other vulnerable groups—with a particular emphasis on how interventions for adolescents could influence fertility outcomes.

Since the creation of this research agenda, the Center for Global Development, along with other advocacy and research organizations has paid close attention to adolescent health. In 2008 and 2009, the organization released two reports, *Girls Count* and *Start with a Girl* [1] [2] both citing the importance of investing in girls education and health as an integral aspect of global development efforts.

These research and advocacy efforts are warranted. There are over 14 million births to adolescent women, ages 15-19, every year [3]. Of these births to adolescent mothers, over 91 percent occur in low-and middle-income countries [3]. Adolescent pregnancies are undesirable due to their perceived effects on girls' health and economic wellbeing. Teen pregnancy is associated with high levels of maternal death, early neo-natal death, post-partum hemorrhage, low birth weight, and preterm delivery [4]. Even more concerning, the *British Medical Journal* reported in 2004 that complications from pregnancy and childbirth were the leading causes of death for young women between the ages of 15-19 in developing countries [5]. Similarly, several studies have shown that adolescent fertility has negative effects on total educational attainment; however, recent research to demonstrate that this effect may not be universal [6-9]. Many of the effects of adolescent fertility on poverty reduction, human capital accumulation are not well documented or understood. During the time of this review, Rachel Silverman is completing a review of this literature, entitled *How Does Adolescent Childbearing Impact School Continuation Rates, Human Capital Accumulation, and Productivity? A Review of the Evidence*.

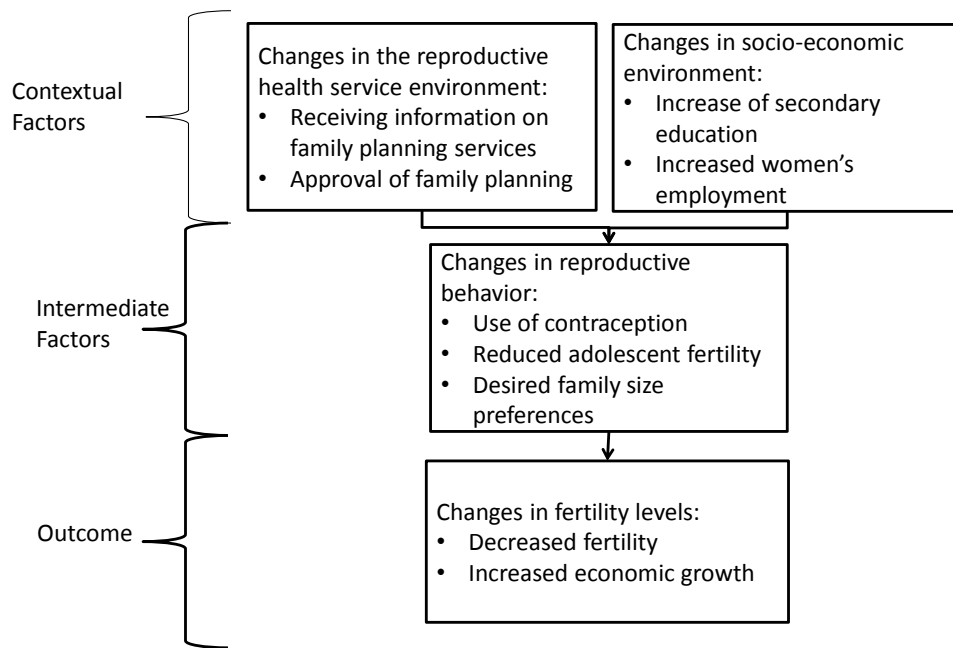
Over 85 percent of the world's youth live in developing countries and nearly half of the global population is under age 25 [10]. Due to the growing numbers of girls world-wide, adolescent women need significant and proportionate resources for their reproductive health needs and as a means to promote sustainable development. At the time of publication for this review, no other systematic review has focused on the results of interventions to reduce adolescent fertility in low- and middle-income countries, using evidence from the last decade. This analysis will highlight best practice, provide policymakers with the current state

of evidence, identify areas where additional or higher quality research is required and draw conclusions and policy recommendations.

Conceptual Framework

It is widely understood that adolescent fertility is a complex and nuanced issue. Beyond its well-documented poor health outcomes, adolescent pregnancy is dually considered both a cause and consequence of socioeconomic disadvantage. While adolescent motherhood can result in lost income and productivity, it is also seen as symptomatic of preexisting gender inequality, poverty, and poor economic prospects for women.

Adolescent fertility is thought to be influenced by two realms of contextual factors: (i) changes to the reproductive health services environment, and (ii) changes to the socio-economic environment [11]. Conversely, some argue that investments in reproductive health have downstream effects on general economic conditions including economic growth and poverty. This study assumes both relationships and assesses the effectiveness of interventions to influence fertility outcomes among adolescents.



Based on Ezeh A C et al. *Phil. Trans. R. Soc. B* 2009;364:2991-3007

Historically, reproductive health programs targeted to adolescents have focused on educational interventions – school-based programs or workshops – to improve knowledge of STI transmission, pregnancy prevention, and reproductive health. From a theoretical perspective, these programs increase youth's knowledge base and thus increase the capacity for adolescents to make educated choices. Increased offerings of health services and

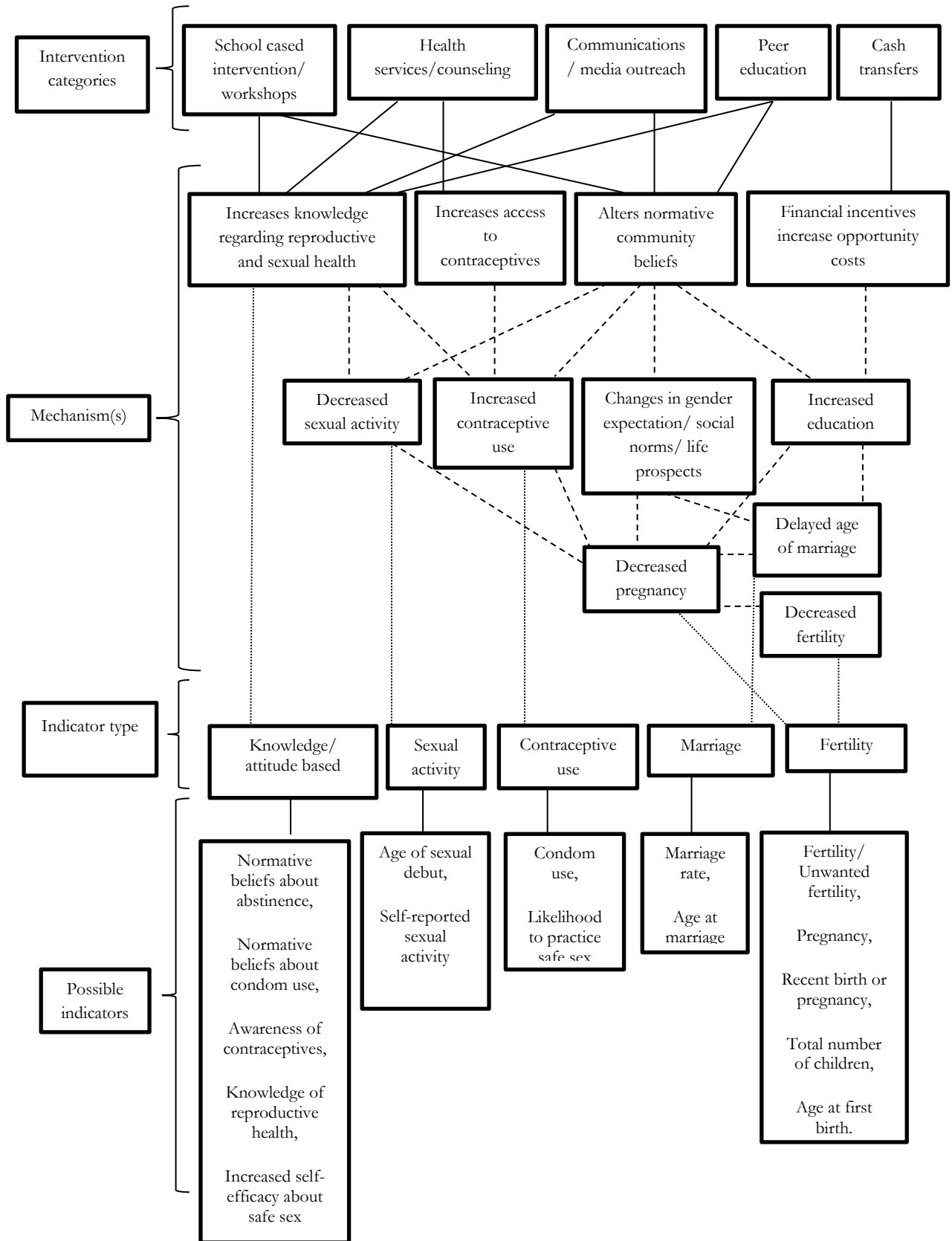
counseling function in a similar way. By removing knowledge based and physical barriers to reproductive health, high-risk youth can benefit from increased knowledge of family planning techniques and reproductive health information, use of contraceptives, and clinical attention.

Over the last decade, peer education has grown in popularity as a method for preventing HIV transmission and adolescent pregnancy. Peer education is designed to reach vulnerable populations by motivating healthy behaviors by changing social norms. In such programs, peer educators convene groups of the target population, who are then encouraged to create tools for social change by addressing the structural and cultural restrictions they face [12]. These interventions allow youth to address expectations and pressures within their own social and economic context as a method for increasing empowerment. Increased empowerment and altered social norms would then be used as an avenue to reduce risky sexual behaviors, delay marriage, and decrease adolescent fertility.

Large-scale communication and outreach campaigns have emerged as another strategy for reaching vulnerable populations. Mass media marketing use widespread messages and outreach to shape individual health beliefs [13]. These programs are generally designed based on the theory that behavior is dependent on perceived risk, barriers to action, and self-efficacy—all of which can be influenced through media [13]. By design, these interventions target a broad population, including many who would not be reached by school-based programs or peer educators.

Finally, cash transfers have grown in popularity for incentivizing health and education behaviors over the last ten years. Such interventions aim to promote positive health and education outcomes by paying individuals or households to comply with a set of pre-established requirements [14]. While stipends could theoretically be paid as an explicit incentive to delay pregnancy, most conditional cash transfers reward either school enrollment or completion. Such programs raise the opportunity cost of pregnancy and dropout, thus providing a financial incentive to delay pregnancy. Many conditional cash transfer programs contain a nutrition or health and education component by design.

Figure 1: Relationship Map between Interventions, Mechanisms and Indicators



Objective

The objective of this review is to synthesize the current literature on the effectiveness of interventions to reduce adolescent pregnancy, or related outcomes such as fertility, contraceptive use, attitudes towards contraceptive use, and reproductive health knowledge or attitudes.

This paper builds on and adds new insight to three existing reviews on adolescent pregnancy. The first, by Kirby (2008), reviewed 56 studies. While comprehensive, the paper's inclusion criteria specified that program implementation must take place within the United States [15]. A second review by Oringanjue et al (2010), which has recently been added to the Cochrane Collaboration, included 41 studies and evaluated *intended* pregnancy as its outcome of interest [16]. Of the studies included, over three-fourths occurred within the United States and only two took place in developing countries. A final review of teen pregnancy prevention efforts is currently underway by Mathematica Policy Research, Inc. This effort is funded by the United States Department of Health and Human Services and also mandates that studies take place within the United States. At the time of this review, 199 studies were scheduled for evaluation as part of the Mathematica Policy Research project (Personal Communication).

This review, in contrast, will focus exclusively on interventions in low- and middle-income countries. As such, evaluated interventions would target both married and unmarried adolescents, and may include broader social interventions than have been included in previous reviews. Further, this systematic review aims to inform policy choices in countries where the need is greatest due to the large and highly vulnerable target population. By limiting inclusion criteria to interventions within the developing world, this review provides low-and middle-income countries with viable interventions for their development status. Conversely, interventions which prove effective in high-income countries may not be generalizable to or affordable in low-resource socioeconomic contexts.

Search Methods

Study Eligibility Criteria

Studies were included that met the following criteria: (i) included an intervention in low-and middle income countries evaluating youth or adolescents (broadly identified as ages 10-25), or a broader population that evaluated adolescents or youth as a subset of the intervention; (ii) evaluated a targeted intervention to reduce adolescent fertility or a related outcome; and (iii) measured outcomes including at least one indicator relating to reproductive health knowledge/attitudes, contraceptive use, sexual activity, use of family planning, marriage, or fertility. In order to be most inclusive of possible evidence, we allowed studies across a wide range of study designs and accepted any design that included a control group, to include randomized controlled trials, cluster randomized trials, and quasi-experiments, or studies that

measured outcomes both before and after the intervention. One-off survey studies (or data on adolescent fertility derived from such studies) were not included in the review.

Databases, Search Terms, Limits and Special Strategies

We searched electronic databases MEDLINE, Social Sciences Research Network, EconLit, and 3IE with a standardized search structure. Methods varied slightly based on the formatting of the search function of the databases, each of which has been recorded in **Appendix 1**. Searches were performed between October and December 2011. Limits on searches included English language restrictions and publication after January 1 2000; in some cases, the searches excluded study results from within the United States. Please see **Table 1** for a summary.

Additional Search Methods

To find additional published and unpublished studies, we searched Google Scholar, PopPov (<http://www.poppovresearchnetwork.org/>), Popline (<http://www.popline.org/>) and other relevant libraries of international agencies, including WHO and the World Bank. Reviewers also attended related seminars and manually reviewed reference lists of all included studies to identify new studies. Eight studies were identified for inclusion through these methods. Author contact resulted in the inclusion of an additional study, provided by Esther Duflo. For contact information for subject experts and those contacted during this review process, please see **Appendix 2**.

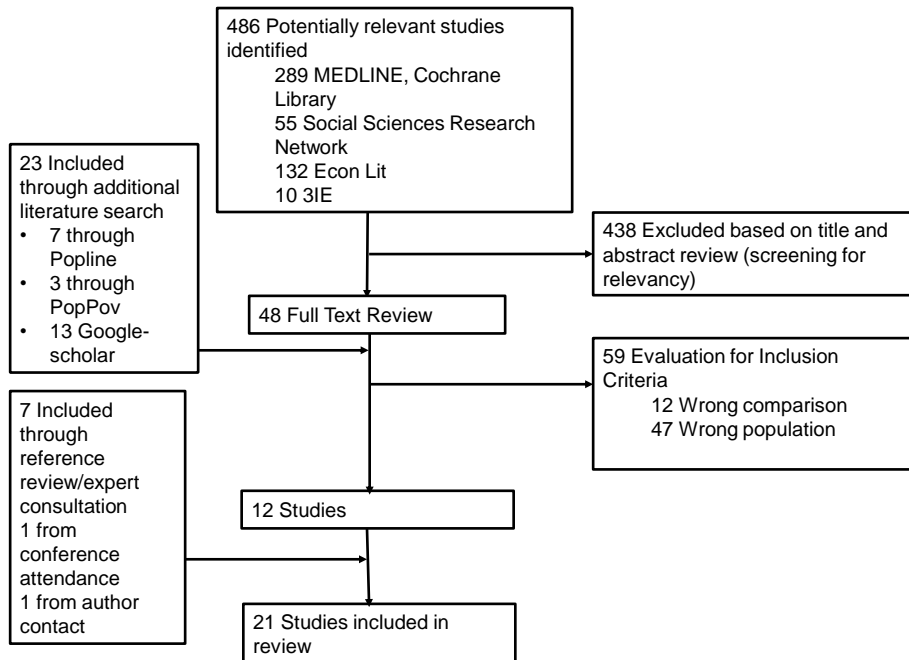
Table 1: Databases, search-terms, and limits of adolescent fertility review (summary, full search strategy available in the appendix)

Databases	Search-terms	Limits
Medline	One Of:	Published after January 1, 2011 English
Social Sciences Research Network	Adolescent, Youth, Young Adult	
EconLit	And One Of:	
3ie	Fertility, Pregnancy	
PopPov Research Network	And One Of:	
Popline	Family Planning, Scholarship	
GoogleScholar	Program, Cash Transfer,	
World Bank/WHO Archives	School based intervention, evidence-based practice	

Study Selection

One reviewer (KM) systematically screened the titles and abstracts of all records identified by the search strategy. After ineligible studies were excluded, the remaining studies were evaluated based on a full text review. Please see **Figure 2** for flow diagram describing study selection.

Figure 2: Prisma flow diagram of search strategy



Data Collection

Using a data collection form, reviewers collected data from the included studies. The collected data included study method, risk of bias, methodological soundness, intervention type, and outcomes, all of which were determined *a priori*. We contacted authors for missing data when necessary, using electronic mail correspondence. For included studies, data was collected to account for (i) the study methods including the type of experiment, intervention, and risk of bias; (ii) participant information including number, age, gender, and location; and (iii) outcomes measured between intervention and control groups, or before and after the intervention.

Results

Results of Search

The initial search was two-pronged, first involving a manual review of 486 study titles for inclusion from key databases including MEDLINE, Social Sciences Research Network, EconLit, and 3ie, followed by a detailed abstract and title review of additional literature from sources including Google scholar, PopPov Research Network, Popline, and reference reviews of related literature.

Included Studies

Included studies all focused on a population consisting of youths and adolescents (broadly defined as between ages 10-25), and an intervention broadly relating to reproductive health services, education, peer-education, communications, or enrollment in a conditional cash transfer program. The studies measured fertility-related outcomes, including outcomes on normative beliefs and knowledge about sexual or reproductive health, age of birth, age of marriage, fertility, and total number of children. For full details of included studies please see [Appendix 3](#).

Methodological Quality of Included Studies

To evaluate the methodical quality of included studies we used two separate metrics modified from tools found in Lassi (2011). The first tool was used to evaluate randomized and quasi-experimental studies with a control; it included four dimensions (selection, performance, measurement, and attrition bias) and evaluated each category separately with a high, medium, or low score. The second tool evaluated studies without a control arm using ten quality measures, each of which was assigned a value of yes, no, or “unclear” [17]. To assign these studies a quality score, the reviewers totaled the number of times each value was assigned. For the modified quality tools please see [Appendix 3](#).

The quality of the studies was evaluated in terms of the research question of this paper. As many studies evaluated several interventions or outcomes, a low quality score may indicate incomplete data on our particular research question, while the study’s overall quality may be quite high. Of the 21 studies included for review, 19 had control arms and two did not. Methodological quality was evaluated by two separate reviewers (KM and RS). Any discrepancies in the assigned quality scores were resolved through consensus. The general quality of included studies was average from a methodological standpoint. Please see [Appendix 4](#) for quality scores.

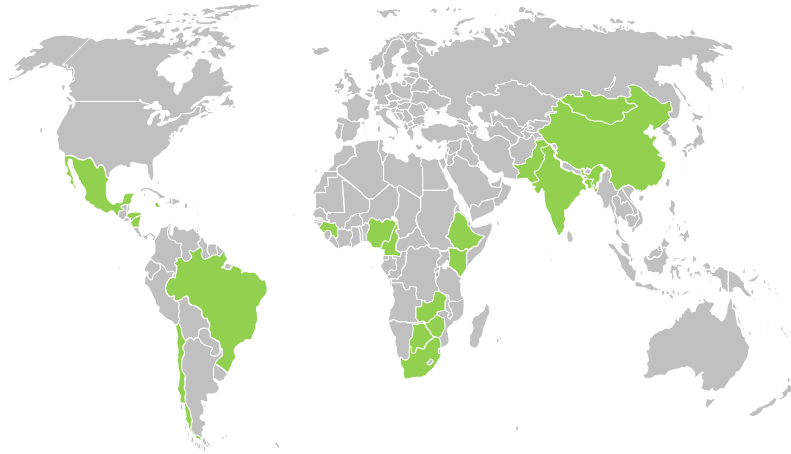
Characteristics of Included Studies

Study length ranged from two months [18] to nine years [19]; sample size ranged from 180 subjects [18] to over 156,000 [20]. The average study size was 13,378; however, after excluding the Alam study (an outlier in terms of its large study size), the average was reduced to 6,247. Seven of the studies (one third of the total) included study populations which were exclusively female [21, 22] [20, 23, 24] [19] [25], while the remainder were comprised of both genders.

Geographically, the included studies offered a wide variation. A total of eight studies evaluated programs that took place in Africa, including Cameroon [13], South Africa [13], Botswana [13], Guinea [13], Zambia [26], Zimbabwe [27], Malawi [23], Kenya [28], Nigeria [18] [29] and Ethiopia [19]. Three studies evaluated interventions that occurred in India, each having at least one aspect of the study in Bihar [21] [30] [31]. In Asia, included studies looked at interventions in Pakistan [20], Bangladesh [32], Mongolia [33], and China [34]. In Latin America and the Caribbean, studies evaluated three interventions in Mexico [22, 35]

[25], as well as projects in Jamaica [36], Chile [24], Honduras [25], Nicaragua [25], and Brazil [37].

Figure 3: Country locations of included Studies



www.powerpointslides.net

Of the included studies, the intervention types were classified under five categories: peer education, school-based interventions or workshops, communications, health services or counseling, and cash transfer programs.

Table 2: Types of interventions

Type of Intervention	Studies
Peer Education	Kim 2001; Agha 2002; Okonofua 2003; Agha S 2004; Cartagena RG 2006; Kanesathasan A 2008
School Based Intervention/Workshops	Eggleston 2000; Magnani, Gaffikin et al. 2001; Okonofua 2003; Bhuiya I 2004; Vernon R 2004; Cabezón C 2005; Mba 2007; Rahman 2010; Duflo 2011
Communications	Kim 2001; Vernon R 2004; Daniel 2008; Rahman 2010
Health Services/Counseling	Kim 2001; Magnani, Gaffikin et al. 2001; Bhuiya I 2004; Lou 2004; Kanesathasan A 2008; Rahman 2010; Portner 2011
Cash Transfer	Stecklov 2006; Baird S 2009; Gulemetova-Swan 2009; Alam A 2010

Five studies included peer education components, including discussion-oriented sessions, youth groups, and information sessions with trained and untrained peer educators [26, 27, 29, 30, 33]. Three studies evaluated programs that consisted primarily of peer education [26] [33] [30].

Nine studies evaluated school educational programs or workshops. [18, 24, 29, 31, 32, 35-37]. The teenSTAR program evaluated an abstinence-only sexual education program incorporated into health education offerings [24]. The program evaluated in the Eggleston paper focused on both abstinence promotion and sexual risk reduction through school environments [36]. The PRACHAR project in Bihar, India provided workshops and counseling with no direct access to medical treatment [31]. Other studies incorporating school education programs and workshops are described as multi-faceted interventions below.

Programs that provided health services largely functioned by tailoring existing reproductive health programs to meet the needs of adolescents. Kim (2001) and Kanesathasan (2008) provided training for family planning providers in youth counseling techniques and Bhuiya (2004) also connected adolescents to “adolescent friendly” reproductive health services [32] [27, 30]. Mignani (2001) paired clinics with local schools—where clinicians to visit schools and facilitated meetings between the education sector and clinic director [37]. Lou (2004) set up a youth counseling center that distributed free contraceptives [34]. Portner (2011) evaluated only the effect of access to family planning and reproductive health programs—however these programs were not designed specifically for adolescents [19]. Finally, the Rahman (2010) program included an aspect where female health workers routinely visited young married women [31].

Four studies evaluated the effects of cash transfers on adolescent fertility and other related outcomes. Stecklov(2006) examined the effects of three similar cash-transfer programs in Latin America, the PROGRESA program in Mexico, the Family Assistance Program (PRAF) in Honduras, and the Social Protection (RPS) in Nicaragua [25]. Baird (2009) evaluated the Zomba Cash Transfer program in Malawi, a program that offers cash transfers to adolescent women conditional on satisfactory school attendance [23]. Gulemetova-Swan 2009 examined the effects of the Oportunidades program in Mexico—a program based on PROGRESA—on sexual debut and age of first birth.[22, 38]. Lastly, Alam 2010 evaluated the effects of conditional cash transfers through the Female School Stipend Program (FSSP) on age of marriage, teen pregnancy, and total adolescent fertility of young women in Punjab, Pakistan [20].

Four studies evaluated the effects of communications outreach, including media campaigns, information on reproductive health, social environment building, hot-lines, wall paintings, and street-theater, among others [21, 27, 35] [31].

Several of the included studies involved interventions that fell into two or more of the study “type” classifications. Bhuiya (2004) included reproductive health education interventions linked to health services [32]. Kanesathan (2008) reviewed the effects of peer education services and youth groups combined with access to reproductive health information and services [30]. Magnani evaluated health educational services through school-based programs and partnerships with local clinics [37]. Both Vernon (2004) and Duflo (2011) examined the effects of a multifaceted intervention consisting of school based education, community communications outreach, and access to affiliated health care services [35] [28]. Okonofuya (2003) evaluated the effects of multiple interventions including peer education, lectures, and health clubs in schools [29]. Agha (2002) evaluated four different interventions in four separate countries (Cameroon, South Africa, Botswana, and Guinea), which generally included peer education programs mixed with media campaigns to promote safe sexual behaviors. Finally, Kim (2001) evaluated multi-media campaigns including peer education sessions, and provided training for family planning providers for local clinics [27]. These seven studies are classified under multiple intervention categories.

Knowledge/Attitude

Knowledge type outcomes were, by far, the most common indicator evaluated across included studies. Evaluated in half of all included studies, these indicators included measures relating to beliefs about abstinence and condom use, awareness of contraceptives, knowledge of reproductive health, self-efficacy about safe sex, and reproductive ideals. Such cognitive outcomes demonstrate that study participants have changed their perceptions or knowledge regarding abstinence or contraception— potentially making them more likely to practice abstinence or safe sex, and thereby reducing pregnancy and thus fertility (see **Figure 1** for conceptual framework). Nine of the ten studies that evaluated cognitive indicators found significant results, and all but one significant result (out of a total 23) found positive results. The outlier of this finding is the Agha (2002) study, which found a decrease in the belief that

sexual activity carries the risk of pregnancy for the intervention group in Guinea (it found no effect in Cameroon and a significant increase in Botswana and South Africa).

Table 3: Summary of results for knowledge/attitude type indicators

Intervention type	Indicator Type(s)	Effect	Quality Score
Peer Education (Only)			
Agha, 2004	Normative beliefs about abstinence	Increased**	1.L 2.L 3.L 4.L
	Normative positive beliefs about condom use	Increased at first follow up**, decreased to no effect at second follow up	
Cartagena, 2006	Reproductive health knowledge	Increased**	1.L 2.L 3.M 4.M
	Attitudes toward contraceptive use	Increased**	
Kasesathasan, 2008	Knowledge of contraception methods and access	Increased**	Y:5; N:3; U:1
School Based Intervention/Workshops (Only)			
Eggleston, 2000	Reproductive knowledge	Increased** after one year, no difference after two years	1.M 2.L 3.M 4.L
	Attitudes (sexual activity, family planning, and parenthood)	Increased** after one year, no difference after two years.	
Bhuiya, 2004	Awareness of contraceptives among boys	Increased in site 2*** relative to other sites	1.M 2.L 3.H 4.L
	Awareness of fertile period	Increased among girls in site 2** and boys in sites 1*** and 2***	
	Attitude toward contraceptive use by unmarried adolescents	Increased**	
	Attitude toward contraceptive use among married adolescents	Increased**	
Mba, 2007	Knowledge of reproductive health problems	Increased**	1.L 2.M 3.L 4.L
	Awareness of contraceptive methods	Increased	
Communications (Only)			
Daniel 2008	Awareness of contraceptives	Increased**	1.L 2.L 3.M 4.M

Intervention type	Indicator Type(s)	Effect	Quality Score
	Knowledge about fertile days in menstrual cycle	Increased***	
Peer Education <i>And</i> Communications Kim, 2001	Awareness of contraceptive methods	Increased**	1.M 2.L 3.M 4.L
Agha, 2002	General reproductive health knowledge	No change	
	Belief that sexual activity carries the risk of pregnancy	No effect/Increased*/Increased* /Decreased*	1.L 2.L 3.L 4.L
	Attitude towards abstinence	Increased*/Increased*/Increased*/Increased*	
School Based Intervention/Workshops <i>and</i> Communications <i>and</i> Health Services/Counseling			
Vernon, 2004	Awareness of contraceptive methods	Increased	1.L 2.L 3.M 4.L
	Reproductive ideals	Ideal number of children-- Increased Ideal age at marriage-- Increased Mean ideal age for having a first child--Decreased	

* sign. At 10%; **sign. At 5%; *** sign. At 1%

Sexual Activity

As sexual activity increases risk of pregnancy, it is often seen as a plausible indicator for measuring adolescent fertility. A total of eight studies evaluated indicators relating to youth's sexual activity. Of these eight studies, only two studies found significant results. A paper by Kim (2001) evaluated a multi-media campaign including posters, leaflets, newsletters and peer education, as well as training sessions to local family planning practitioners, and found significant increases in continuing abstinence and the percentage of study participants that declined a sexual encounter [27]. Similarly, Baird (2009) which evaluated the Zomba Cash Transfer Program, found a significant decrease in the percentage of students with multiple regular partners and self-reported sexual activity for students who had previously dropped out of school [23]. Neither of the school-based interventions reported significant changes in sexual activity.

Table 4: Summary of results of studies that evaluated sexual behavior based indicators

Intervention type	Indicator Type(s)	Effect	Quality Score
School Based Intervention/Workshops (Only)			
Eggleston, 2000	Engagement in sexual activity	No change	1.M 2.L 3.M 4.L
Mba, 2007	Level of sexual activity	No change	1.L 2.M 3.L 4.L
Cash Transfer (Only)			
Baird, 2009	Percentage of students with multiple regular partners	Decreased **	1.H 2.M. 3.H 4.H
	Self-reported sexual activity	For Dropouts-- Decreased***	
Gulemetova-Swan 2009	Age of sexual debut	Schoolgirls— Decreased Increased	1.M 2.M 3.M 4.M
Peer Education <i>And</i> Communications			
Agha, 2002	Women's sexual activity	No change/No change/No change/Increased	1.L 2.L 3.L 4.L
School Based Intervention/Workshops <i>And</i> Health Services/Counseling			
Magnani, 2001	Levels of sexual activity	No change	1.M 2.L 3.M 4.M
School Based Intervention/Workshops <i>and</i> Communications <i>and</i> Health Services/Counseling			
Vernon, 2004	Age at first intercourse	No change	1.L 2.L 3.M 4.L
	Proportion of youth in a sexual relationship	Increased	
Peer Education <i>And</i> Communications <i>And</i> Health Services/Counseling			

Intervention type	Indicator Type(s)	Effect	Quality Score
Kim, 2001	Report declining sexual encounter	Increased***	1.M 2.L 3.M 4.L
	Continued abstinence	Increased***	

* *sign. At 10%*; ***sign. At 5%*; *** *sign. At 1%*

Contraceptive Use

Contraceptive use functions as a tool to prevent pregnancy, and as such wide variety of interventions evaluated contraceptive use as a surrogate indicator for reduced pregnancy and fertility. All such studies found an increase in contraceptive use or no change, with the exception of Vernon (2004), which found a decrease in contraceptive use within the intervention group [35]. A total of five studies found significant increases in contraceptive use [30] [21] [36] [29] [34] [27]. However, while Eggleston (2000) found significant results one year after the program, these results were no longer significant at the two-year follow up, indicating that the benefits of the school-based intervention on contraceptive use may be short lived.

Table 5: Summary of results for contraceptive use type indicators

Intervention type	Indicator Type(s)	Effect	Quality Score
Peer Education (Only)			
Agha, 2004	Condom use	No Change	1.L 2.L 3.L 4.L
Cartagena, 2006	Likelihood to practice safe sex	Increased	1.L 2.L 3.M 4.M
Kasesathasan, 2008	Contraceptive use among married youth	Increased** among females	Y:5; N:3; U:1
Communications (Only)			
Daniel, 2008	Contraceptive demand	Increased**	1.L 2.L 3.M 4.M
	Contraceptive use	Increased	
School Based Intervention/Workshops (Only)			
Eggleston, 2000	Contraception at first intercourse	Increased* after 1 year, no difference after two years	1.M 2.L 3.M 4.L
Mba, 2007	Practice of pregnancy prevention	Increased	1.L 2.M 3.L 4.L

Intervention type	Indicator Type(s)	Effect	Quality Score
Peer Education <i>And</i> Communications Agha, 2002	Contraceptive use	Increased/Increased/ Increased/No Change	1.L 2.L 3.L 4.L
Peer Education <i>And</i> School Based Intervention/Workshops Okononfua, 2003	Condom use for females Condom use for males	Increased** No change	1.M 2.L 3.M 4.M
Communications <i>And</i> Health Services/Counseling Lou, 2004	Percent initiating sexual activity Ever used contraception Regular contraception use Condom use	No change Increased*** Increased*** Increased***	1.M 2.M 3.M 4.M
School Based Intervention/Workshops <i>And</i> Health Services/Counseling Magnani, 2001	Use of contraception	No change	1.M 2.L 3.M 4.M
School Based Intervention/Workshops <i>and</i> Communications <i>and</i> Health Services/Counseling Vernon, 2004	Use of contraception	Decreased**	1.L 2.L 3.M 4.L
Peer Education <i>And</i> Communications <i>And</i> Health Services/Counseling Kim, 2001	Visit a health center Contraceptive use	Increased *** Increased ***	1.M 2.L 3.M 4.L

* *sign. At 10%*; ***sign. At 5%*; *** *sign. At 1%*

Marriage

The practice of child marriage remains prevalent in many areas of the developing world; it has been estimated that between 30-70 percent of married women in Bangladesh, India, Nepal, and Pakistan were married before age eighteen [39]. While contraception can function as a mitigating factor or secondary prevention strategy, exposure to pregnancy is often increased following marriage. Studies have found that child marriage is significantly associated with decreased use of contraceptives prior to first child birth, multiple unwanted pregnancies, and short birth spacing [40]. Contextual factors may account for this, as pregnancy outside of marriage for adolescents may be stigmatized, pregnancy within marriage often complies with social and cultural norms.

Six of the twenty-one studies evaluated at least one marriage-related indicator, all of which considered marriage rates or age of marriage. Half these studies found significant results. Duflo (2011), which evaluated the provision of free school uniforms and an HIV/AIDS prevention curriculum, found that the uniform intervention led to significant reductions in the likelihood of being married three, five, and seven years following the original intervention [28]. Two of the three conditional cash transfer programs also found similar results. Gulemetova-Swan (2009) and Alam (2010) both evaluated the age of marriage following the implementation of conditional cash transfer programs (the Oportunidades and Female School Stipend Programs, respectively). Among intervention types, conditional cash transfers appear to be particularly effective at increasing the age of marriage.

Table 6: Summary of results of studies that evaluated marriage type indicators

Intervention type	Indicator Type(s)	Effect	Quality Score
Peer Education (Only) Kanesathasan, 2008	Age at marriage	Increased	Y:5; N:3; U:1
School Based Intervention/Workshops (Only) Duflo, 2011	Likelihood of having married	Uniform project (after 3 years)—decreased** HIV/Aids prevention curriculum (after 3 years)—No change Uniform project (after 5 years) —decreased** HIV/Aids prevention curriculum (after 5 years)—No change Uniform project (after 7 years)—Decreased* HIV/Aids prevention curriculum (after 7 years)—No change	1.H 2.H 3.H 4.H
Cash Transfer (Only) Baird, 2009	Marriage rate	For Dropouts-- Decreased For School Girls—No change	1.H 2.M. 3.H 4.H
Gulemetova-Swan 2009	Age at marriage	Increased***	1.M 2.M 3.M 4.M
Alam, 2010	Age of marriage	Increased*	1.M 2.M 3.H 4.M
School Based Intervention/Workshops <i>And</i> Communications <i>And</i> Health Services/Counseling Rahman, 2010	Age at marriage	For girls—Increased For boys—Increased	1.L 2.M 3.M 4.L

* *sign. At 10%*; ***sign. At 5%*; *** *sign. At 1%*

Fertility

Fertility was the primary interest of this study; however, few studies directly evaluated fertility or pregnancy outcomes, instead opting for related indicators that theoretically influence fertility rates. Nine studies evaluated fertility-related indicators. Of these, five had

at least one significant finding. Cabezon (2005), an abstinence-only sexual education program in Chile, found a significant decrease in the rates of pregnancy for their intervention group [24]. The other school-based intervention, Duflo (2011), found that providing free uniforms to Kenyan students decreased the likelihood of having ever been pregnant three and five years following the intervention [28].

Portner (2011), which evaluated adolescents as a subgroup of a community-based family planning service, found a significant decrease of children “ever born,” yet also found increases in recent births or pregnancies among adolescents. Finally, two of the cash transfer programs found at least one significant result. Baird (2009) found that for girls that had previously dropped out of school, cash transfers significantly decreased teenage pregnancy rates [23]. Alam (2010) found that the cash transfer program in Pakistan significantly decreased the total number of children for youth; however, it did not find an effect on the probability of childbearing among girls ages 17-19. Stecklov (2006) found that the cash transfer program decreased fertility, however these results were marginal and non-significant [25].

Table 7: Summary of results of studies that evaluated fertility type indicators

Intervention type	Indicator Type(s)	Effect	Quality Score
School Based Intervention/Workshops (Only)			
Cabezon, 2005	Pregnancy	Decreased **	1.H 2.M 3.H 4.M
Duflo, 2011	Likelihood having been pregnant	Uniform Project— Decreased** HIV/Aids prevention curriculum (after 3 years)—No change Uniform project (after 5 years)—decreased** HIV/Aids prevention curriculum (after 5 years)—no change Uniform project (after 7 years)—decreased HIV/Aids prevention curriculum (after 7 years)—No change	1.H 2.H 3.H 4.H
Health Services/Counseling (Only)			
Portner, 2011	Number of children ever born	Decreased**	Y:6; N:1; U:2

Intervention type	Indicator Type(s)	Effect	Quality Score
	Unwanted fertility	Decreased	
	Recent birth or pregnancy	Increased	
Cash Transfer (Only)			
Stecklov, 2006	Fertility for women under 20 years of age	Decreased (up to 2%)	1.H 2.H 3.H 4.H
Baird, 2009	Teenage pregnancy over the last year	For Dropouts-- Decreased**(5%) Schoolgirls—No Change	1.H 2.M. 3.H 4.H
Gulemetova-Swan 2009	Arrival of first birth	No Change	1.M 2.M 3.M 4.M
	Arrival of second birth	No Change	
Alam, 2010	Girls 17-19 who gave birth	No change	1.M 2.M 3.H 4.M
	Total number of children	Decreased*	
School Based Intervention/Workshops and Communications and Health Services/Counseling			
Vernon, 2004	Percent ever pregnant	No Change	1.L 2.L 3.M 4.L
Rahman, 2010	Age of first birth	Increased	1.L 2.M 3.M 4.L

* *sign. At 10%*; ***sign. At 5%*; *** *sign. At 1%*

Discussion

Overall Completeness and Applicability of Evidence

The twenty-one studies included in this review represent only a small fraction of the total global efforts to reduce adolescent fertility over the last ten years. This review can only offer analysis of studies for which (i) an impact evaluations took place and (ii) the results were published. There is a possibility of bias for each step. Ideally, more studies would have evaluated hard outcomes such as rates of pregnancy and age of first childbirth. Studies would also have standardized units of outcome measurement and methods of intervention. Due to large differences in both chosen interventions and measured outcomes, the current pool of available research does not offer easy comparability.

Quality of Evidence

There were several factors that may have negatively affected the quality of evidence. Of the included interventions, three did not include controls [21] [30] [19]. A further methodological concern is that many studies created control groups using comparable sites; however, their assignments to treatment and control groups was not randomized at the outset, nor were participants blinded of their status within the intervention. As such, there is little way to detect that the groups were treated equally with the exception of the intervention.

Many studies relied on intermediary survey results and self-reports rather than collected information on verifiable outcomes such as fertility and age of first birth which may be more accurate. Such methodologies may be biased in two ways. These reports are subject to recall bias of study subjects or by respondents attempting to fulfill researcher expectations. Additionally, survey outcomes may be biased due to unintentional flaws in the survey design or lack of representative samples.

Aside from how the data was collected, there may be bias found in the types of outcomes reported. A significant proportion of the included studies measured surrogate or soft outcome to indicate progress, rather than measuring for hard outcomes, which are externally verifiable, and of higher interest to policy makers. Lastly, programs may have been subject to (intentional or unintentional) selective reporting due to the nature of the intervention and the desire to demonstrate positive effects.

Potential Biases in the Review Process

Though the search strategy was tailored to the research question, there were still a substantial number of included studies from outside sources. There was a lack of standardized MeSH terms for literature on this research topic; as such, creating a search strategy to include all relevant literature was challenging. Additionally, the relevant literature crossed medical, public health, economics, social sciences, and demography disciplines, over which the relevant search terms may have varied.

Due to the large volume of studies found in the initial search, a manual title and abstract review was used to determine whether studies met the inclusion criteria. Because of the unconventional nature of our study question, we may have missed studies if the intervention was not explicitly identified in the title or the subgroup was not indicated in the study abstract.

Studies were limited to research that had been published following January 1, 2000. This may have excluded relevant literature that was published prior to this date, and may make included literature increasingly biased towards recent trends in adolescent fertility interventions. Finally, the limitation of studies to the English language may exclude relevant studies written in other languages.

Summary of Main Results

Based on the evidence described above, it appears that most interventions that attempt to increase cognitive indicators related to reproductive health are successful, at least in the short term. However, while these programs are successful at modifying beliefs or increasing knowledge, it is not clear that they necessarily lead to short or long term behavior change. For instance, Eggleston found a significant difference in behavior a year after a school-based intervention; however this effect disappeared after two years. The author writes, “these findings were not unexpected; it is unreasonable to expect a school-based intervention of limited duration to have a long-term impact, given competing socioeconomic and cultural forces in Jamaica that encourage early sexual activity and parenthood among adolescents” [36]. Indeed, this finding might suggest that in the absence of such an intervention, Jamaican girls’ behavioral choices do not stem from their ignorance but rather are already optimized for their particular life circumstances.

When the studies evaluated more primary outcomes such as actual pregnancies and births to adolescent mothers, the proportion of significant findings decreased. However, the nature of the interventions also changed; for instance, no papers on conditional cash transfers evaluated indicators for knowledge, sexual activity, or contraceptive use. This is of particular interest, because though such indicators are often associated with decreased fertility, these sub-indicators, at least theoretically, may not be correlated with fertility.

Study results related to sexual activity, for instance, are more ambiguous than those measuring cognitive outcomes. Five of the eight studies with indicators in this category found no change on their measured aspect of sexual behavior [36] [18] [37] [13] [35]. Perhaps more interestingly, none of the studies that had a school-based aspect to the intervention found significant results on sexual activity indicators.

In contrast, contraceptive use indicators were more commonly improved by the interventions that measured them. This might indicate that while sexual behavior is difficult to modify, changing adolescents’ contraceptive use may be more feasible and impactful. However, the 12 studies which evaluated contraceptive use as an indicator covered a wide range of intervention types, making it difficult to draw strong conclusions on the effectiveness of any specific intervention.

As mentioned previously, only three studies demonstrated a significant impact on marriage-related indicators. However, the other three studies which looked at this category also found positive results which lacked statistical significance. Conditional cash transfers achieved the greatest number of significant positive results (though they also comprised the majority of studies evaluating marriage-related indicators). This fits theoretically, as cash transfers provide incentives to stay in school and increase financial independence, both of which have been suggested to reduce adolescent marriage. The Duflo (2011) study found that a school-based intervention successfully lowered the barriers to attending school by providing free uniforms to students. These results suggest that improving school attendance may more

effectively reduce adolescent fertility than providing reproductive health education as part of a school curriculum.

Finally, fertility-related indicators decreased significantly in five projects. Two such interventions were school based: Duflo (2011) and Cabezon (2005). Cabezon (2005) is particularly interesting because it was the sole study that evaluated the effectiveness of an abstinence-only education program. The first cohort to receive the intervention had a 3.3% pregnancy rate compared to 18.9% in the control group; the second cohort experienced rates of 4.4% and 22.6% respectively among intervention and control. Overall, these findings suggest that a variety of interventions can reduce fertility, including school-based interventions, health counseling, and cash transfers. However, as two cash transfer programs were able to demonstrate significant effects for reducing fertility, this strategy currently has the most evidence to support its effectiveness within developing countries.

Chapter 4: Implications for Practice

Implications For Policy

The previous two chapters examine two different sides of the same issue—what is the extent of the adverse effects associated with adolescent fertility and how effective are the interventions used to date. But what can we take away from these findings?

First, to the extent that adolescent fertility is symptomatic of deeper factors, policymakers should focus on the distal rather than immediate causes of early childbearing. To start, the vast majority of teenage childbearing occurs within the context of child marriage. In India, for example, approximately 40% of women between the age of 15 and 19 have already married. Among those women, an estimated 58% have begun childbearing (WHO, 2007). In such cases, the socioeconomic effects of childbearing in isolation are likely to be negligible, as the girls' life course has already been set via her marriage. Moreover, if early childbearing within marriage is socially accepted and even encouraged, interventions targeted at increasing contraceptive knowledge and availability would do little to prevent *wanted* pregnancies. Indeed, DHS data from a wide range of countries shows that most births to married adolescents are wanted and planned (WHO, 2007). To achieve maximum impact, interventions should thus target child marriage rather than fertility itself. Likewise, donors should continue their general economic and social development efforts to address the systematic poverty and disadvantage which breed adolescent childbearing, including gender inequality, which can lower girls' bargaining power over contraception and fertility decisions within marital and other sexual relationships.

Second, policymakers should embrace strategies to empower and assist girls who have already become pregnant as teenagers. The empirical evidence demonstrates that some teenage mothers are able to continue their schooling, while others are forced to drop out. To reduce the effects of adolescent pregnancy – to the extent that they do exist – policymakers should help young moms succeed. Developing countries could pass laws allowing girls to return to school at zero cost; where financial resources are available, they could provide child-care support and modest financial assistance to help the mother continue her education. In this respect, South Africa's progressive legal framework could be a model for other developing countries.

The same holds true, to some extent, even with respect to reproductive health, where the relationship at first appears more clear-cut. While a deep literature demonstrates adolescents' vulnerability to maternal mortality and morbidity, the effect does not necessarily appear to be caused directly by biological factors related to their young age. Rather, some contend that the increased health risks of early childbearing occurs because young mothers “tend to be having their first baby (first births are riskier regardless of age), and they are small, poorly nourished, suffering from malaria, and relatively uninformed about how to manage a pregnancy and birth” (Temin and Levine, 26). Even if biological factors are not themselves

causing high maternal mortality among young mothers, policymakers are unlikely to improve young mothers' health status sufficiently in the short run to achieve parity in reproductive health outcomes with older cohorts. Nonetheless, this suggests that governments can mediate the health effects of adolescent fertility by improving healthcare access, nutrition, and information among pregnant teenagers, or among the poor and marginalized groups that are most likely to experience early childbirth. Put another way, interventions solely focused on reducing adolescent fertility are only one path, and not necessarily the most effective path, toward improved reproductive health for teenage girls.

The findings of Chapter 3 also have implications for practice particularly because it provides information on the efficacy of interventions that are feasible within the financial and societal contexts of developing countries. There are several implications for practice and recommendations for policy change.

1. **Lowering the barriers of attending school or increasing the opportunity costs of leaving school can affect adolescent fertility.** Several programs used differing strategies to reduce the barriers to attending school, or to increase the incentives for attending school. Though pregnancy and education are not mutually exclusive, research has shown that continued education is often correlated with reduced rates of pregnancy. As several studies in this review have shown, increasing access to education can affect pregnancy rates in adolescents. While Portner (2011) did not study education directly, the author did find that there was no apparent benefit of family planning programs in Ethiopia for women with formal education—suggesting that improving education may be a viable alternate to family planning [19]. Similarly, Baird (2009) found positive effects of programs for recent school drop-outs, but did not find significant effects for girls currently in school [23]. From this, we suggest that policy makers focus on keeping girls in school as much as what they learn while they are there.
2. **Better match adolescent pregnancy interventions with the true causes of adolescent fertility.** In many parts of the developing world it is not clear if adolescent pregnancy causes poorer life prospects or if poor life prospects motivate early pregnancy. Adolescent pregnancies may not be caused by lack of knowledge about sexual or reproductive health, but rather by the desire or social pressure to become pregnant that is not mitigated by outside incentives to delay fertility. Of course, the reasons for adolescent fertility are nuanced and poorly understood; as such, the local context must be considered when designing and executing programs to reduce adolescent fertility.
3. **The evidence base for conditional cash transfers is relatively strong in comparison to other mechanisms.** Conditional cash transfers performed well in reducing the age of marriage, marriage rate, total number of children, and teen pregnancy over the last year [20] [22, 23] [25]. This is not to say that these programs are necessarily better at reducing adolescent fertility—however the evidence base available does appear to be stronger than other methods

evaluated in this review. Similarly, studies on such programs generally received high quality scores, demonstrating that the conclusions are derived from rigorous, well-designed studies. Specifically, the two programs that provided cash-transfers directly to adolescents [20, 23] found significant fertility related results for women participating in their programs, while the programs that evaluated community wide cash-transfers were not found to be as effective. A study that examined risk behaviors for adolescents whose families participated in the Oportunidades found that the program was protective for risk behaviors relating to smoking and drinking, but did not have any effect on sexual related risk behaviors [41]. This is consistent with the insignificant findings of the program in Stecklov (2006) and Gulemetova-Swan (2009) [25] [22]. However, recent literature analyzing the effects of cash-transfers on STD prevalence has been found to effective. A secondary study by Baird et al (2012) has found that cash-transfers are effective at reducing HIV prevalence for girls attending school [42]. Similarly, a study evaluating the effect of cash transfer programs in Tanzania suggests that the program may be a sacksful way to protect against HIV and other STIs [43]. Such programs, though they do not evaluate fertility, do add support to the concept that cash-transfers can influence sexual behavior and reproductive health.

Implications For Research

Several key gaps have become apparent within the existing literature. While there exists critical mass to outline some basic trends in adolescent fertility and school disruption in developing countries, our understanding of the issues remains limited by insufficient and inconclusive research. Based on the findings of this review, the following are recommendations for a revised research agenda on the socioeconomic consequences of adolescent childbearing and interventions to reduce adolescent fertility.

1. **Attempt to establish causality between adolescent fertility and socioeconomic outcomes.** While the studies included in Chapter 2 employ widely varying methodologies along a broad spectrum of rigor, none can truly claim to demonstrate causality by convincingly addressing the methodological challenge of endogeneity. Researchers from the United States have used a range of techniques in their attempt to overcome this challenge; their studies have included such methodologies as panel data analysis from sisters, comparison of twin versus single births to teenage mothers, and using girls who miscarried as a control group for teen mothers. Their results demonstrated that previous research – primarily traditional regressions which controlled for observable characteristics – greatly overstated the impact of adolescent childbearing (Hoffman, 1998). While even such methods are unlikely to completely eliminate bias, they are substantially more rigorous than the current developing country literature base. To provide value-added to the existing

literature base, further research should use such methods and attempt to demonstrate a causal impact (or lack thereof).

2. **Understand the context of adolescent fertility.** To estimate the “impact of adolescent fertility” is really a misnomer; there cannot possibly be a one-size-fits-all impact, as early childbearing occurs within an extraordinarily wide range of contextual factors. As Figure 1 (Chapter 2) demonstrates, the impact of pregnancy on a girl’s life trajectory depends upon a wide range of factors specific to her life, including marital status, current enrollment status, legal right to return to school, economic returns to education, family attitudes, and likelihood of dropout for other reasons. Accordingly, future research should take a more nuanced view and investigate the impact within particular contexts. How does childbirth affect girls who have already entered an early marriage? Do more liberal laws which allow for school return facilitate greater educational achievement among adolescent mothers? How do different contextual factors mediate the impact of early childbearing? And if context proves important, are there policy responses which can promote positive socioeconomic outcomes for girls who have already experienced childbirth? To better understand these questions, future research should include randomized control trials of interventions which target teenage mothers *after* they have given birth.
3. **Demonstrate external validity.** Right now, the vast majority of micro-level research has been conducted in a single country (South Africa), which also happens to be a major outlier with respect to socioeconomic dynamics and fertility behavior. For reasons discussed above, results from South Africa are unlikely to be generalizable across regions, and even across African countries. Further research should broaden the geographical base using micro-level data from other locations.
4. **Expand the outcomes.** Every study identified in Chapter 2 looks at only one socioeconomic variable (schooling) as its outcome of interest. There is also an extensive literature on the health effects of adolescent fertility, which are outside the scope of this review. However, I was unable to find any completed research considering the consequences of adolescent fertility on other long-term outcomes such as labor participation, income, and productivity; marriage prospects and social capital; or the children’s socioeconomic outcomes and intergenerational effects. At the time of writing, one paper on the long-term consequences of adolescent childbearing in Colombia was in progress. Researchers should devote additional attention to understanding these potential long-term consequences of adolescent fertility, perhaps by building multi-stage panel data to facilitate this analysis.
5. **Evaluate pregnancy and fertility:** Less than half of studies included in Chapter 3 evaluated pregnancy and fertility-related outcomes. This is problematic because the theoretical linkages between surrogate indicators—such as knowledge, sexual activity, and contraceptive use—and fertility may not be representative of the true relationships, and do not necessarily correlate with the desired impact. More research should focus on evaluating the ultimate desired impact of programs

designed to reduce adolescent fertility by including indicators relating to pregnancy and fertility outcomes.

6. **More studies should evaluate the effect of knowledge/attitude type outcomes on overall fertility or pregnancy outcomes:** Only one study in Chapter 3 evaluated a cognitive outcome in conjunction with a fertility-related outcome. Vernon (2004) evaluated awareness of contraceptive methods, finding an increase among study participants. However, that study also found increases in participants' ideal number of children and ideal age for marriage, and a decrease on the ideal age for having a first child. These mixed results are theoretically consistent with studies finding that an intervention had no change on the percent of study participants ever pregnant. More studies should evaluate both outcomes in order to establish the causal link between (1) cognitive interventions and (2) cognitive and fertility-related indicators in low- and middle- income countries.
7. **Include cost information:** None of the studies included in Chapter 3 included information about the cost of the intervention. This information should be better incorporated into research, or at least noted, to better understand the tradeoffs implicit in choosing one type of intervention over another—particularly if the interventions are of comparable efficacy. While costs would clearly vary depending on location of implementation and scope of intervention, understanding the costs—as well as efficacy—of interventions will be integral in providing all the needed information that will be required to better facilitate the scale up proven interventions.
8. **Connect adolescent fertility and total fertility:** It remains unclear if reducing adolescent fertility effects total fertility. An example, from Brazil shows total fertility declines in conjunction with increasing rates of adolescent fertility[44]. While reducing adolescent fertility may have beneficial health and education outcomes, it is not transparent that reducing adolescent fertility may be a tool to reduce fertility as a whole. This relationship should be further examined.
9. **Continue impact evaluations for existing programs:** The studies included in this review offer some insight into the work being done to approach adolescent fertility world-wide. However, unless programs conduct high-quality impact evaluations, policymakers understanding of program efficacy will remain opaque, and valuable lessons learned will not be used to influence the design of new programs. The results of these impact evaluations should be published regardless of the outcome to provide unbiased platform to base policy and spending decisions, allowing for the scale up of increasingly evidence informed and effective interventions.
10. **Evaluate the impact of generally unstudied interventions:** While it was an inclusion criteria of Chapter 3 to include studies that intentionally aimed to reduce adolescent fertility or related factors, there may be a wide range of studies not generally studies as linking with adolescent fertility and not included in the review. Kruger (2009) evaluated the effect of a national policy to lengthen the school day in Chile as to its effects on adolescent pregnancy—but could not be included in the review due to lack of identifiable sample size[45]. Nonetheless, the study finds that

by increasing participation rates in the full day municipal school enrollment by 20 percent reduces the probability of adolescent pregnancy by a corresponding five percent. Additionally, programs that require mandatory schooling, legal enforcement of statutory rape or child marriage may possibly be effective methods to reduce adolescent fertility, and were not included in this review. Traditionally such interventions are not well studied as interventions for adolescent pregnancy, but rather as programs that increase educational attainment, gender rights, and economic prosperity. However, following this review and in identifying which programs are successful in achieving these goals, it has become increasingly clear to the authors that these issues may be inseparably intertwined. Further, in if such programs can be demonstrated to have the dual benefit of increasing their intended benefit (i.e. increased gender equality) with externalities relating to adolescent fertility, this would only strengthen the case for wider policy uptake of such programs.

Appendix and References

Appendix I: Search Strategy and Results

Does lower fertility among adolescents lead to improved school continuation rates, greater human capital accumulation, or enhanced productivity?

EconLit and MEDLINE (Conducted 10/26/11)

Search	Terms	Search Details	Found Items
#1	Adolescent AND fertility AND human capital	2000-2011, Scholarly	25
#2	Adolescent AND fertility AND schooling	2000-2011, Scholarly	31
#3	Adolescent AND fertility AND education	2000-2011, Scholarly	206

PubMed (Conducted 12/16/11)

Search	Terms	Search Details	Found Items
#1	Adolescent AND fertility	("adolescent"[MeSH Terms] OR "adolescent"[All Fields]) AND ("fertility"[All Fields] OR "fertility"[MeSH Terms]) AND ("humans"[MeSH Terms] AND English[lang] AND ("2000"[PDAT] : "2011"[PDAT]))	2015
#2	(human AND capital) or schooling or education or health	((("humans"[MeSH Terms] OR "humans"[All Fields] OR "human"[All Fields]) AND ("economics"[MeSH Terms] OR "economics"[All Fields] OR "capital"[All Fields])) OR ("educational status"[MeSH Terms] OR ("educational"[All Fields] AND "status"[All Fields]) OR "educational status"[All Fields] OR "schooling"[All Fields] OR "education"[MeSH Terms] OR "education"[All Fields]) OR ("education"[Subheading] OR "education"[All Fields] OR "educational status"[MeSH Terms] OR ("educational"[All Fields] AND "status"[All Fields]) OR "educational status"[All Fields] OR "education"[All Fields] OR "education"[MeSH Terms]))	1,140,432
#3	#1 and #2		381

Social Sciences Research Network (Conducted 10/26/11)

Search	Terms	Found Items
#1	Adolescent Fertility Schooling	5
#2	Adolescent Fertility Education	9
#3	Adolescent Fertility Human Capital	3

Appendix II: Papers Identified for Full Text Review, by Category

Included (11):

- Azarnert, L. (2009). Abortion and Human Capital Accumulation: A Contribution to the Understanding of the Gender Gap in Education. Scottish Journal of Political Economy 56(5): 559-2009.
- Eloundou-Enyegue, P. (2004). Pregnancy-Related Dropouts and Gender Inequality in Education: A Life-Table Approach and Application to Cameroon. Aug;41(3):509-28.
- Eloundou-Enyegue, P. and C. S. Stokes (2004). Teen Fertility and Gender Inequality in Education: A Contextual Hypothesis. Demographic Research. Demographic Research 11: 305-334.
- Grant, M. and K. Hallman. "Pregnancy-related School Dropout and Prior School Performance in KwaZulu-Natal, South Africa." Studies in Family Planning 39(4): 369-382.
- Hunter, N. and J. May (2011). "Poverty, Shocks and School Disruption Episodes among Adolescents in KwaZulu-Natal, South Africa." Development Southern Africa 28(1): 1-17.
- Kaufman, C. E., T. de Wet, et al. (2001). "Adolescent Pregnancy and Parenthood in South Africa." Studies in Family Planning 32(2): 147-160.
- Lloyd, C. B., & Mensch, B. S. (2008). Marriage and Childbirth as Factors in Dropping Out from School: An Analysis of DHS Data from Sub-Saharan Africa. Population Studies, 62(1), 1-13.
- Marteletto, L., D. Lam, et al. (2008). "Sexual Behavior, Pregnancy, and Schooling among Young People in Urban South Africa." Studies in Family Planning 39(4): 351-368.
- Madhavan, Sangeetha and Kevin J.A. Thomas. 2005. "Childbearing and Schooling: New evidence from South Africa." Comparative Education Review 49(4): 452-467.
- Mensch, B. S. et al. (2001). "Premarital Sex, Schoolgirl Pregnancy, and School Quality in Rural Kenya." Studies in Family Planning 32(4): 285-301.
- Ranchhod, L., Lam, Leibbrandt and Marteletto (2011). "Estimating the Effect of Adolescent Fertility on Educational Attainment in Cape Town Using a Propensity Score Weighted Regression " Fifth Annual PopPov Conference on Population, Reproductive Health, & Economic Development, 2011.

Excluded as Reviews (4):

Das Gupta, M., J. Bongaarts, et al (2011). "The Social and Private Benefits of Reducing High Fertility in Low-income Countries: Implications for Sub-Saharan African and Global Economic Prospects." Paper presented at the Population Association of America Annual Meeting, March 2011.

Greene, E.G., and Merrick, T. (2005). Poverty Reduction: Does Reproductive Health Matter? Health, Nutrition, and Population (HNP) Discussion Paper. The World Bank.

Schultz, T. P. (2001). Why Governments Should Invest More to Educate Girls. Yale University.

World Health Organization (2007). "Adolescent Pregnancy: Unmet Needs and Undone Deeds."

Excluded for Wrong Research Question (9):

Biddlecom, A., R. Gregory, et al. (2008). "Associations between Premarital Sex and Leaving School in Four Sub-Saharan African Countries." Studies in Family Planning 39(4): 337-350.

Joshi, S. and P. Schultz (2007). "Family Planning as an Investment in Development: Evaluation of a Program's Consequences in Matlab, Bangladesh." Discussion Paper No. 951, Economic Growth Center, Yale University.

Padmadas, S., I. Hutter, et al. (2004). "Compression of women's reproductive spans in Andhra Pradesh, India." International Family Planning Perspectives 30(1): 13-19.

Rani, M. and E.Lule (2004). Exploring the Socioeconomic Dimension of Adolescent Reproductive Health: A Multicountry Analysis. International Family Planning Perspectives 30(3):110-117.

Save the Children (2011). "Champions for Children: State of the World's Mothers 2011."

Shapiro, D. and O. Tambasche (2001). "Gender, poverty, family structure, and investments in children's education in Kinshasa, Congo." Economics of Education Review 20: 359-375.

Singh, S., et al. (2005). "Adding It Up: The Benefits of Investing in Sexual and Reproductive Health Care." United Nations Population Fund and the Alan Guttmacher Institute.

Singh, S., et al. (2009). "Adding It Up: The Costs and Benefits of Investing in Family Planning and Maternal and Newborn Health." The Guttmacher Institute.

The Population Council and the International Center for Research on Women (2000).
Adolescent Girls' Livelihoods. New York, NY, and Washington, DC, the
Population Council and ICRW.

Incomplete or Inaccessible (3):

Hallman, Kelly and Monica Grant. 2003. "Disadvantages and youth schooling, work, and
childbearing in South Africa." Paper presented at the Annual Meeting of the
Population Association of America, Minneapolis, 1–3 May.

Plane, Patrick. "Fertility, Schooling, and Work Transitions of Young Women in Africa:
Understanding Determinants and Outcomes."

Tshiswaka-Kashalala, Gauthier. "Reproductive Health, Labor Outcomes, and Pro-Poor
Growth in South Africa: A Micro-Simulation Approach."

Appendix III: Summary of Results

Study (Author, Year)	Location and Study Design	Findings	Potential Bias
High-Quality Studies			
Estimating the Effect of Adolescent Fertility on Educational Attainment in Cape Town Using a Propensity Score Weighted Regression (Ranchod et al., 2011)	Cape Town, South Africa. Longitudinal regressions using propensity score matching to generate appropriate counter-factual control group.	While girls who experience adolescent fertility are 30% less likely to graduate from high school by age 20 than their peers, this effect reduces to a 6%** difference as controls and propensity matching are introduced. However, by age 22 the difference is only 2.7% and no longer significant, suggesting that many girls later return to school after a birth.	
Childbearing and Schooling: New Evidence from South Africa (Madhavan and Thomas, 2005)	Limpopo province, South Africa. N=34,829 African women aged 13-22. Analysis of census data and qualitative supplement. Estimates the effects of childbearing on education through OLS and logistic regression models, with both individual and household-level covariates.	Girls who experienced a live birth were 56% less likely*** to be enrolled in school after controlling for a range of socioeconomic factors. They also completed 1.02 years less*** of cumulative schooling. Among young mothers, unmarried girls were 3.61 times as likely to be enrolled in school*** and had completed 1.09*** years of additional schooling. Girls who were older when they had their children were 9% less likely to be enrolled in school for each additional year of age***, but had completed .18 years of additional schooling*** per each additional year of age.	Does not address endogeneity.
Sexual Behavior, Pregnancy, and Schooling among Young People in Urban South Africa (Marteletto et al. 2008)	Cape Town, South Africa N=762 girls. Longitudinal study of data from Cape Area Panel Study.	Teen pregnancy is not entirely inconsistent with continued schooling. Over 50% of African women who had a pregnancy at age 16 or 17 were enrolled in school the following year. A pregnancy was correlated with an increased likelihood of dropping out of school of 12% for Africans* and 22.3% for Coloreds** after controlling for a number of relevant variables.	Does not address endogeneity.
Medium-Quality Studies			

<p>Marriage and Childbirth as Factors in Dropping Out from School: An Analysis of DHS Data from sub-Saharan Africa (Lloyd and Mensch, 2007)</p>	<p>Burkina Faso, Cameroon, Cote d'Ivoire, Guinea, and Togo, plus group of 15 other African countries for comparison. Life-table analysis of DHS survey data. Estimates the risk of school-leaving as the result of marriage or early childbirth.</p>	<p>A low estimate attributes between a 4 and 15% chance of leaving school early, among girls still enrolled at age 12, as a result of childbirth or marriage, while a “ceiling” estimate ranged between 20 and 40% in the five countries studied. The risks of leaving school for other reasons far exceed the risks of leaving due to pregnancy. Early marriage is more impactful than childbirth. Looking at childbirth alone, a low estimate attributes a 3 to 10% change of leaving school early among girls still enrolled at age 12 as a result of childbirth. A ceiling estimate ranged between 5 and 17%.</p>	<p>Even low estimate does not address endogeneity and assumes that self-reporting of pregnancy as reason for leaving school is accurate and causal. High estimate corrects in other correction. Likely to dramatically overstate impact of both pregnancy and marriage, even in low estimates.</p>
<p>Pregnancy-related School Dropout and Prior School Performance in Kwazulu-Natal, South Africa (Grant and Hallman, 2008)</p>	<p>Kwazulu-Natal, South Africa. N=443 girls aged 14-24 who became pregnant while enrolled in school. Event history analysis based on cross-sectional survey data. Examined which factors would lead girls who became pregnant while enrolled in school to drop out, and which factors were associated with later school re-entry.</p>	<p>Of those who were enrolled in school at the time of pregnancy, 74% of 14-19 year-olds (at the time of the survey) and 72% of 20-24 year olds (at the time of the survey) had dropped out of school in the year of their pregnancy. Girls were 1.97*** times as likely to drop out after becoming pregnant if they had previously repeated a grade and 2.61** times more likely to drop out if they had previously withdrawn from school temporarily. Of those, 29% of 14-19 year olds and 51.8% of 20-24 year olds had returned to school by the time of the survey. Girls were about twice as likely to drop out upon becoming pregnant if they had previously repeated a grade*** or withdrawn temporarily from school**. After dropping out, girls were less likely to return to school with each subsequent year*** and if they had dropped out while in a higher grade at school***, but were 2.36 times as likely to return*** if they were in the 20-24 age group rather than 14-19 at the time of pregnancy.</p>	<p>Does not attempt to control for causality in dropout due to pregnancy; focus is on factors influencing dropout once a girl does become pregnant.</p>
<p>Teen Fertility</p>	<p>38 nations (23 in Africa, 3</p>	<p>Between 0 and 27.6 percent of</p>	<p>Relies on self-reporting of</p>

and Gender Inequality: A Contextual Hypothesis (Eloundou-Enyegue and Stokes, 2004)	in South Asia, 7 in Latin America, 5 in the Middle East and North Africa. Cross-national regression of DHS data.	female dropouts are associated with pregnancy (at the country level). Reducing teenage fertility would help close the gender gap in many countries in Africa and to a lesser extent in Latin America, but only a negligible impact in the Middle East and Asia. Few countries would close the gender gap solely by reducing unintended teenage fertility. The estimated impact is larger for intermediate countries in the demographic transition.	reason for dropout. If pregnancies are merely a symptom of underlying reasons for dropout, paper would overestimate the contribution of teen pregnancy to gender inequality. Best viewed as upper bound of potential payoff.
Pregnancy-Related Dropouts and Gender Inequality in Education: A Life-Table Approach and Application in Cameroon (Eloundou-Enyegue, 2004)	Cameroon. N=6,686 pupils. Life table approach from survey data to estimate how much hypothetical reductions in pregnancy-related dropouts would help close the gender gap in educational attainment.	Pregnancies account for 13% of female dropouts in grade 6; 33-41% of all female dropouts in grades 7-10; and 4-22% of dropouts in grades 10-13. Pregnancies increase the gender gap by 6% during primary school, compared to about 3% from other causes. In secondary school, pregnancies increase the gender gap by 30% (11% other causes). However, elimination of pregnancy-related dropout may be neither necessary nor sufficient to eliminate the gender gap in schooling.	Analysis based on self-reported reasons for dropout among girls. Pregnancy may be only the proximate cause or one of several causes of dropout. Does not address whether student would otherwise have stayed in school. Pregnancy assumed to be exogenous. Likely to overestimate impact – should be considered upper bound estimate.
Abortion and Human Capital Accumulation: A Contribution to the Understanding of the Gender Gap in Education (Azarnert, 2009)	N=41 countries in Sub-Saharan Africa. Cross-country regression analysis analyzing the relationship between liberalness of abortion laws and the gender gap in educational achievement.	More liberal abortion laws are significantly** associated with increased secondary school enrollment among girls; there is no effect for boy's enrollment. Girl's enrollment is approximately 7% higher in countries with liberal abortion policies than countries with very restrictive abortion policies when controlling for GNI, TFR, and boy's school enrollment.	If liberalness of abortion laws is correlated with more liberal attitudes about gender equality more generally, then the observed difference between states with liberal and highly restrictive abortion laws could arise from more liberal societal attitudes toward girls' schooling rather than the abortion laws per se.
Premarital Sex, Schoolgirl Pregnancy, and School Quality in Rural Kenya (Mensch et al. 2001)	Three districts in rural Kenya. N=346 girls aged 17-19. Cross-sectional analysis of survey data, primarily looking at the relationship between school quality and premarital sex. Considered impact of pregnancy on dropout as	Of the girls in the sample, 8 percent had reported a prior pregnancy and all had dropped out of school; however, only 12 percent of those had become pregnant before leaving school. Of the total 27 girls who had been pregnant, only four listed child-care responsibilities and	Data on impact of dropout only a secondary consideration and not rigorously evaluated; paper focused on causes of pregnancy and risky sexual behavior.

	secondary outcome.	two listed marriage as the main reason for drop out, while 14 listed “could not pay fees.” Only 3 percent of all girls would leave school before age 19 specifically because of pregnancy.	
Low-Quality Studies			
Adolescent Pregnancy and Parenthood in South Africa (Kaufman et al., 2000).	Soweto and Agincourt, South Africa. Analysis of focus group discussions held in May 1998 with teenage mothers, mothers in their 20s who had their first child before age 20, parents of adolescent mothers, and young men in their 20s.	Many young mothers return to school after the birth of the child. However, returning is not a given, and many girls move into the homes of their boyfriends where they are subject to the financial decisions of their in-laws. Girls have primary responsibility for securing child care and get little family support. Young mothers want to return to school quickly and see staying out of school as a punishment.	n/a – focus groups
Poverty, Shocks, and School Disruption Episodes among Adolescents in South Africa (Hunter and May, 2002)	Durban, South Africa. N=3,013 adolescents and N=1074 households. Analysis of cross-sectional survey data. Pregnancy considered as a secondary explanatory variable.	38% of female dropouts in the sample were attributed to pregnancy. 37% of girls who had dropped behind in school without dropping out were currently pregnant or had been pregnant previously. 59% of “ever pregnant” girls had experienced a dropout and 41% repeated at least one grade.	Analysis of relationship between fertility and dropout or falling behind limited to descriptive statistics. No controls or further analysis.

Appendix IV: Additional Works Cited

- Bird, K (2007). "The Intergenerational Transmission of Poverty: An Overview." Overseas Development Institute Working Paper 286. Chronic Poverty Research Center.
- Geronimus, A. T. and S. Korenman (1992). "The Socioeconomic Consequences of Teen Childbearing Reconsidered." *The Quarterly Journal of Economics* 107 (4): 1187-1214.
- Sawyer, S. M., et al. (2012). "Adolescence: A Foundation for Future Health." *The Lancet* 379 (9826): 1630-1640.
- SmithBattle, L. (2009). "Reframing the Risks and Losses of Teen Mothering." *The American Journal of Maternal/Child Nursing* 34 (2): 122-128.
- Temin, M. and R. Levine (2009). "Start with a Girl: A New Agenda for Global Health." Center for Global Development.
- United Nations Population Fund (2005). "State of the World Population." Accessed 12/14/11 at http://www.unfpa.org/swp/2005/english/ch3/ch3_box9.htm.

Appendix V: Search Strategy

How do different types of investments in reproductive health affect health outcomes for women and children? How does the type and organization of services affect their effectiveness, including their availability of to reach poor and vulnerable populations?

Research Question 1: What are the most effective strategies to improve health and fertility outcomes among adolescents?

	MeSH Terms	Key Words
Population	Adolescent (13-21) Young Adult	
Intervention	Child Health Services/organization & administration Family Planning Services/organization & administration Reproductive Health Services/utilization Evidence-Based Practice	
Outcome	Fertility Health Adolescent Behavior Pregnancy Sexual Behavior/ethnology Sexual Behavior/statistics & numerical data* Birth Rate/trends* Contraception/utilization* Contraceptive Agents/supply & distribution Contraceptive Devices/supply & distribution	

Pubmed: (Conducted 10/21/2011)

Search One	Terms	Search Details	Found Items
#1	Adolescent Young Adult	("adolescent"[MeSH Terms] OR "adolescent"[All Fields]) OR ("young adult"[MeSH Terms] OR ("young"[All Fields] AND "adult"[All Fields]) OR "young adult"[All Fields])	1,600,829
#2	evidence-based practice family planning scholarship program cash transfer school based intervention	("evidence-based practice"[MeSH Terms] OR ("evidence-based"[All Fields] AND "practice"[All Fields]) OR "evidence-based practice"[All Fields] OR ("evidence"[All Fields] AND "based"[All Fields] AND "practice"[All Fields]) OR "evidence based practice"[All Fields]) OR ("family planning services"[MeSH Terms] OR ("family"[All Fields] AND "planning"[All Fields] AND "services"[All Fields]) OR "family planning services"[All Fields] OR ("family"[All Fields] AND "planning"[All Fields]) OR "family planning"[All Fields]) OR ("fellowships and scholarships"[MeSH Terms] OR ("fellowships"[All Fields] AND "scholarships"[All Fields]) OR "fellowships and scholarships"[All Fields] OR "scholarship"[All Fields]) AND program[All Fields]) OR (cash[All Fields] AND ("transfer (psychology)"[MeSH Terms] OR ("transfer"[All Fields] AND ("psychology)"[All Fields]) OR "transfer (psychology)"[All Fields] OR "transfer"[All Fields])) OR ("schools"[MeSH Terms] OR "schools"[All Fields] OR "school"[All Fields]) AND based[All Fields] AND ("Intervention (Amstelveen)"[Journal] OR "intervention"[All Fields]))	128410
#3	fertility	"fertility"[All Fields] OR "fertility"[MeSH Terms]	60,701
#4	#1 AND #2 AND #3	#1 AND #2 AND #3	3,341
#5	Limits Activated: Publication Date from 2000/01/01	Limits Activated: Humans, English, Publication Date from 2000/01/01	289

SSNR:

Fertility + Adolescent + Family Planning—53

Fertility + Adolescent + Scholarship Program—0

Fertility + Adolescent + Cash Transfer—2

Econ Lit:

Limit to full text, limit to after January 2000

Fertility + Adolescent + Family Planning—132

Fertility + Adolescent + Scholarship Program—0

Fertility + Adolescent + Cash Transfer—0

Popline

3IE

Fertility + Adolescent—10

PopPov-

- Need: Poverty and Unmet Needs in Reproductive Health of Adolescents and Youth in Central Africa
- Information, Sexual Behavior, and Health Among Teenagers in Cameroon
- The Effects of Cash Transfer Programs on ECD of Adolescent Girls

Appendix VI: Assessment of Methodological Quality and Risk of Bias

Table 1: Quality Assessment Criteria for Randomized/Quasi-Experimental Controlled Trials [46]

	High Quality	Medium Quality	Low Quality
Selection Bias	Studies with randomization, allocation concealment, and similarity of groups at baseline	RCTs with some deficiencies in randomization, e.g. lack of allocation concealment, or non-randomized studies with either similarities at baseline or use of statistical methods to adjust for any baseline differences	Non-randomized, with obvious differences at baseline and without typical adjustment for these differences.
Performance bias	Differed only in intervention, which was adhered to without contamination. Groups were similar for co-intervention or statistical adjustment was made for any differences. Outcome measured equally in both groups with adequate length of follow-up, direct verification of outcome, with data to allow calculation of precision estimate.	Confounding was possible but some adjustment was made in the analysis	Intervention was not easily ascertained or groups were treated unequally other than for intervention or there was
Measurement Bias		Inadequate length of follow up or length not given	Inadequate reporting or verification of outcomes or differences in measurements in both groups
Attrition Bias	Non-systematic differences in withdrawals between groups and with appropriate imputation for missing values		Incomplete follow-up data, not intention-to-treat analysis or lacking reporting on attrition

Table 2: Quality assessment criteria for pre-post studies without control arm [46]

Study features	Assessment
Study based on explicit theory	Yes/No/Unclear
Adequate description of how the health intervention was adapted to local conditions	Yes/No/Unclear
Health interventions services described	Yes/No/Unclear
Measured outcome before and after intervention	Yes/No/Unclear
Measurement method the same before and after	Yes/No/Unclear
Paper included discussion of possible biases and caveats (or limitations)	Yes/No/Unclear
Paper included p-values or confidence interval	Yes/No/Unclear
Analysis employed some form of modeling or regression	Yes/No/Unclear
Exposure to intervention monitored	Yes/No/Unclear

Study (Author, Year)	Study design	Location/ Sample	Study Length	Program Description	Program Results	Quality Assessment
Agha, 2002	Quasi-Experiment. case-controlled.	Cameroon, Edea and Bafia N=3239 males and females ages 12-22 South Africa, Soweto and Umalazi N=425 females ages 16-20 Botswana, Lobatse and Francistown N=3398 males and females ages 13-18 Guinea, Conkary N=4021 male and female adolescents	8-13 Months	Cameroon: 13-month intervention included peer education, youth clubs, mass media advertising, and the distribution of informational and educational materials. Training of 28 peer educators to promote behavior change. South Africa: 11-month intervention included radio campaigns promoting safe sex and trained 70 volunteers to distribute condoms and educate peers. Botswana: Intervention to persuade adolescents that reproductive health services were for them and not just for adults. Providers were trained to be youth-friendly and a mass media campaign used radio messages and peer educators. Some in control group were also exposed to the radio program. Guinea: Peer educators trained on reproductive health issues and communications and held discussions about RH with young adults. Organized activities such as educational theater, film presentations, and	Belief that sexual activity carries the risk of pregnancy Cameroon—No Effect Botswana and South Africa—Increased* Guinea—Decreased* Attitude towards abstinence South Africa—Increased* Botswana—Increased* Cameroon—Increased* Guinea—No Change Women’s sexual activity South Africa—No Change Botswana—No Change Cameroon—No Change Guinea—Increased* Contraceptive use South Africa—Increased Botswana—Increased Cameroon—Increased Guinea—No Change	Low Low Low Low

				dances. Distributed educational materials		
Agha, 2004[26]	Quasi-experiment, case-control	Zambia, Lusaka N=416 males and females ages 14-23	6 months	The Zambia peer sexual health intervention was implemented by the Society for Family Health (SFH) to reduce risky sexual behavior and sexual transmission of HIV among adolescents. Interventions included single discussion-oriented session with peer educators focusing on abstinence and condom as HIV prevention methods.	Normative positive beliefs about abstinence—Increased** Normative positive beliefs about condom use—Approval of condom use and intent to use condoms increased at first follow up**, decreased to no effect at second follow up. Belief that condom use is normal increased at second follow up** Sexual behavior—Decreased percentage of students with multiple regular partners**, no impact on condom use or abstinence	Medium Low Medium Low
Alam 2010 [20]	Quasi-experiment, case-control	Pakistan, Punjab N=156,000 girls ages 12-19	6 years	Female School Stipend Program (FSSP) is a conditional cash transfer program implemented to promote participation in public education for girls in middle school (grades 6 through 8). Program benefits comprise a quarterly stipend of approximately PKR 600 (equivalent to US\$10) per female student.	Age of Marriage—Increased* (12.2-1.5 years) Girls 17-19 who gave birth—No change Total number of children—Decreased* (.3 fewer)	Medium Medium High Medium.
Baird 2009 [23]	Quasi-experiment, Cluster	Malawi, Zomba District	14 Months	The Zomba Cash Transfer Program is a randomized, conditional cash transfer	Marriage rate For Dropouts—Decreased For School Girls—No Change	High Medium High

	randomized control trial	N=3,806 never-married, 13-22 year-old females		intervention targeting young women in Malawi that provides incentives (in the form of school fees and cash transfers) to current schoolgirls and recent dropouts to stay in or return to school. An average offer of US\$10/month conditional on satisfactory school attendance—plus direct payment of secondary school fees.	Teenage Pregnancy over the last year For Dropouts—Decreased**(5%) Schoolgirls—No Change Self-reported sexual activity For Dropouts—Decreased*** (5.5%) Schoolgirls—Decreased (p-Value .112) (2.5%)	High
Bhuiya, 2004 [32]	Quasi-experiment, case-control.	Bangladesh, Pabna, Dinajpur, and Rangpur N=6,000 women and men ages 10-19	2 years	Intervention 1: provides reproductive health education to out-of-school adolescents linked with adolescent-friendly services at health facilities. Intervention 2: provides reproductive health education to both in-school and out-of-school adolescents linked with adolescent-friendly services at health facilities.	Awareness of contraceptives among boys—Increased in site 2*** relative to other sites Awareness of fertile period—increased among girls in site 2** and boys in sites 1*** and 2*** Attitude toward contraceptive use by unmarried adolescents— increased*** in site 2 Attitude toward contraceptive use among married adolescents— increased*** in site 2	Medium Low High Low
Cartagena, 2006[33]	Quasi-experiment, case-control.	Monglia, Ulaanbaatar N=1,367 grade 10 students, male and female	3 Years	Peer education program focused on 1) Reproductive health; 2) AIDS and STI transmission, symptoms and prevention; 3) Safe sex including how to use condoms; 4) Discussions and interactive communication through skills-based learning	Reproductive health knowledge— increased** Attitudes toward contraceptive use— increased** Likelihood to practice safe sex— Increased	1. Low 2. Low 3. Medium 4. Medium

				about emotions, refusal skills, love, friendship.		
Cabezon , 2005 [24]	Randomized controlled trial.	Chile, Santiago N=1259 women ages 15-20	4 years	TeenSTAR Program: abstinence-only sexual education program stressing the importance of the biological and physiological aspects of fertility. The program consists of 14 45 minute sessions delivered during the school day.	Pregnancy during follow up period—Decreased ** Cohort one—6 pregnancies in intervention group, 35 in control Cohort two—13 pregnancies in intervention group, 17 in control	High Medium High Medium
Daniel, 2008[21]	Quasi-experiment, case controlled	India, Bihar N=4,075 married women ages 15- 25	2 years	The PRACHAR Project in Bihar, seeks to increase contraceptive use for delaying and spacing births through communication interventions including social environment building, information on reproductive health services, and improving access to reproductive health services.	Contraceptive demand—Increased** Contraceptive use—Increased*** Awareness of health risks of early motherhood—Increased ** Awareness of contraceptives—Increased** Knowledge about fertile days in mistral cycle—Increased***	Low Low Medium Medium
Duflo, 2011 [28]	Quasi-experiment, Cluster randomized control trial.	Western Kenya (328 Schools) N=19,487 male and female adolescents age 13.5 on	7 years	The study evaluates two programs. The first reduced the costs of education by providing free uniforms, the second program consisted in training teachers on how to deliver the national HIV/AIDs prevention curriculum to primary school	Likelihood of having married Uniform project (after 3 years)—decreased** HIV/Aids prevention curriculum (after 3 years)—No Change Uniform project (after 5 years) —decreased** HIV/Aids prevention curriculum	High High High High

		average		students.	(after 5 years)—No Change Uniform project (after 7 years)—Decreased* HIV/Aids prevention curriculum (after 7 years)—No Change Likelihood having been pregnant Uniform Project—decreased** HIV/Aids prevention curriculum (after 3 years)—No change Uniform project (after 5 years)—decreased** HIV/Aids prevention curriculum (after 5 years)—no change Uniform project (after 7 years)—decreased HIV/Aids prevention curriculum (after 7 years)—No change	
Eggleston, 2000[36]	Quasi-experiment, case-control.	Jamaica, five schools throughout the country N= 945 seventh graders ages 11-14, males and females	2 years	School-based sexuality education program known as the grade 7 project with focus on both abstinence promotion and sexual risk reduction. Female educator-counselors conducted 45 minute sessions once per week throughout the academic year (nine months). Comparison group had a variety of sexual education programs typical in Jamaica, but not the Grade 7 project.	Contraception at first intercourse—increased* after 1 year, no difference after two years Engagement in Sexual Activity—No change Reproductive knowledge: — Increased** after one year, no difference after two years Attitudes (sexual activity, family planning, and parenthood)— Increased** after one year, no difference after two years.	Medium Low Medium Low

<p>Gulemetova-Swan, 2009 [22]</p>	<p>Quasi-experiment, case-control</p>	<p>Mexico, 506 communities N=2,746 adolescent girls.</p>	<p>2 years</p>	<p>Oportunidades offered two types of transfers to the titulares (female household heads): one for household purchases, which is conditional upon family members' complying with health-promoting activities, and one for education, conditional upon children's school attendance. . The program provides periodic check-ups free of charge and reproductive health services, including family planning, pregnancy and obstetric care. The objective of Oportunidades is to place emphasis on regular healthcare visits, to set up monitoring systems, and to provide extra training to personnel within the existing services and infrastructure.</p>	<p>Age at marriage—Increased*** Age of Sexual Debut—Increased</p>	<p>Medium Medium Medium Medium</p>
<p>Kanesathasan, 2008[30]</p>	<p>Before and after study</p>	<p>India, Bihar and Jharkhand N=4,323 ages 14-24 males and females</p>	<p>2 years</p>	<p>The Development Initiative Supporting Healthy Adolescents (DISHA) is a large-scale integrated programs in India to address the broader context of young people's sexual and reproductive health needs. They established youth groups and resource centers in participating villages to provide young people with reproductive health</p>	<p>Knowledge of contraception methods and access—Increased** Age at marriage—Increased (15.9 years. to 17.9 years) Contraceptive use among married youth—Increased** among females</p>	<p>• Y: 5; • N: 1; • U: 3.</p>

				<p>knowledge, services, and livelihood training. They also used a cadre of peer educators to assist youth groups and individual counseling sessions. DISHA also targeted adults in target villages with mass communication and adult groups to discuss the status of youth. DISHA also trained local health service providers in youth friendly services and enlisted a group of young volunteers to help dispense modern family planning methods as needed.</p>		
Kim, 2001 [27]	Quasi-experiment, case-control	<p>Zimbabwe, five pilot sites (Mutare) and four growth points (Maphisa, Nemanwa, Nzvimbo and Tongogara). N= 1,400 males and females Ages 10–24</p>	9 Months	<p>Multimedia campaign promoted sexual responsibility among young people, while strengthening their access to reproductive health services by training providers. Multimedia campaign included posters, leaflets, newsletters, a radio program, launch events, dramas, peer educators, and a hot line. Also provided a one-week course to train one family planning provider from each of 26 clinics in interpersonal communication skills and youth counseling.</p>	<p>Awareness of contraceptive methods—Increased*** General reproductive health knowledge—No change Report declining sexual encounter—Increased*** Visit a health center—Increased *** Contraceptive use—Increased*** Continued abstinence—Increased***</p>	<p>Medium Low Medium Low</p>

Lou, 2004 [34]	Quasi-experiment, case-control.	Shanghai, China N= 4454 males and females ages 15-24	20 Months	A multifaceted intervention program which provides information and skills, as well as counseling and services for reproductive health. Program built awareness among unmarried youth aged 15 to 24 through educational materials, instructional videos, lectures, and small group activities. Materials provided information on sexual physiology, psychology, reproduction, sexual responsibility, contraception, etc., as well as how to access contraceptive and reproductive health services. The program also set up a youth health counseling center and distributed contraceptives free of charge through a variety of channels.	Percent initiating sexual activity—No change Ever used contraception—Increased*** Regular contraception use—Increased*** Condom use—Increased***	1. Medium 2. Medium 3. Medium 4. Medium
Magnani, 2001 [37]	Quasi-experiment, case-control.	Brazil, Bahia N=4,777 males and females ages 11-19	2 Years	A partnership between local schools and clinics with activities based on sexual and reproductive health efforts including: (1) referral of students in need of sexual and reproductive health services from project schools to reference clinics; (2) meetings between teachers and health-service providers from partner units; (3) visits by teachers (with their students, if feasible)	Levels of sexual activity—No change Use of contraception—No change	1. Medium 2. Low 3. Medium 4. Medium

				to health facilities; (4) visits by health-service providers to schools; and (5) meetings between clinic directors and education and health-system district managers		
Mba, 2007[18]	Quasi-experiment, case-control.	Nigeria, Abia N=360 males and females ages 10-20 (mean age 14.3)	2 months	This intervention study compared a study group, which received health education on reproductive health and a control group, which did not receive any. The study was done in three phases: (1) the pre-intervention stage, when a baseline study was done on both control and study groups using a questionnaire to assess their level of knowledge on reproductive health; (2) the intervention stage, when a 3-h workshop was organized by the researchers for the study group on sexually transmitted diseases, HIV/AIDS and family planning; (3) the post-intervention stage, when the same questionnaire used earlier was used to evaluate their knowledge on the same subject 6 weeks after the workshop.	Knowledge of reproductive health problems—Increased** (27%) Knowledge of family planning—Increased** (14.7%) Level of sexual activity—No change Practice of pregnancy prevention—Increased	1. Low 2. Medium 3. Low 4. Low
Okonofua, 2003[29]	Quasi-experiment, Randomized Controlled	Nigeria, Edo N=1,858 males and females ages	11 months	Intervention to improve STD treatment-seeking through community participation, peer education, public lectures,	Condom use for females—Increased** (OR=1.11 (95% CI=1.22-1.42) Condom use for males—No Change	1. Medium 2. Low 3. Medium 4. Medium

	Trial	14-20		health clubs in schools, and the training of STD treatment providers. (1) established a reproductive health club in each school which mounted awareness campaigns on STD prevention and treatment (2) some members of the club were trained as peer educators to provide one-on-one counseling and distribute information and (3) training of health providers to treat STDs		
Portner, 2011[19]	Cross-sectional study	Ethiopia, country wide N=2,700 women ages 15-45	9 Years	Access to family planning services and community based reproductive health programs and family planning access for women without schooling age 15-45 (broken down into subgroup for 15-19).	The effect of family planning on number of children ever born- Decreased** (.656 children) Unwanted Fertility—No change Recent birth or pregnancy—No change	Y: 6; N: 1; U: 2.
Rahman, 2010 [31]	Quasi-experiment, case-control	India, Bihar N=1,200 males and females ages 19-24.	6 years	Reproductive health communication model called “PRACHAR” provided health information to adolescents and young couples, their parents, in-laws, and influential community members. Aims to increase girls’ age at marriage, delay the first birth until age 21, and ensure spacing of at least three years between births. Adolescents are given three-day RH training and taught communication skills to	Age at marriage For girls—Increased** (1.5 years) For boys—Increased** (1 year) Age of first birth—Increased (2.1 years)	Low Medium Medium Low

				negotiate with partners or guardians. Newlywed couples were given “infotainment” sessions and young married women are routinely visited by female health workers. RH information is also disseminated via wall paintings, street theater, posters, and leaflets.		
Stecklov 2006 [25]	Cluster randomized controlled trial	Mexico (Progresa) N=8,817 women ages 12-47. Honduras (PRAF) N= 6,456 women ages 12-47. Nicaragua (RPS) N=2,409 women ages 12-47.	2 years	Households in the treatment group received transfers under the condition that their children enroll in and attend school and that family members obtain health care. Mexico: PROGRESA program provided CCTs at approximately 20% mean value of consumption to remain enrolled in school and attend health check-ups/health lectures, including family planning. Transfer amount was lump sum and could not be increased by addition of new eligible individuals. Honduras: PRAF same as PROGRESA, but 21% of consumption. Amount of voucher was determined by number of children under age 3 and pregnant women per household; roster was open to	Fertility for women under 20 years of age—decreased (up to 2%)	High High High High

				<p>women in treatment communities.</p> <p>Nicaragua: RPS same as above, but transfers were a much lower share of income.</p> <p>Provided lump sum transfer to households, but other households could join midway through if they had children and became eligible.</p>		
Vernon, 2004[35]	Quasi-experiment, case-control	Mexico, Country wide N=35,000 adolescents (10-19) and parents.	3 years	<p>The Mexican Foundation for Family Planning (MEXFAM)'s Young People Program includes courses taught in schools and community, video and plays, health fairs, and affiliated health services.</p> <p>Trained community volunteers to improve the sexual and reproductive health of adolescents. One young people coordinator was hired and trained in each city, and a center was opened which housed meetings and showed educational films. Multipliers were trained, including schoolteachers, service providers, peer promoters, and other adult community volunteers. Schools and clinics received a set of materials including a sex education training manual, seven videos, brochures, and pamphlets. YPP</p>	<p>Use of contraception: decreased**</p> <p>Age at first intercourse: no change</p> <p>Percent ever pregnant: no change</p> <p>Contraceptive awareness: no change</p> <p>Proportion of youth in a sexual relationship—Increased</p> <p>Reproductive Ideals</p> <p>Ideal number of children--Increased</p> <p>Ideal age at marriage--Increased</p> <p>Mean ideal age for having a first child--Decreased</p>	<p>Low</p> <p>Low</p> <p>Medium</p> <p>Low</p>

				<p>staff implemented many activities such as household visits, group talks, mass media communication, contraceptive distribution, etc. In one intervention group, a school-based component was also included.</p>		
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* sign. At 10%; **sign. At 5%; *** sign. At 1% (All other entries insignificant)

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