SOCIAL INFLUENCE AND CONTRACEPTIVE USE AMONG ADOLESCENT GIRLS AND YOUNG WOMEN IN MALAWI

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ABSTRACT

Nivedita Latha Bhushan: Social Influence and Contraceptive Use Among Adolescent Girls and Young Women in Malawi
(Under the direction of Edwin B. Fisher)

Background: In Malawi, 45% of adolescent girls and young women (AGYW) report their pregnancies as unintended or mistimed, yet uptake of modern contraception remains low. Adolescence and young-adulthood are periods when individuals begin to make health-related decisions independently but are still largely influenced by those around them. Understanding how social interactions impact AGYW contraceptive use might explain low levels of contraceptive uptake beyond individual and environmental factors and guide effective strategies to engage AGYW and their social networks in reproductive health interventions.

Methods: Two studies were conducted using data from *Girl Power (GP)*, a one-year intervention for sexually active AGYW (age 15-24) in Malawi. Study one used cross-sectional analyses to examine whether contraceptive communication and social norms (descriptive and injunctive) were associated with contraceptive outcomes and how associations differed by source of social influence, marital status, and parity (N=942). Study two used longitudinal mediation analyses to examine whether exposure to *GP*, and to contraceptive-specific empowerment sessions within *GP*, was associated with contraceptive outcomes and whether associations were mediated by contraceptive communication (N=517).

Results: In study one, contraceptive communication and descriptive norms were associated with non-barrier contraceptive use. However, associations differed across sources of social influence, marital status, and parity. Contraceptive communication with partners was important for all; communication with peers was important for single AGYW, regardless of parity; and communication with older women in the family was important for single, childless AGYW. Descriptive social norms were important for single

AGYW, regardless of parity. There was no association among contraceptive communication, social norms, and condom use. In study two, exposure to contraceptive-specific empowerment sessions was positively associated with non-barrier contraceptive use and the relationship was mediated by contraceptive communication with partners. Exposure to contraceptive-specific empowerment sessions was also positively associated with condom use but the relationship was not mediated by contraceptive communication with any source.

Conclusions: These findings inform reproductive health interventions situated in sub-Saharan Africa by highlighting the variation in sources of social influence for AGYW non-barrier contraceptive use. Interventions for AGYW that encourage contraceptive communication in general, but especially with partners, have the potential to increase non-barrier contraceptive use.

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LIST OF ABBREVIATIONS

AGYW	Adolescent Girls and Young Women
aOR	Adjusted Odds Ratio
CI	Confidence Interval
GPM	Girl Power – Malawi
HICs	High-Income Countries
HIV	Human Immunodeficiency Virus
IQR	Interquartile Range
IUD	Intrauterine Device
LMICs	Low and Middle-Income Countries
ODK	Open Data Kit
SDGs	Sustainable Development Goals
SES	Socio-Economic Status
SSA	sub-Saharan Africa
YFHS	Youth Friendly Health Services

CHAPTER 1: INTRODUCTION

1.1 Statement of the Problem

Each year, approximately 90% of births among adolescent girls and young women (AGYW) occur in low and middle-income countries (LMICs). Births among this population are much more likely to be either unwanted at the time of pregnancy or at any time in the future.[1] Furthermore, complications from pregnancy and childbirth are the leading cause of death for adolescent girls (age 15-19) and the second leading cause of death for young women (age 20-24) in LMICs.[2] Decreasing maternal mortality among AGYW in LMICs is a significant public health issue that needs to be addressed. In 2005, the World Health Organization stated that the provision of adequate family planning is the principal strategy by which to reduce pregnancy-related mortality and morbidity.[3,4] In addition, family planning has been found to be a key approach for countries to achieve Sustainable Development Goals (SDGs) related to health and economic well-being.[5,6] Despite these benefits and high rates of unintended pregnancy, contraceptive use among AGYW in LMICs remains low, particularly in Malawi and the sub-Saharan Africa (SSA) region at large.[7,8] Effectively intervening with AGYW in Malawi to prevent unintended pregnancy thus requires an in-depth understanding of the determinants of contraceptive use as well as the mechanisms through which reproductive health programs might increase contraceptive use.

Determinants of Contraceptive Use

Studies have found that individual-level determinants, such as sociodemographic factors and health beliefs, and societal-level determinants, such as healthcare access and public policies, are important predictors of AGYW contraceptive use in Malawi.[9–14] Less is known about the impact of interpersonal-level determinants, such as the influence of social network members on contraceptive use. Filling this gap in the literature is particularly important for AGYW given their stage in life. Adolescence marks a developmental period when individuals begin to make sexual and reproductive health decisions

independently but are still largely influenced by those around them. Understanding how interactions with social network members impact AGYW contraceptive use, and what type of social network members might be particularly influential, could help to explain low levels of contraceptive use beyond individual and societal level factors. Furthermore, it would provide evidence to develop appropriate and effective strategies to engage AGYW in reproductive health services to prevent unintended pregnancies.

Existing evidence for the association between social influence and AGYW contraceptive use varies across high-income countries (HICs) and LMICs, In HICs, there is an abundance of quantitative and qualitative literature demonstrating that adolescent contraceptive behavior is strongly related to contraceptive social norms and contraceptive communication with social network actors (family members, peers, and intimate partners). In LMICs, there is strong evidence to suggest that AGYW who discuss reproductive health issues and contraception with their intimate partners are more likely to use contraceptives.[15–20] Studies examining the influence of family/peer based contraceptive communication and contraceptive social norms on AGYW contraceptive use in LMICs are few and those that exist are largely qualitative with mixed findings. To our knowledge, no studies have quantitatively examined the association between social influence factors and AGYW contraceptive use across family members, peers, and intimate partners. Nor have any studies examined whether the interactions among social influence factors are associated with AGYW contraceptive use.

Interventions to Increase Contraceptive Use

Programs to increase AGYW contraceptive use in SSA have been implemented across multiple levels (societal, interpersonal, individual) through interventions that use a combination of supply-side oriented strategies and demand-generating strategies. Supply-oriented strategies include increasing access to contraceptives by reducing costs and providing integrated, client-centered services. Strategies to generate demand often include financial-based mechanisms, mass media campaigns, and programs utilizing interpersonal communication. Existing evidence from reproductive health programs in SSA suggest that a combination of supply-oriented and demand generating strategies have been utilized. Mass media campaigns, community-based interventions, and finance-based incentives have had positive effects

on increasing AGYW contraceptive use.[21–34] However, limited data are available on the components of these interventions, and related intervening variables, which are responsible for their effectiveness. For example, among the above cited studies, many measured the impact of their intervention on contraceptive knowledge, attitudes, self-efficacy, interpersonal communication, perceived barriers, and perceived social norms.[21–34] Yet, none examined whether these variables were the pathways through which intervention components increased contraceptive uptake, often citing cross-sectional design as a limitation. Identifying the pathways through which intervention components work is key to developing effective family planning programs for AGYW in the future.

One such pathway is interpersonal communication, which theoretical perspectives suggest is one of the mechanisms through which social network members reinforce norms for adolescent health behaviors. In SSA, few studies have examined the impact of the interpersonal communication on AGYW contraceptive use. Available evidence suggests that parent-adolescent communication about reproductive health is not very common.[35,36] Similarly, studies examining the association between peer- based reproductive health conversations and AGYW contraceptive use are few and those that exist have reported mixed results.[37–40] Contrary to studies examining the influence of parent and peer communication, there is strong evidence for the relationship between intimate partner contraceptive communication and AGYW contraceptive use. AGYW who discuss reproductive health topics with their intimate partners are more likely to use contraceptives compared to AGYW who do not discuss reproductive health topics with their intimate partners.[53–55]

In sum, there is some evidence to suggest that contraceptive related interpersonal communication positively impacts AGYW contraceptive use in SSA. Similarly, studies reporting on existing family planning interventions in the region have found a positive effect on contraceptive related interpersonal communication as well as AGYW contraceptive use. However, none have longitudinally examined the extent to which the relationship between exposure to family planning interventions and AGYW contraceptive use is mediated by contraceptive related interpersonal communication.

1.2 Objectives of the Dissertation

The broad goal of this dissertation was to address the above-mentioned gaps in the literature by better understanding how social influence factors are associated with AGYW contraceptive use and the mechanisms through which exposure to components of a reproductive health intervention impacts AGYW contraceptive use. The specific aims are:

Aim 1: Examine whether social influence factors (communication, descriptive social norms, injunctive social norms) are associated with AGYW contraceptive use (non-barrier methods and condoms) and the degree to which the association differs by source of social influence, marital status, and parity

Aim 2: Examine the extent to which the relationship of 1) exposure to a reproductive health intervention designed to increase AGYW contraceptive use and 2) exposure to empowerment sessions designed to increase contraceptive communication with contraceptive use (non-barrier methods and condoms) is mediated by contraceptive communication and whether the mediation relationship differs by source of communication, marital status, and parity

To address both aims, I analyzed quantitative data from Girl Power – Malawi (GPM). GPM was a quasi-experimental cohort study which assessed the impact of a multi arm sexual and reproductive health intervention on care-seeking and sexual risk behaviors among AGYW. GPM compared a standard of care clinic to three clinics which provided a combination of youth friendly health services (YFHS), empowerment sessions, and conditional cash transfers.

1.3 Organization of the Dissertation

This dissertation is composed of two scientific papers, plus additional chapters that provide an overview of the issues and summarize the contribution of this research to the literature. Chapter Two provides epidemiological background on pregnancy and contraceptive use and reviews existing interventions to increase contraceptive use among AGYW in LMICs and in Malawi. Chapter Three

describes the study's theoretical overview and presents the research questions for the study. Chapters Four and Five present the results of the study, in the format of two manuscripts. Chapter Six provides final conclusions and presents suggestions for future work.

CHAPTER 2: BACKGROUND

In order to understand the context for the study, this chapter 1) provides epidemiological background on pregnancy and contraceptive use among AGYW in LMICs and in Malawi 2) reviews existing interventions to increase contraceptive use among AGYW in LMICs and in Malawi and 3) details the gaps in the literature.

2.1 Pregnancy, Unmet Need, and Contraceptive Use among AGYW in LMICs

Approximately 58 million AGYW (age 15-24) give birth each year, accounting for 41% of births worldwide. Ninety percent of births among this age group occur in LMICs, with wide regional differences.[44] Births to AGYW are much more likely to be either unwanted at the time of pregnancy or at any time in the future when compared to older women.[1]

Childbearing and childbirth carry inherent health risks for all women and these risks are higher for AGYW and in the context of unintended pregnancy. Studies have found that AGYW are at increased risk of several direct causes of maternal mortality such as complications during pregnancy (hypertensive disorders, eclampsia, etc.), difficulties at the time of delivery (hemorrhaging, obstructed labor etc.), and other comorbidities (malaria, HIV, etc.).[45] In LMICs, these risks are amplified due to poverty, malnutrition, and lack of adequate healthcare.[1] A common outcome of AGYW unintended pregnancy is unsafe abortion, which accounts for 13% of all maternal deaths and is the leading source of maternal morbidity worldwide for women of all reproductive ages. Compared with HICs, the burden per 1000 unsafe abortions is six times higher in SSA and four times higher in Asia.[46] Risks associated with abortion are particularly prevalent in LMICs where the practice is often illegal, or where abortion service provision and care does not exist.[47]

In addition to the risks to AGYW's health, children born of unintended pregnancies are more susceptible to adverse health and developmental issues.[48] Studies have found that infants of unintended

pregnancy in LMICs are at greater risk of being born prematurely or underweight, which decreases their chances of short term survival and has major implications for long-term development. Children born of unintended or unwanted pregnancy are more likely to die in their first year, to be weaned from breastfeeding prematurely, and to experience stunting or wasting. The children are also more likely to be deprived of resources such as food, clothing, health care, and education.[49] These outcomes have been attributed to maternal engagement in risky behaviors, poor maternal healthcare during pregnancy, and increased risk of both intentional and unintentional maternal neglect after birth.[48,50,51]

Beyond immediate health consequences, unintended pregnancies can also limit the financial, educational, social, and political resources of AGYW. Unintended pregnancies often result in AGYW having a higher number of births over their lifetime which makes them less likely to complete their education, to participate in the labor force, and to have high levels of income.[52] In addition to the effects on AGYW's individual socioeconomic status, health care costs associated with complications due to pregnancy and birth can strain families with limited resources. In many LMICs, where resources for national healthcare are low, high fertility can further burden fragile health systems.[52–55]

In 2005, the World Health Organization stated that the provision of adequate family planning is the principal means by which to reduce mortality and morbidity related to pregnancy for women of all reproductive ages.[3] Furthermore, family planning has been found to be a key approach for countries to achieve Sustainable Development Goals (SDGs).[5,6] Family planning allows women to attain their desired number of children, determine the spacing of pregnancies, and is achieved through the use of traditional and modern contraceptive methods.[55] Traditional contraceptive methods include the rhythm method and withdrawal. Modern contraceptive methods include pills, implants, injectables, patches, intrauterine devices, condoms, sterilization, lactation amenorrhea, and tracking changes in fertile periods[55]. Amongst LMIC regions, use of modern methods by married AGYW is the highest in Latin America and the Caribbean (averaging 47.8%) and the lowest in SSA (averaging 19.85%). Use of modern methods amongst unmarried AGYW follows a similar pattern, it is the highest in Latin America and the Caribbean (averaging 56.5%) and the lowest in SSA (averaging 38.5%).[7] In an analysis of AGYW across 40 LMICs,

one report found male condoms and injectable methods to be the most commonly used modern contraceptives.[56]

Over the past 25 years, global modern contraceptive use among women aged 15-49 increased from 54% in 1990 to 57.4% in 2015. In LMICs, the proportion of women using contraception increased from 10% to 60% in the same time period. However, there is significant variation in gains by geographic region, age, and marital status.[57] Countries in Asia (61.8%) and Latin America (66.7%) have seen the greatest increases in contraceptive use while those in the SSA region continue to remain low (28.5%). Among all AGYW in LMICs, 31% use contraception but the proportion of use varies by both age and marital status.[58,59] Contraceptive use among married AGYW is highest in Latin America and the Caribbean, where 50% of married AGYW aged 15-19 use contraception and 62% of married AGYW aged 20-24 use contraception. In both SSA and Asia, contraceptive use among married AGYW aged 15-19 is considerably lower, at 12% and 20%, respectively. In both regions, contraceptive prevalence nearly doubles by age 20-24, to reach 24% in SSA and 38% in Asia. Amongst unmarried, sexually active AGYW in LMICs, 10% of those aged 15-19 and 27% of those aged 20-24 use contraception, respectively.[60]

A common way of conceptualizing the impact of underutilization of contraception is to use a measure of unmet need for family planning. Unmet need for family planning takes a variety of forms in the literature, but is most often defined as the proportion of sexually active women who wish to delay or stop childbearing but are not using a modern contraceptive.[61,62] It is estimated that 33 million AGYW in LMICs, aged 15-24 have an unmet need for contraception.[7] Globally, unmet need for family planning is higher, on average, among unmarried AGYW than among married AGYW. Across LMIC regions, unmet need for family planning for married AGYW is the highest in SSA (27.4%) and the lowest in the Middle East and North Africa (10.8%). Amongst unmarried AGYW, unmet need for family planning is the highest in SSA (40.1%) and the lowest in Asia (19.3%).[7]

2.2 Determinants of Contraceptive Use among AGYW in LMICs

Contraceptive use among AGYW in LMICs has been shown to be associated with a number of individual, interpersonal, and environmental level factors.

Individual factors are personal attributes, attitudes, beliefs, or knowledge that influence behavior. Attributes such as age, rural-urban residence, education, income, employment, women's status, and marital status have also been shown to have an effect on contraceptive uptake. AGYW in LMICs above the age of 20 are more likely to use and continue to use contraceptives than those under the age of 20. Urban residence as well as higher education, income, and consistent employment are all associated with increased use of modern contraceptives. Some studies have shown that a measure of a AGYW's status (or empowerment) - often derived from variables such as education, income and decision making power - is associated with contraceptive use, such that AGYW with higher status have higher use of contraceptives than AGYW with lower status.[63] Contraceptive use among unmarried AGYW is lower than contraceptive use among married AGYW.[56,59] Health related individual level factors, such as birth parity and knowledge of contraceptives, have also been shown to be important determinants of contraceptive use among AGYW in LMICs. Studies indicate that AGYW contraceptive use generally increases with the number of live births as well as with greater information about contraceptive functionality, availability, and use.[56,64,65] Some studies have found that misconceptions about the immediate and long-term side effects of contraceptive methods on health and fertility are associated with decreased contraceptive use.[65]

Interpersonal Factors. Interpersonal influences on behavior are the product of interactions with an individual's informal or formal social network.[66] Two interpersonal factors have been consistently reported to be associated with AGYW contraceptive use in LMICs: discussing family planning with an intimate partner and intimate partner approval for family planning.[67–69] Beyond these two factors, there is limited quantitative evidence on the relationship between interpersonal factors and contraceptive use among AGYW in LMICs. Studies examining the association between interpersonal factors and contraceptive use have been largely conducted among AGYW in HICs or among married, adult women in

LMICs. In HICs, social support and reproductive health communication have both been found to be positively associated with AGYW contraceptive use. Studies of sexually active college-age women in the United States have found that while friends and partners were identified as equally supportive, only partner related social support is related to contraceptive use. [70] In addition, AGYW in HICs who discuss reproductive health with parents and intimate partners are much more likely to use contraceptives than those who do not. [71–73] Among married, adult women in LMICs, there is evidence that social capital, social support, social influence, and communication are associated with contraceptive use. Two studies in Uganda found that greater perceptions of individual social capital were a significant predictor of family planning behavior and condom use among adult women.[74,75] One study in rural Mali found a significant positive association between the size of a woman's material social support networks and contraceptive use.[76] In addition, knowing and perceiving that other female social network members use contraception has been associated with contraceptive use among women in Bangladesh, Kenya, Cameroon, and Mali.[76–79] There is also an abundance of evidence that discussing family planning with intimate partner and female peers has a positive impact on contraceptive use among women in LMICs.[6,37]

Environmental Factors. Across LMICs, the most common environmental-level factors influencing contraceptive use are accessibility, availability, and affordability of modern contraceptive methods. These factors are often dictated by the broader political context of reproductive health. Specifically, political support for reproductive health has the potential to impact contraceptive use through financial investments into the reproductive health environment as well as laws and policies that promote universal access for women and girls. However, across many LMICs, AGYW find that their utilization of contraceptives is limited by distance to health clinics, prohibitively high pricing of contraceptives, as well as laws and policies that prevent provision of contraceptives to younger or unmarried adolescents.[64,65]

2.3 Pregnancy, Unmet Need, and Contraceptive Use among AGYW in Malawi

Similar to other LMICs, AGYW in Malawi experience early, unprotected sexual activity, placing them at high risk for unintended pregnancy.[82] Approximately 60% have had sex by age 18, 50% have had

one child by age 19, and greater than 45% report their pregnancies as unintended or mistimed.[8] Contraceptive use is low and unmet need continues to be high. The prevalence rate of modern contraceptive use is 15.2% for AGYW age 15-19 and 46.1% for AGYW aged 20-24, compared to 45.2% for all women aged 15-49. Contraceptive use among AGYW in Malawi varies by marital status. Approximately 40.1% of unmarried AGYW utilize modern contraceptives compared to 46.2% of married AGYW. In regard to unmet need, 31.0% of AGYW would like to have access to modern contraceptives but are unable to do so while 9.0% would have liked to have waited before having children but had no access to family methods.[8]

Amongst AGYW aged 15-19, the most commonly used modern contraceptive method are hormonal injectables (9.1%), followed by male condoms (3.7%), hormonal implants (1.7%), hormonal birth control pills (0.4%), and intrauterine devices (0.3%). Amongst AGYW aged 20-24, the most commonly used modern contraceptive method are also hormonal injectables (29.7%), followed by hormonal implants (10.6%), male condoms (2.9%), hormonal birth control pills (1.7%), and intrauterine devices (0.7%). Type of modern contraceptive utilized also differs by marital status. Amongst married AGYW aged 15-19, the most commonly used modern contraceptive method are hormonal injectables (28.2%), followed by hormonal implants (5.1%), male condoms (2.2%), birth hormonal birth control pills (1.2%), and intrauterine devices (0.3%). Amongst married AGYW aged 20-24, the most commonly used modern contraceptive method are hormonal injectables (37.5%), followed by hormonal implants (12.3%), birth hormonal birth control pills (2.0%), male condoms (1.7%), and intrauterine devices (0.9%). Among sexually active, unmarried AGYW aged 15-19 the most commonly used modern contraceptive method was male condoms (21.3%) followed by hormonal injectables (7.6%), hormonal implants (1.3%), hormonal birth control pills (1.0%), and intrauterine devices (0.8%). Among sexually active, unmarried AGYW aged 20-24 the most commonly used modern contraceptive method was hormonal injectables (16.1%) followed by male condoms (15.7%), hormonal implants (9.2%), hormonal birth control pills (2.0%), and intrauterine devices (0.2%).[8]

2.4 Determinants of Contraceptive Use among AGYW in Malawi

Documentation of the individual, interpersonal, and societal determinants of contraceptive use in Malawi have been largely amongst married women of all reproductive ages (15-49) and rarely for AGYW or single AGYW. The following sections present information for women of all reproductive ages (15-49).

Individual Factors Individual-level determinants of contraceptive use in Malawi amongst married women are largely analogous to determinants of contraceptive use among AGYW in LMICs. Older, married women are more likely to use and continue to use contraceptives than unmarried, single women.[8,83] Higher education, income, and consistent employment are also all associated with increased use of contraception.[8,83–85] Similarly, contraceptive use amongst women in Malawi increases with the number of live births they experience as well as with higher levels of contraceptive knowledge.[8,84–87] An often cited determinant of contraceptive use in Malawi is beliefs and misconceptions about contraceptive side effects. Women's beliefs about how contraceptives might impact their fertility, relationships with partners, and ability to use contraception discreetly have been found to be significant barriers to contraceptive use.[86,87]

Interpersonal Factors. At the interpersonal level, studies among married Malawian women have found that intimate partners, cultural context, and religiosity influence contraceptive decision making. Although contraceptive methods and services are directed toward women, male partners are often the primary decision makers about family size and family planning. Conversations with male partners about family planning, as well as perceptions of partner approval for family planning, have been associated with uptake of family planning methods in Malawi. The absence of family planning conversations has been associated with perceptions of male partner opposition to family planning, covert use of family planning methods, and low uptake of family planning methods.[8,83,84,86–91] Studies have also found that contraceptive related conversations with older adults, such as parents, teachers, and health workers, are limited. Parents and teachers indicate that they do not feel comfortable discussing sexuality with their children and students because they feel ashamed to discuss a taboo topic.[44,47,49] Malawian culture is imbued with social norms related to who should utilize contraceptives, when contraceptives should be utilized, and how

contraceptives are related to fertility. Specifically, married young women are expected to prove their fertility, contraceptive use is promoted for older women who have proven their fertility, and it is suggested that early use of contraceptives will lead to infertility.[87,92] Qualitative studies have found that contraceptive norms are reinforced through women's social networks and religious socialization. This includes belonging to specific denominations as well the intensity and volume of religious activity.[12,83,84,93]

Societal Factors. In 1987, rapid population growth combined with an intense food crisis prompted the Malawian Government to implement a nation-wide child spacing policy. The policy mandated government health facilities offer free family planning services to both Malawian men and women. However, Malawian women still face numerous barriers in accessing consistent, quality family planning services. First, many women live far from health facilities and lack the time or transportation money to travel for care. Second, high patient volume at health facilities and frequent stock out of contraception prohibit women from seeing providers as well as initiating or continuing family planning.[8,83,87,94] Third, women (particularly young women) report that health providers often refuse to provide family planning services to unmarried women who have never give birth.[84,87,91,92,94] Some studies note that initial government framing of contraceptive methods as a way to protect maternal and child health are at odds with sexual practices in Malawi. Specifically, the pattern of sexual relations has been changing from one in which sex occurs as part of a process of marriage and contribution to family and kinship to one in which sex has become an aspect of individual procreation, pleasure, and gratification.[89,91,93] Providers often associate contraceptives, particularly condoms, with pre-marital or extra-marital sex and frown upon young, unmarried women seeking family planning services.[91]

2.5 Interventions to Increase Contraceptive Uptake among AGYW in LMICs

Programs to promote family planning in LMICs began in the 1960s due to rapid population growth following improvements in child survival.[57] Programs have been implemented across multiple levels (societal, interpersonal, individual) and have been largely categorized as either supply-side oriented interventions or demand-generating interventions. Supply-oriented strategies include increasing access to contraceptives by

reducing costs and providing integrated, client-centered services. Strategies to generate demand often include financial mechanisms (cash transfer, microfinance, etc.), mass media campaigns (radio, television, and print publications), and programs based on interpersonal communication (counseling, education sessions, home visits, etc.).[95,96] This section will focus on demand generating interventions given our research questions of interest.

Finance-Based. Finance-based interventions aim to influence fertility related decisions (e.g contraceptive use, number of children, birth spacing, etc.) by reducing income related barriers to health care utilization. To date, no finance-based interventions to increase contraceptive use have exclusively focused on AGYW in LMICs. Thus, this section describes finance-based interventions that include women of all reproductive ages (15-49) in LMICs. The impact of finance-based interventions on contraceptive use varies by intervention type as well as geographic region.[97–99] Finance-based interventions have employed community-based health insurance, microfinance approaches, as well as conditional and unconditional cash transfer strategies to improve reproductive health. Microfinance is a general term to describe financial services, such as loans, savings, and insurance, for those who lack access to traditional banking.[100] Cash transfer programs comprise of small grants to qualifying families or individuals which are called conditional when receipt of the grant is made contingent upon involvement in specified activities. Interventions in Latin America have used both cash transfers and microfinance approaches. Two studies evaluating the PROGRESA/Oportunidades cash transfer program in Mexico found no association between program exposure and contraceptive use among girls aged 15-19.[101,102] Similarly, results from Nicaragua's Social Protection Network cash transfer program revealed no association between program exposure and contraceptive use, though the analysis included women of all reproductive ages (15-49).[103] Another study in Nicaragua examined the impact of community-based health insurance provision on contraceptive use and found no significant effect among AGYW.[104] Programs based in SSA have used microfinance approaches as well as cash transfer strategies to improve reproductive health. Mainthia et. al. found that women (age 15-49) exposed to a microfinance program in Kenya reported an increase in contraceptive use at two-year follow up.[33] Conversely, Desai et.al. found that the provision of community–based insurance slightly decreased contraceptive use in a study of

reproductive aged women (age 15-49) in Ethiopia.[105] Among reproductive health related cash transfer programs in SSA, only one has published results related to contraceptive use.[106–109] Palermo et. al found a net increase in contraceptive use among women (age 15-49) who were exposed to the Zambia's Child Grant Program, which provides an unconditional monthly grant to qualifying households.[34] Two studies in Asia (Bangladesh and Indonesia) used microfinance strategies to improve reproductive health. However, neither study reported a significant increase in contraceptive use among women (age 15-49) involved in the microfinance programs.[110,111]

Mass Media Mass media campaigns aim to increase contraceptive use by making family planning utilization more socially acceptable through the provision of information for decision making and by encouraging discussion among social network members.[112] Interventions have utilized radio, television, and print media to broadcast and publish dramas, skits, and advertisements that address culturally sensitive issues, such as reproductive health and sexuality, in entertaining ways. In LMICs, interventions targeting AGYW contraceptive use have largely utilized mass media in combination with other approaches, such as interpersonal communication and social marketing. The positive impact of mass media-based interventions on AGYW contraceptive use has been demonstrated across all LMIC regions. In SSA, studies have found a positive association between exposure to multicomponent mass media programs and contraceptive use among AGYW in Zimbabwe, Guinea, Malawi, Cameroon, South Africa, Botswana, Nigeria, Tanzania, and Burkina Faso.[21–30] In Asia, published results related to the influence of mass media campaigns on contraceptive use have been among married women of all reproductive ages (15-49).Researchers have found an increase in contraceptive use among women exposed to multicomponent mass media campaigns in Bangladesh, Nepal, Pakistan, Philippines, India, Kyrgyzstan, and Tajikistan.[113–118] Similarly, published results from interventions utilizing multicomponent mass media approaches in Latin America and the Caribbean have been among married women of all reproductive ages (15-49) but have reported an increase in contraceptive use following intervention exposure.[119,120]

Interpersonal Communication Interpersonal communication interventions aim to increase contraceptive use through the provision of information and support. There is an abundance of both peer-

reviewed and grey literature examining the impact of interpersonal communication interventions on AGYW contraceptive use in LMICs. In their review of effective family planning interventions, Mwaikambo et al. categorized interpersonal communication interventions into three categories: peer-led, facilitator/instructor-led, and community based.[95] Peer educators are often volunteers who typically provide individual and group counseling about sexual and reproductive topics as well as referrals to health services. Interventions utilizing peer educators have occurred in SSA and Asia but report mixed results on both contraceptive use (hormonal methods + condoms) and only condom use, regardless of LMIC region.[121–130] Instructors/facilitators are often health care providers or health counselors who conduct individual or group counseling sessions both in-school and out of school.[95,131] Similar to peer-led interventions, there is mixed evidence for the impact of facilitator/instructor-led interventions on both AGYW contraceptive use (non-barrier methods + condoms) and only condom use. However, the majority of facilitator/instructor-led interventions have occurred in the Caribbean and Latin America.[132–139] Community based interventions aim to foster a more supportive social environment for AGYW by raising awareness among community members, parents, and leaders about sexual and reproductive health issues.[95,131] The majority of community based interventions have occurred in SSA or Asia and report positive impacts on both AGYW contraceptive use (non-barrier method + condoms) and only condom use.[32,140–144]

Effective Interventions in SSA Taken together, evidence from interventions using demand generating strategies in SSA suggest that mass media campaigns, community-based programs, and finance-based strategies can have positive effects on AGYW contraceptive use.[21–34] Studies evaluating the impact of peer-led and facilitator/instructor-led interventions in SSA have found mixed results in relation to AGYW contraceptive use.[121,123,125,126,131,145] However, limited data are available on the components of facilitator/instructor-led interventions which contributed to their findings. Among the previously cited effective studies, many measured the impact of their intervention on contraceptive knowledge, attitudes, and self-efficacy, communication, perceived barriers, and perceived social norms.[21–34] Yet, no study quantitatively examined whether these intervening variables were responsible for program impact, often citing cross-sectional design as a limitation.

Identifying the indirect effects of program components on AGYW contraceptive use is important and can be used to develop, adapt, and tailor future family planning interventions.

2.6 Interventions to Increase Contraceptive Uptake among AGYW in Malawi

Documentation of interventions to increase AGYW contraceptive use in Malawi is limited. In the category of finance-based interventions, existing cash transfer and microfinance programs have only reported a reduction in AGYW pregnancy among program beneficiaries. None have published results related to AGYW contraceptive use.[146–149] In the category of mass media campaigns, Meekers et al. reported a positive association between ever condom use and radio program exposure among women age 15-49.[27] In the category of interpersonal interventions, there is evidence of increased contraceptive uptake as a result of a peer-led program and as a result of an instructor/facilitator based program. Shattuck et. al found that contraceptive use increased significantly among adult women after male partners were counseled on family planning and reproductive health topics.[18] Lemani et al. found a positive association between dual contraceptive use (non-barrier method and condoms) and exposure to couple's family planning counseling among adult women.[150] Similar to other studies in SSA, existing studies in Malawi measured intervention impact on intervening variables such as contraceptive knowledge, attitudes, social norms, and interpersonal communication.[18,27,150] However, no studies evaluated the indirect effects of intervention components on AGYW contraceptive use.

2.7 Gaps in AGYW Contraceptive Literature

First, there is limited information about interpersonal determinants of contraceptive use among young, unmarried women both in LMICs, as well as in Malawi. Existing studies are largely amongst AGYW in HICs or amongst married women of reproductive age in LMICs. Second, little attention has been given to the influence of social network members beyond intimate partners on contraceptive use. Specifically, there are few studies in LMICs that have examined how interactions with peers and older women in the family impact AGYW contraceptive use. Furthermore, no studies have compared or contrasted the influence of these three actors (partners, peers, and older women) on contraceptive use. Third, existing studies on the relationship between interpersonal determinants and contraceptive use are

largely cross-sectional or qualitative in nature. Longitudinal research examining how interpersonal factors influence AGYW contraceptive use is warranted. Fourth, the mechanisms through which family planning programs impact contraceptive use is largely unexamined in LMICs, as well in Malawi. Few intervention studies utilized mediation analyses to examine the link between exposure to program components and AGYW contraceptive use.

CHAPTER 3: THEORTICAL FRAMEWORK & CONCEPTUAL MODEL

The previous chapter serves as a background and rationale for the study and provides a review of the empirical research on AGYW contraceptive use and family planning interventions in LMICs and Malawi. This chapter describes the theoretical framework, presents a conceptual model, and states the research questions, specific aims, and hypotheses for the dissertation.

3.1 Health Development Frameworks and Primary Socialization Theory

According to the Life Course Health Development Framework and the Health Socialization Framework, there are sensitive periods in an individual's life during which ecological factors have a more profound effect on norms, attitudes, and behaviors that shape health trajectories over a lifetime.[151,152] Adolescence has been identified as one of these sensitive periods. The transition to adulthood often includes biological and psychological change, a rapid expansion in social relationships and responsibilities, and a gradual increase in overall independence.[153] It is also during this period that individuals first engage in risky behaviors (e.g. smoking, drinking, driving, sex, etc.) that have the potential to impact their health well into adulthood.[154] Both frameworks suggest that it is possible to alter the course of health development by changing health behaviors during sensitive periods and that the longer individuals stay on a specific trajectory (either positive or negative) the harder it is to draw them away from it.[155–157]

Primary Socialization Theory posits, and quantitative studies have found, that adolescent decision-making around risky behaviors is particularly susceptible to social influence. In HICs, sources of social influence often transition from parents during childhood to peers during adolescence.[153] In LMICs, young people experience disengagement from parental homes, education termination, marriage, parenthood, and economic responsibility much earlier in life than their HICs counterparts.[158,159] The occurrence and timing of these life events have implications for the composition of LMIC adolescent

social networks and the strength of social network members' influence on adolescent health behaviors.[160]

Taken together, these conceptual perspectives underscore the importance of examining the impact of social influence factors on adolescent health behaviors and engaging individuals in health promoting interventions during adolescence.

3.2 Social Influence Factors

Theories regarding social networks describe social influence as the effect social network members have on an individual's attitudes and behaviors.[161–164] Social influence can be implicit or explicit and does not have to be deliberate or conscious. Two main social influence factors are social norms and communication. Communication among social network members creates norms for behavior and frames the social rewards for following norms and repercussions for violating norms.[165]

Social Norms

Social norms have largely been categorized as collective or perceived.[166] Collective norms operate at the societal level and function as codes of conduct that govern behaviors of individual community members. Perceived norms operate at the individual level and consist of an individual's perception of prevailing collective norms. There are two main types of perceived norms, injunctive and descriptive. Injunctive norms refer to the perceptions about what behaviors are expected from an individual. Descriptive norms refer to perceptions of what other social network members are doing, even if the perception is speculation. In cases where behavior is public (i.e. smoking, alcohol consumption) injunctive norms and descriptive norms have proven to be congruent. In cases where the behavior of interest is not easily observable (i.e. contraceptive use) injunctive norms have proven to be more influential.[166]

The general construct of social norms is prominent across theories that are used to design research as well as explain and predict individual engagement in health behaviors and health promoting interventions. For example, the Theory of Planned Behavior includes subjective social norms as a determinant of behavioral intention, where subjective social norms refer to an individual's perception of social pressures to act in a particular way.[167] Social Cognitive Theory suggests that observational and

experiential learning give rise to social norms about expected behavior.[168] Social Identity Theory and Social Exchange Theory posit that social norms are adopted to facilitate favorable interactions and remain in good social standing, which then leads to conformity in behavior between individuals and social network members.[169,170] The Theory of Normative Social Behavior suggests that the influence of descriptive norms on behavior is moderated by injunctive norms[171]. In social network related theories, social norms are shaped by information communicated among social network members.[162] Taken together, these theories emphasize that individual behavior is shaped by norms that are created and reinforced during social interactions.

The impact of social norms on behavior has been found to vary by type of source norms, source of social norms, and the context in which social norms are first developed or perceived.[172] Interactions with weak social ties have the potential to greatly facilitate the diffusion of normative information. Discussion with close social ties diminishes the strength of norms related uncertainty about behaviors.[173,174] Other studies suggest that individuals initially form perceptions of group norms through group settings, then conform to these norms even when separated from the group.[166,172]

Communication

Communication has been proposed as one of the key mechanisms through which social networks inform the development of normative perceptions that influence behavior. Interpersonal communication can be both observational and verbal. In observational communication, social network members serve as role models. Seeing how role models act can introduce a new idea or behavior, increase or decrease the frequency of a behavior, or impact behaviors that are similar, but not identical to, the ones being modeled.[168,175] In verbal communication, individuals are not only exposed to new ideas and behaviors but also have the opportunity to engage in the exchange of thoughts, feelings, and information with social network members. Together, observational and verbal communication provide individuals with the opportunity to learn from other's experiences engaging in a behavior, evaluate the appropriateness of the behavior for their own situation, and assess whether social norms favor engaging in the behavior.[172,176]

Studies have found that communication among social network members serves to both disseminate health information and reinforce either risk-taking or health-promoting behavior as socially normative. However, the association between health-related interpersonal communication and health behaviors has been found to vary by the source of communication and type of health outcome. In addition, the occurrence and influence of conversations with different social network members (e.g. family members, peers, and intimate partners) varies across the life course and by context[153,176].

3.3 Social Influence Factors and AGYW Contraceptive Use

Social Norms

Evidence for the relationship between social norms and adolescent contraceptive use varies by socio-economic context and research methodology. In HICs, there is an abundance of both quantitative and qualitative literature demonstrating that adolescent contraceptive behavior is strongly related to the social norms of individuals in their social network (family members, peers, and romantic partners).[177] However, studies examining the association between social norms and contraceptive use among adolescents in LMICs are limited and have been largely qualitative in nature. In South Africa, MacPhail et.al found that older adolescents were more able to ignore social norms associating promiscuity and carrying condoms, as compared to younger adolescents[178]. In Malawi, Tanzania, Mali, and South Africa, adolescent girls described the existence of social norms related to who should utilize contraceptives, when contraceptives should be utilized, and how contraceptives are related to fertility. Specifically, married young women are expected to prove their fertility, contraceptive use was promoted for older women who have proven their fertility, and it was suggested that early use of contraceptives would lead to infertility.[92,179–182] In Vietnam, as well as countries in SSA, accessing contraceptives constituted a public admission of having had sex and was linked to promiscuity and prostitution.[92,179–183]

Communication

Communication has been suggested as one of the mechanisms through which social network members reinforce norms for adolescent health behaviors. Health researchers have found that the occurrence of reproductive health conversations and their influence on contraceptive use varies by

conversation partner and by context. In SSA, available evidence suggests that parent-adolescent communication about reproductive health is not very common.[35,36] Similarly, few studies have documented the occurrence of peer based reproductive health conversations among AGYW in LMICs.[40,184]Among existing studies, evidence from Mexico reveals that AGYW who discuss reproductive and sexual health with their friends are more likely to use contraception. However, studies that have examined the association between reproductive health peer discussions and condom use have reported mixed results.[37–39] Contrary to studies examining communication with family members and peers, there is strong evidence for the relationship between intimate partner reproductive health conversations and AGYW contraceptive use in LMICs. AGYW who discuss reproductive health with their intimate partners are more likely to use contraceptives compared to AGYW who do not discuss reproductive health with their intimate partners.[53–55]

Gaps in the Literature

Few existing studies have examined the association between social influence factors (communication and social norms) and AGYW contraceptive use in LMICs and how the association differs by source of social influence, marital status, and parity. Examining variation by source of social influence is important because influential social ties change throughout life and have implications for health. For example, the most influential relationships in childhood (i.e. family members) are unlikely to be the most influential relationships in adulthood (e.g. intimate partners). Given that adolescents are transitioning between life stages and that many LMIC societies are family centric, identifying influential social ties is key for tailoring family planning interventions for AGYW in LMICs. Examining variation by marriage is important because it alters the context of reproductive decision making. Marriage represents an observable change in the composition of AGYW's social networks which expose individuals to the reproductive preferences of partners, husbands, and new family members, as well as new social role. Similarly, examining variation by parity is important given its inherent link to reproductive decision making as well as the documented existence of social norms surrounding fertility in many LMICs.

3.4 Issues for the Present Study

The second chapter in this dissertation demonstrated that previous research among AGYW in LMICs has largely concentrated on determinants of contraceptive use at the individual and societal level, while neglecting the interpersonal context. Focusing on the individual and societal level assumes that AGYW contraceptive use is solely a result of independent decision making and structural issues related to reproductive health. In reality however, contraceptive-related decisions are also informed by experiences and beliefs generated through membership in specific social networks and communities. Furthermore, few studies have examined whether interpersonal factors mediate the relationship between family planning interventions and adolescent contraceptive use. Taken together, this warrants further research about how the interpersonal context factors influence AGYW contraceptive use in LMICs and whether these factors can be modified through family planning interventions.

This chapter provides a theoretical basis for why the interpersonal context (i.e. social influence factors) matters for adolescent health behaviors (i.e. contraceptive use) and underscores the importance of engaging individuals in health promoting interventions during adolescence. Life Course Health Development and Health Socialization Frameworks suggest that adolescence is a developmental period when young people begin to make decisions independently and first engage in behaviors that shape health outcomes through life. Health trajectories are modifiable but interventions in early life stages have the potential to make a significant impact. Primary Socialization Theory suggests that adolescent decisions making about health behaviors is largely influenced by those around them. Sources of social influence often shift from family members to peers which modifies standards for health beliefs and behaviors. Early sexual activity and marriage in many LMICs also expose adolescents to the normative beliefs of partners and new family members. Theories regarding social networks describe social influence as the effect social network members have on an individual's attitudes and behaviors. Specifically, communication among social network members creates norms for behavior and frames the social rewards for following norms and repercussions for violating norms.

3.5 Research Questions, Specific Aims, and Hypotheses

Research Question 1: Are social influence factors associated with AGYW contraceptive use?

Aim 1: Examine whether social influence factors (communication, descriptive social norms, injunctive social norms) are associated with AGYW contraceptive use (non-barrier methods and condoms) and the degree to which the association differs by source of social influence, marital status, and parity

Hypothesis 1a. Contraceptive communication with older women in the family, peers, and intimate partners will be positively associated with contraceptive use among AGYW

Hypothesis 1b. Social norms (descriptive and injunctive) related to older women in the family and peers to will be positively associated with contraceptive use among AGYW

Hypothesis 1c. Contraceptive communication will interact with social norms (descriptive and injunctive) to positively influence contraceptive use among AGYW

Research Question 2: Can reproductive health interventions increase contraceptive use by encouraging contraceptive communication?

Aim 2: Examine the extent to which the relationship of 1) exposure to a reproductive health intervention designed to increase AGYW contraceptive use and 2) exposure to empowerment sessions designed to increase contraceptive communication with contraceptive use (non-barrier methods and condoms) is mediated by contraceptive communication and whether the mediation relationship differs by source of communication, marital status, and parity

Hypothesis 2a. Exposure to 1) a reproductive health intervention designed to increase AGYW contraceptive use and 2) exposure to empowerment sessions designed to increase contraceptive communication will be positively associated with contraceptive use among AGYW

Hypothesis 2b. Contraceptive communication (older women in the family, peers, intimate partners) will partially mediate the relationship between exposure to 1) an intervention designed to increase AGYW contraceptive use and 2) empowerment sessions designed to increase contraceptive communication and contraceptive use. In particular, exposures will be positively associated with contraceptive communication (older women in the family, peers, intimate

partners) and in turn, contraceptive communication will be positively associated with contraceptive use.

3.6 Conceptual Models

Figures 3.1 & 3.2 illustrate key relationships proposed for in the dissertation. In Aim 1, contraceptive communication (older women in the family, peers, and intimate partners) and contraceptive social norms (older women in the family and peers) are hypothesized to be associated with contraceptive use (non-barrier methods and condoms). The bidirectional arrows connecting contraceptive communication and contraceptive social norms illustrate the hypothesis that these variables may interact to influence contraceptive use. The extent to which associations among contraceptive communication, contraceptives social norms, and contraceptive use vary by marriage and party will also be explored and is indicated by the vertical arrow. In Aim 2, exposure to the intervention (overall intervention and specific empowerment sessions) is hypothesized to be associated with contraceptive use (non-barrier methods and condoms). Contraceptive communication with older women in the family, peers, and intimate partners is then hypothesized to mediate the relationship between exposure to the intervention and contraceptive use.

Figure 3.1 Conceptual Model for Aim 1

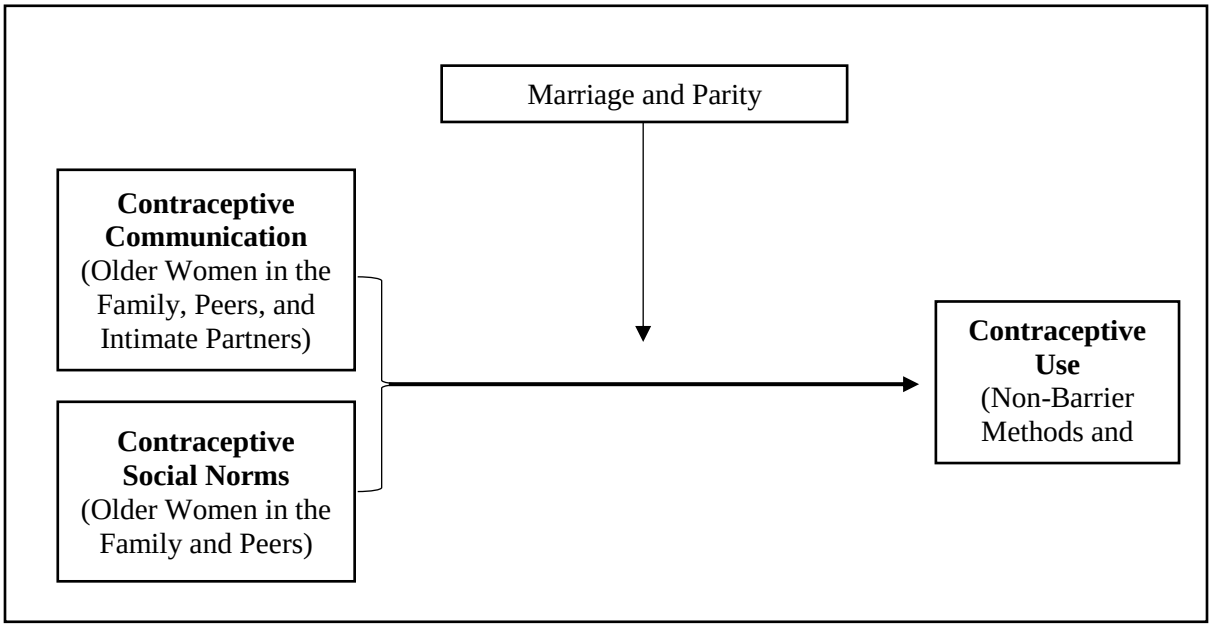
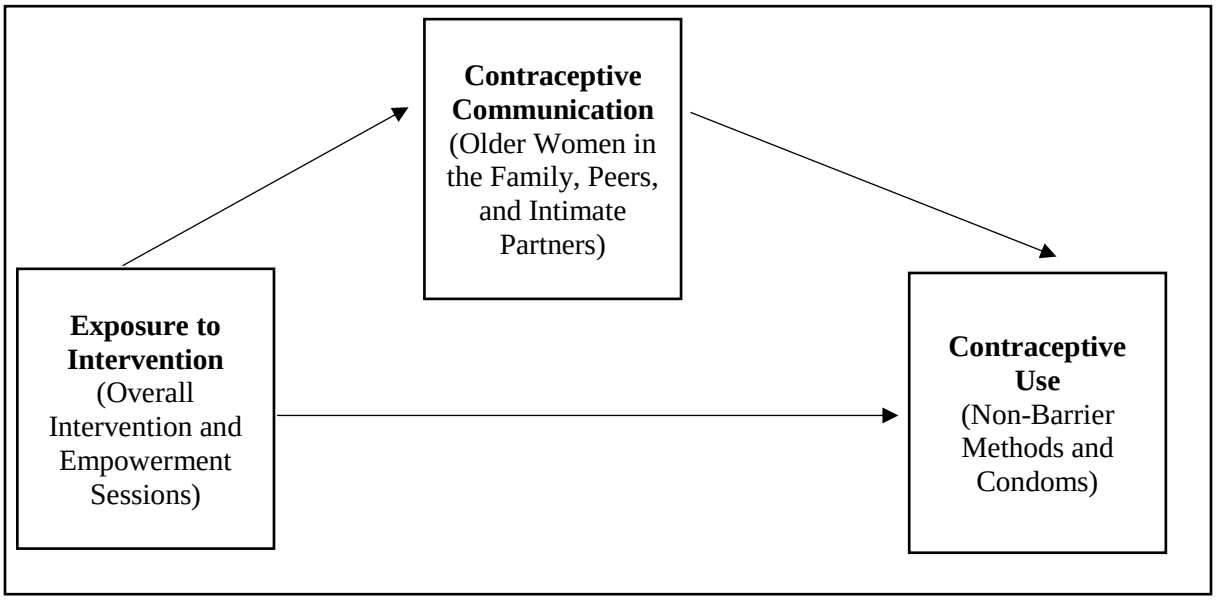


Figure 3.2 Conceptual Model for Aim 2



CHAPTER 4: MANUSCRIPT ONE

4.1 Introduction

In sub-Saharan Africa (SSA), substantial numbers of AGYW (age 15-24) experience early, unprotected sexual activity, placing them at high risk for unintended pregnancy.[82,185] This is particularly the case for AGYW in Malawi, where approximately 60% have had sex by age 18, 50% have had one child by age 19, and greater than 45% report their pregnancies as unintended or mistimed.[8] Despite considerable investment towards increasing access to modern contraceptives in Malawi, uptake among AGYW remains low (30.1%).[8,9] Effectively intervening with AGYW in Malawi to prevent unintended or mistimed pregnancy requires an in-depth understanding of the determinants of contraceptive use in this population.

Studies have found that individual-level determinants, such as sociodemographic factors and health beliefs, and societal-level determinants, such as healthcare access and public policies, are important predictors of AGYW contraceptive use in Malawi.[9–14] However, less is known about the impact of interpersonal-level determinants, such as social influence.

Numerous theories and conceptual perspectives suggest that social relationships can influence health behaviors by providing a structure for the diffusion and enforcement of social norms. [162,163,168,186] First, family members, peers, and intimate partners often function as role models for health behaviors. Second, conversations with and among these actors provide a mechanism for the exchange and evaluation of opinions related to health behaviors. Third, the cultural value of the modeled or discussed behaviors has the potential to impact how closely the behavior is adopted and maintained.[153,163] In sum, health behaviors are in part shaped by norms that are created and reinforced through communication among social network members.[187]

Examining the association between these social influence factors (i.e. social norms and communication) and contraceptive use is particularly relevant for AGYW in Malawi. First, adolescence and young adulthood mark developmental periods when young people begin to make decisions independently but are still largely influenced by those around them. Role models and sources of information often shift from family members to peers and intimate partners which affects standards for health beliefs and behaviors.[153,188–190] Second, early sexual activity and marriage in Malawi exposes adolescents to the contraceptive and fertility preferences of partners, husbands, and new family members.[8] Third, Malawian culture is imbued with social norms related to who should utilize non-barrier contraceptives and condoms, when non-barrier contraceptives and condoms should be utilized, and how non-barrier contraceptives and condoms are related to fertility.[27,91,92] Taken together, these social influence factors create a complex social climate that AGYW must navigate as they make contraceptive-related decisions.

Evidence for the association between social influence factors and AGYW contraceptive use varies across high-income countries (HICs) and low-middle-income countries (LMICs). In HICs, there is an abundance of quantitative and qualitative literature demonstrating that adolescent contraceptive behavior is strongly related to contraceptive social norms and contraceptive communication with social network members (family members, peers, and intimate partners). In LMICs, there is evidence to suggest that AGYW who discuss reproductive health issues and contraception with their intimate partners are more likely to use contraceptives. [15–20] Studies examining the influence of family/peer based contraceptive communication and contraceptive social norms on AGYW contraceptive use are few and those that exist are largely qualitative with mixed findings. To our knowledge, no studies have quantitatively examined the association between social influence factors and AGYW contraceptive use across family members, peers, and intimate partners. Nor have any studies examined whether the interaction among social influence factors is associated with AGYW contraceptive use. This study aims to address these two gaps in the literature.

In the present study, we first examine the association between type of contraceptive use (non-barrier methods and condoms) and social influence factors (contraceptive communication, descriptive contraceptive social norms and, injunctive contraceptive social norms) and if the association differs by source of social influence (older women in the family, peers, intimate partners). We then examine if the association between social influence factors and use of contraception differs by marital status and parity. Finally, we examine whether the interaction among social influence factors is associated with contraceptive use and whether the association differs by source of social influence as well as marital status and parity.

4.2 Methods

Study Context

Malawi places among the lowest in the world on the United Nations Development Program's human development index with a ranking of 165 out of 177 countries. Of Malawi's approximately 18.1 million people, 85% live in rural areas.[192,193] The main livelihood for rural Malawians is agriculture and natural resource mining, and the majority of household consumption is spent on food. More than 85% of children attend primary school, approximately 25% attend secondary school, and 72% of adult women are literate[194]. Malawi's HIV prevalence is one of the highest in the world, with 9.2% of the adult population (aged 15-49) living with HIV [195] Fertility is higher in Malawi than many other countries in SSA, and particularly higher than in neighboring countries South Africa and Zimbabwe. Women have more than five children on average over their lifetime and sixty percent of women experience a first birth during adolescence (ages 14-19).[8,44]

Parent Study Recruitment, Eligibility, and Enrollment

Data for the present analysis comes from Girl Power, a quasi-experimental prospective cohort study conducted in Lilongwe, Malawi and Cape Town, South Africa. This analysis is restricted to the Malawi sites due to data collection issues. Girl Power-Malawi (GPM) was implemented from February 2016 to August 2017 across four comparable, public-sector health clinics. All clinics were in peri-urban areas, located on a main road, had antenatal volumes >200 women per month, and had antenatal HIV

prevalence levels >5%. The purpose of the parent study was to assess the impact of a multi arm intervention on care-seeking and sexual risk behaviors among AGYW: 1) standard of care (no intervention), 2) youth-friendly health services (YFHS), 3) YFHS + empowerment sessions, 4) YFHS + empowerment sessions + cash transfer.

Each of the four clinics was randomly assigned to one service delivery model and enrolled 250 AGYW, totaling 1000 participants across the study sites. Sexually active AGYW were recruited through a combination of community outreach activities, referrals through invitations from other participants, and self-referral. Outreach workers visited catchment areas known to be venues for at-risk AGYW to promote GPM participation and distribute invitations. AGYW who brought invitation cards to health facilities and AGYW who presented were then screened for eligibility. Eligibility criteria include being 15-24 years old, currently sexually active, residing in the clinic's catchment area, and willing to be enrolled for a one-year period. Those who were eligible and provided informed consent or assent were enrolled and provided with three study participation referrals to give to friends who they believed would also benefit. GPM began recruitment and enrollment in February 2016. Across all four sites, 1,109 potential participants were screened and 1,080 were eligible. The primary reason for ineligibility was age. Study enrollment closed in August 2016 with a total of 1000 AGYW, 250 at each of the four health clinics. Enrollees were recruited through community outreach by peer educators (36%), participant referral (26%), and self-referral (44%). Participants were followed for one year, starting from their individual enrollment date.

Parent Study Data Collection and IRB Approval

GPM trained young, female staff members to administer a detailed behavioral survey at three time points across the one-year study period. Surveys were conducted in Chichewa, the local language, using Android tablets and Open Data Kit (ODK) software. The survey included questions about demographics, socio-economic status (SES), health communication, self-reported past and current care-seeking behaviors, sexual history, and psychosocial outcomes. All study activities and data collection were completed by August 2017.

GPM received approval from the University of North Carolina Institutional Review Board and the Malawi National Health Sciences Research Committee. Voluntary written informed consent was obtained from AGYW 18-24 years old. Assent and permission by a parent, guardian, or authorized representative were obtained from AGYW 15-17 years old. All informed consent documents were read and discussed aloud in Chichewa and, in cases of limited literacy, an impartial witness was present.

Measures

Outcome Variables: The outcomes of interest in this analysis were two dichotomous variables that measured self-reported current non-barrier contraceptive use and self-reported current condom use, based on responses to the baseline behavioral survey. All participants were asked if they have ever used the daily hormonal contraceptive pill, non-hormonal intrauterine device (IUD), hormonal injection, hormonal implants, male condoms, and female condoms. If a participant indicated they had ever used one of these methods, they were asked if they were currently using the method. To create the non-barrier contraceptive use variable, a positive response was recorded if the participant reported currently using any of form of non-barrier contraception at baseline. Non-barrier methods included the daily hormonal contraceptive pill, IUD, hormonal injection, and hormonal implants. A null response was recorded if the participant reported not using any form of non-barrier contraception at baseline. To create the condom use variable, a positive response was recorded if the participant reported currently using either male or female condoms. A null response was recorded if the participant reported not currently using any type of condom. No participants responded "No Response" to any of the contraception measures in the behavioral survey. AGYW who indicated that they were pregnant during the baseline survey (N = 38) were dropped from the analytical sample, as contraceptive use would not be relevant to pregnancy prevention for these individuals. The behavioral survey items used to construct the outcome variable are detailed in Table 4.1.

Table 4.1 Outcome Variables for Aim 1

Variable Name	Measure	Response Categories
Non-Barrier Contraceptive Use (Baseline)	*Survey Questions:* Are you currently using birth control pills? Are you currently using Depo-provera, the 3-month injectable? Are you currently using an intrauterine device (the loop)? Are you currently using a contraceptive implant? *Response Options for all Survey Questions:* Yes No No Response	Recoded as: 1 = Yes (any method) 0 = No
Condom Use (Baseline)	*Survey Questions:* Are you currently using male condoms? Are you currently using female condoms? *Response Options for all Survey Questions:* Yes No No Response	Recoded as: 1 = Yes (any type of condom) 0 = No

Independent Variables: The independent variables in this analysis were three groups of variables intended to capture social influence: contraceptive communication, contraceptive descriptive social norms (perceptions of what others are doing), and contraceptive injunctive social norms (perceptions of what is approved by others). These variables are detailed in Table 4.2.

Contraceptive communication in this analysis consisted of three dichotomous variables measuring whether the participant had had a contraceptive conversation with older women in their family, a contraceptive conversation with their peers, or a contraceptive conversation with an intimate partner. A fourth dichotomous variable was created to measure whether the participant had a conversation with at least one of the three sources (older women in the family, peers, or intimate partners). A response of 1 one was recorded if the participant had spoken with at least one of the three sources. A response of 0 was

recorded if the participant had not spoken with any of the three sources. A response of 0 was also recorded if the participant responded that they did not have an intimate partner (N = 7). There were no participants who responded "Don't Know" to any of the three contraceptive communication items at baseline.

Descriptive contraceptive social norms in this analysis consisted of two dichotomous variables measuring whether the participant believed that their peers used contraception and whether older women in their family used contraception. A third dichotomous variable was created to measure whether the participant believed that at least one of the two sources (older women in the family or peers) used contraception. A response of 1 was recorded if the participant believed that either older women in their family or their peers used contraception. A response of 0 was recorded if the participant believed that neither older women in their family or their peers used contraception or responded. A response of 0 was also recorded if the participant responded "Don't Know" to the two survey items; less than 40 participants responded "Don't Know" to the descriptive contraceptive social norms items regarding older women in the family (N = 37) and peers (N = 31).

Injunctive contraceptive social norms in this analysis consisted of two categorical variables measuring participant's perceptions of peer and older women in their family's approval for contraceptive use. Specifically, participants were asked how much they agreed with the following two statements: "*most of your close friends think it is a good idea to use contraceptive methods"* and *"most older women in your family think it is a good idea to use contraceptive methods"*. Both variables were measured on a five-point scale ranging from strongly disagree to strongly agree. A third, dichotomous, variable was created to measure whether the participant believed that at least one of the two sources approved of contraceptive use (older women in the family or peers). A response of 1 was recorded if the participant responded "strongly agree" or "agree" to the variables measuring participant's perceptions of peer or older women in the family's approval for contraceptive use. A response of 0 was recorded if the participant responded "strongly disagree", "disagree", or "neutral" to the variables measuring participant's perceptions of peer or older women in the family's approval for contraceptive use.

Table 4.2 Independent Variables for Aim 1

Variable Name	Measure	Response Categories
Contraceptive Communication with Older Women in the Family (Baseline)	*Survey Question:* Have you ever talked to older women in your family about family planning or contraception? *Response Options:* Yes No Don't Know	Recoded as: 1 = Yes 0 = No or Don't Know
Contraceptive Communication with Peers (Baseline)	*Survey Question:* Have you ever talked to your close friends about family planning or contraception? *Response Options:* Yes No Don't Know	Recoded as: 1 = Yes 0 = No or Don't Know
Contraceptive Communication with Partners (Baseline)	*Survey Question:* Have you ever talked to a partner about family planning or contraception? *Response Options:* Yes No Don't Know	Recoded as: 1 = Yes 0 = No, Don't Know, or Does Not Have Partner
Summary Measure: Contraceptive Communication with Any Source (Baseline)	Participant reports having spoken with at least one source (older women in the family, peers, and intimate partner) about contraception	1 = Yes 0 = No
Descriptive Contraceptive Social Norms – Older Women in the Family (Baseline)	*Survey Question:* Do you know if older women in your family use family planning or contraception? *Response Options:* Yes No Don't Know	Recoded as: 1 = Yes 0 = No or Don't Know
Descriptive Contraceptive Social Norms – Older Women in the Family (Baseline)	*Survey Question:* Do you know if your close friends use family planning or contraception?	Recoded as: 1 = Yes 0 = No or Don't Know

Variable Name	Measure	Response Categories
	Response Options: Yes No Don't Know	
Summary Measure: Descriptive Contraceptive Social Norms – Older Women in the Family or Peers (Baseline)	Belief that either peers or older women in the family use family planning or contraception	1 = Yes 0 = No or Don't Know
Injunctive Contraceptive Social Norms – Older Women in the Family (Baseline)	*Survey Question:* Most of your close friends think it is a good idea to use contraceptive methods *Response Options:* Strongly agree Agree Neither Disagree Strongly disagree	5 = Strongly agree 4 = Agree 3 = Neither 2 = Disagree 1 = Strongly disagree
Injunctive Contraceptive Social Norms – Peers (Baseline)	*Survey Question:* Most older women in your family think it is a good idea to use contraceptive methods *Response Options:* Strongly agree Agree Neither Disagree Strongly disagree	5 = Strongly agree 4 = Agree 3 = Neither 2 = Disagree 1 = Strongly disagree
Summary Measure: Injunctive Contraceptive Social Norms – Older Women in the Family or Peers (Baseline)	Perception that either peers or older women in the family approve of contraceptive use	1 = Yes (Agree or Strongly Agree) 0 = No (Disagree, Strongly Disagree, or Neither)

Control Variables: Demographic control variables included age (in continuous single years), education, assets, marriage, parity, and study clinic. These variables are potential confounders as they have been shown to be associated with contraceptive use for AGYW in LMICs, and SSA in particular[56] and may also be associated with our independent variables of interest. Educational attainment was a dichotomous variable measuring whether or not the participant completed primary education. Achieving universal primary education is a sustainable development goal, has been associated with adolescent sexual and

reproductive health outcomes, and is a common indicator of measuring socio-economic position across studies in LMICs. [196,197] Asset score was included as dichotomous variable measuring whether the participant reported two or more on an asset scale. The scale was the sum of household assets from a list of 13 items (radio, phone, television, fridge, bike, stove, microwave, washing machine, mattress, computer, satellite dish, motorcycle car). A cut off point of two for the asset scale has been previously used with this population.[198] Asset-based indicators are also commonly used to measure standard of living across studies in LMICs.[196] Marriage was defined as a dichotomous variable measuring whether the participant was never married (single or no-response) or ever married (married, separated/divorced, widowed). Grouping those who are married, separated, divorced, or widowed together as ever married is consistent with other adolescent sexual and reproductive health literature and reports from LMICs. In addition, numerous qualitative studies indicate that contraception is acceptable only after marriage in Malawi.[27,91,92] There was only 1 participant who responded "no response" to the marriage item on the behavioral survey. Cohabitation was not included in the creation of the marriage variable. Parity was defined as a dichotomous variable measuring whether the participant had any living children. Study assignment was also included as a control variable to account for potential differences among the types of AGYW that were recruited at each of the four health centers, as described in the recruitment for GPM, above. The behavioral survey items used to construct the control variables are detailed in Table 4.3.

Table 4.3 Control Variables for Aim 1

Variable Name	Survey Question	Response Categories
Age **(Baseline)**	*Survey Question:* How old are you? *Response Options:* Integer (years)	Number in years (continuous)
Education **(Baseline)**	*Survey Question:* What is the highest level of education you have successfully completed? *Response Options:* Standard 1 Standard 2 Standard 3 Standard 4 Standard 5 Standard 6 Standard 7 Standard 8 Form 1 Form 2 Form 3 Form 4 Post-Secondary No response	Recoded as: 1 = Completed Primary Education (Standard 8 or greater) 0 = Less than Standard 8 or No Response
Assets **(Baseline)**	*Survey Question:* Asset Score: Do you or other household member own any of the following? *Response Options:* Radio Mobile Phone Television Refrigerator Bicycle Electric or Gas Stove Microwave Washing Machine Mattress Computer Satellite Dish Motorcycle/Scooter Car or Another Vehicle None	Recoded as: 1 = Greater than 2 assets 0 = Less than 2 assets

Variable Name	Survey Question	Response Categories
Marital Status (Baseline)	*Survey Question:* What is your current marital status? *Response Options:* Single Married Separated/Divorced Widowed No Response	Recoded as: 1 = Ever Married (Married, Separated, Divorced, Widowed) 0 = Single, No Response
Parity (Baseline)	*Survey Question:* How many living children do you have, that you have given birth to? *Response Options:* Integer (number of children)	Recoded as: 1 = Yes, Has Children 0 = No, Does Not Have Children
Study Clinic Assignment	*Survey Question:* What Girl Power Clinic did you enroll? *Response Options:* Clinic 1 Clinic 2 Clinic 3 Clinic 4	1 = Clinic 1 2 = Clinic 2 3 = Clinic 3 4 = Clinic 4

Stratification Variables: To explore whether the association between non-barrier method contraceptive use and social influence factors (contraceptive communication, descriptive contraceptive social norms, injunctive contraceptive social norms) differed by marriage and parity, four marriage and parity groups were created. These groups included single participants without children, single participants with children, married participants without children, and married participants with children. Our descriptive analyses revealed that 1% of married participants without children were currently using non-barrier method contraception at baseline. Given the lack of variability in one of the main outcomes of interest, married participants without children (N = 20) were dropped from the analytical sample. Subsequently, three marriage and parity groups were used in the analysis: single participants without children, single participants with children, and married participants with children. The behavioral survey items used to construct the stratification variables are detailed in Table 4.4.

Table 4.4 Stratification Variables for Aim 1

Variable Name	Measure	Coded Values
Combined Marriage and Parity Variable (Baseline)		1 = Single, No Children 2 = Single, Children 3 = Ever Married, No Children* 4 = Ever Married, Children

*Dropped from Analytical Sample

Data Management and Analyses

First, we cleaned the data and checked for missingness by running frequencies for each of the variables used in this analysis. There were no issues with missing data on variables of interest, as all had <3% missing or non-response. We also then checked for inconsistencies and multicollinearity among outcome and independent variables by using bivariate descriptive statistics including frequencies (Table 4.5), means (Table 4.6), and correlations (Table 4.7).

Second, we calculated the number and proportion of participants with each baseline characteristic and compared across our three marriage and parity groups of interest using chi-square tests. In addition, we calculated the number and proportion of participants who had contraceptive conversations and endorsed contraceptive social norms and then compared across marriage and parity groups using chi-square tests (Table 4.8).

Third, generalized linear models with a logit link and binomial distribution were used to estimate odds ratios and 95% confidence intervals for the relationship between contraceptive use and social influence factors. Three sets of models were run for each contraceptive outcome (non-barrier methods and condoms). In the first set, we estimated unadjusted odds ratios for the relationship between contraceptive use and each of the seven social influence factors (contraceptive communication with older women in the family, contraceptive communication with peers, contraceptive communication with intimate partners, older women in the family based descriptive norms, older women in the family based injunctive norms, peer based descriptive norms, and peer based injunctive norms). In the second set, we estimated adjusted odds ratios for the relationship between contraceptive use and each of the seven social influence factors. In the third set, we estimated the adjusted odds of contraceptive use and included interaction terms for

contraceptive communication*descriptive social norms and contraceptive communication*injunctive social norms. Control variables included age, education, asset score, study assignment, marriage, and parity. Unadjusted and adjusted analyses were run for the entire sample. Adjusted analyses were run for each of the three marriage and parity groups: single without children, single with children, and married with children, we set $\alpha = .05$ and used 2-tailed statistical tests. All analyses were conducted using StataSE, version 14.2 (College Station, TX).

Since both of the contraceptive outcomes were dichotomous, sample size calculations were based on the magnitude of the difference in proportions which can be detected between contraceptive users (N = 262) vs. non-contraceptive users (N = 670). Given that these groups are not equal, we first calculated sample size as if groups were equal and then calculated the modified sample size based on 2.5:1 ratio. Using an alpha level of 0.05 we had >80% power to detect differences $\geq$10% between contraceptive users and contraceptive non-users.

4.3 Results

Characteristics of Study Population

Out of the 1000 AGYW enrolled in the study, 58 were excluded because they were pregnant (N = 38) or married without children (N = 20) at the time of the baseline survey. Table 4.8 presents the basic demographic characteristics of the final study sample (N = 942). Median age was 19 (interquartile range 17-21 years). The majority of participants completed primary education (71%) and possessed greater than two assets (62%). Ninety-nine percent had experienced sexual debut and less than half had living children (37%) or were married (25%). The proportion of AGYW using male or female condoms at baseline was 67% and varied across marriage and parity groups (single participants without children (79%), single participants with children (68%), married participants with children (35%) ($p < 0.001$)). The proportion of AGYW using non-barrier modern contraceptives at baseline was 28% and also varied across marriage and parity groups (single participants without children (6%), single participants with children (47%), married participants with children (73%) ($p < 0.001$)) (Table 4.9).

Contraceptive Communication

Participants were asked whether they had ever spoken to older women in their family, close peers, or intimate partners about contraception. The majority had spoken to at least one source (78%) and the median number of conversation sources was 2 (interquartile range 1-3 sources). Contraceptive conversation with at least one source varied across marriage and parity groups (single participants without children (67%), single participants with children (90%), married participants with children (99%) ($p < 0.001$)). Disaggregating by source of contraceptive conversation revealed that at least half of all participants had spoken to their peers (64%) and partners (50%) but not to older women in their family (42%) (Table 4.9).

Contraceptive Social Norms

Participants were also asked about injunctive and descriptive contraceptive norms in relation to older women in their family and their close peers. In terms of descriptive norms, the majority of participants believed that at least one of these two sources used contraception (73%). Disaggregating by source, participants believed that 56% of older women in their family and 57% of their close peers used contraception. In the case of injunctive norms, the majority of participants believed that one of the two sources approved of contraceptive use (88%). Disaggregating by source, participants believed that 80% of older women in their family and 69% of their close peers approved of contraceptive use (Table 4.9).

Associations among Contraceptive Use, Contraceptive Communication, and Contraceptive Social Norms

The unadjusted and adjusted odds of contraceptive use (non-barrier methods and condoms) by source (older women in the family, peers, and partners) are presented in Table 4.10 and Table 4.11. The following sections describe the adjusted odds of contraceptive use by source for the overall sample as well as the three marriage and parity groups (Table 4.11).

All Sources

Contraceptive Communication

Among all AGYW, speaking with any source about contraception was positively associated with non-barrier contraceptive use (aOR: 6.03, 95% CI: 1.82, 9.95). Disaggregating by marriage and parity groups revealed that the positive association between contraceptive communication with any source and non-barrier contraceptive use was significant for single AGYW without children (aOR: 5.80, 95% CI: 1.74, 9.32) and single AGYW with children (aOR: 3.45, 95% CI: 1.59, 13.65) and less precise for married AGYW with children (aOR: 5.55, 95% CI: 0.87, 16.49). There was no association between speaking any source about contraception and condom use (aOR: 1.22, 95% CI: 0.83, 1.80), regardless of marital status or parity.

Contraceptive Social Norms

Among all AGYW, believing that either older women in the family or close peers used contraception (descriptive norms) was positively associated with non-barrier contraceptive use (aOR: 2.02, 95% CI: 1.26, 3.86). Disaggregating by marriage and parity groups revealed that this association was significant for single AGYW without children (aOR: 3.77, 95% CI: 1.53, 9.27) but not for single AGYW with children (aOR: 1.99, 95% CI: 0.72, 5.51) or married AGYW with children (aOR: 0.34, 95% CI: 0.04, 2.83). Believing that believing that either older women in the family or close peers used contraception was not associated with condom use (aOR: 1.18, 95% CI: 0.82, 1.70), regardless of marital status or parity.

Believing that either older women in the family or peers approved of contraceptive use (injunctive norms) was not associated with non-barrier contraceptive use, regardless of marital status or parity (aOR: 0.87, 95% CI: 0.43, 1.75). Similarly, believing that either older women in the family or peers approved of contraceptive use (injunctive norms) was not associated with condom use, regardless of marital status or parity (aOR: 1.22, 95% CI: 0.75, 1.96).

Older Women in the Family

Contraceptive Communication

Among all AGYW, those who spoke to older women in the family about contraception had 1.48 times the odds of non-barrier contraceptive use (95% CI: 0.99, 2.20). Disaggregating by marriage and parity groups revealed that speaking with older women in the family about contraception was significantly associated with contraceptive use for single AGYW without children (aOR: 2.60, 95% CI: 1.33, 5.07) but not for single AGYW with children (aOR: 1.41, 95% CI: 0.65, 3.02) or married AGYW with children (aOR: 0.92, 95% CI: 0.49, 1.76). Speaking to older women in the family about contraception was not associated with condom use (aOR: 0.97, 95% CI: 0.75, 1.96), regardless of marital status or parity.

Contraceptive Social Norms

Believing that older women in the family used contraception, descriptive norms, (aOR: 1.22, 95% CI 0.80, 1.88) and perceptions of older women's approval for contraceptive use, injunctive norms, (aOR: 1.01, 95% CI 0.82, 1.23) were not associated with non-barrier contraceptive use, regardless of marriage or parity. Similarly, older women in the family based descriptive norms (aOR: 1.03, 95% CI 0.75, 1.43) and injunctive norms (aOR: 1.08, 95% CI 0.92, 1.26)) were not associated with condom use, regardless of marriage or parity.

Contraceptive Communication and Social Norms Interactions

The association between contraceptive communication with older women in the family and non-barrier contraceptive use did not differ by descriptive norms - belief in older women's contraceptive use (B = 0.33, 95% CI: -0.63, 1.28 or injunctive norms - perceived level of older women's approval of contraceptive use (B = 0.12, 95% CI: -0.27, 0.51). Similarly, the association between contraceptive communication with older women in the family and condom use did not differ by descriptive norms - belief in older women's contraceptive use (B = 0.99, 95% CI: -0.73, 0.72) or injunctive norms - perceived level of older women's approval of contraceptive use (B = -0.21, 95% CI: -0.51, 0.08) (Table 4.12).

Peers

Contraceptive Communication

Among all AGYW, speaking with peers about contraception was positively associated with non-barrier contraceptive use (aOR: 3.12, 95% CI: 1.96, 4.96). Disaggregating by marriage and parity groups revealed that the positive association between peer contraceptive communication and non-barrier contraceptive use was significant only for single AGYW without children (aOR: 4.65, 95% CI: 1.91, 11.36) and single AGYW with children (aOR: 4.61, 95% CI: 1.66, 12.81). There was a weaker association between peer contraceptive communication and contraceptive use for married AGYW with children (aOR: 1.92, 95% CI: 0.94, 3.93)). Speaking to peers about contraception was not associated with condom use (aOR: 1.53, 95% CI: 0.99, 2.13), regardless of marital status or parity.

Contraceptive Social Norms

Among all AGYW, believing that close peers used contraception (descriptive norms) was positively associated with non-barrier contraceptive use (aOR; 2.57, 95% CI: 1.63, 4.96). Similar to peer contraceptive conversation, the positive association between belief in peer contraceptive use and non-barrier contraceptive use was only significant for single AGYW without children (aOR: 4.45, 95% CI: 2.11, 9.39) and single participants with children (aOR: 2.45, 95% CI: 1.07, 6.07). There was a weaker association between belief in peer contraceptive use and non-barrier contraceptive use for married participants with children (aOR: 1.16, 95% CI: 0.48, 2.83). Perceptions of peer approval for contraceptive use (injunctive norms) were not associated with non-barrier contraceptive use (aOR: 1.09, 95% CI 0.90, 1.31), regardless of marriage or parity. Peer based descriptive norms (aOR: 1.38, 95% CI: 0.97, 1.95) and injunctive norms (aOR: 1.15, 95% CI: 0.99, 1.32) were not associated with condom use, regardless of marriage or parity.

Contraceptive Communication and Social Norms Interactions

The association between contraceptive communication with peers and non-barrier contraceptive use varied by descriptive norms - belief in peer's contraceptive use (B = 1.11, 95% CI: 0.06, 2.15). Those who spoke to their peers about contraception and believed that their peers used contraception had three

times the odds of non-barrier contraceptive use compared to those who did not speak to their peers about contraception and did not believe their peers used contraception (aOR: 3.36, 95% CI: 1.92, 5.90). Those who spoke to their peers about contraception and did not believe that their peers used contraception had higher odds of non-barrier contraceptive use compared to those who did not speak to their peers about contraception and did not believe their peers used contraception (aOR: 1.27, 95% CI: 1.06, 2.70). The association between peer contraceptive communication and non-barrier contraceptive use did not differ by injunctive norms - perceived level of peer's approval of contraceptive use (B = 0.12, 95% CI: -0.27, 0.51).

The association between contraceptive communication with peers and condom use did not differ by descriptive norms - belief in peer's contraceptive use (B = 0.09, 95% CI: -0.63, 0.80) or injunctive norms - perceived level of peer's approval of contraceptive use (B = 0.09, 95% CI: -0.18, 0.36) (Table 4.12).

Intimate Partners

Contraceptive Communication

Among all AGYW, speaking with an intimate partner about contraception was positively associated with non-barrier contraceptive use (aOR: 5.15, 95% CI: 3.13, 8.48). This association was strong, significant and positive across all marriage and parity groups (single participants without children (aOR: 4.46, 95% CI: 2.24, 8.86), single participants with children (aOR: 6.53, 95% CI: 2.46, 17.30), married participants with children OR: 5.43, 95% CI: 1.90, 15.50)). Speaking to intimate partners about contraception was not associated with condom use (aOR: 1.20, 95% CI: 0.82, 1.75), regardless of marital status or parity.

4.4 Discussion

The main objective of this study was to examine the association between two types of contraceptive use and a set of social influence factors: contraceptive communication, contraceptive descriptive norms, and contraceptive injunctive norms. In regard to non-barrier contraceptive use, contraceptive communication and contraceptive descriptive norms to be associated with non-barrier

contraceptive use. However, there were notable differences across sources of social influence as well as among groups differing by marriage and parity. In regard to condom use, we found no association between any social influence factor and condom use, regardless of source of social influence, marital status, or parity.

Partner contraceptive communication was associated with non-barrier contraceptive use for both married and single AGYW, regardless of parity. For married AGYW, this finding is consistent with the current literature linking spousal communication, husband-centered decision making, and contraceptive uptake in Malawi.[89,90,199,200] For single AGYW, this finding in encouraging given that previous studies have found that AGYW who are in short term or informal relationships are less likely to talk to their partners about using contraceptives and less likely to use contraceptives.[201–205] Furthermore, existing family planning interventions in SSA that involve male partners are largely limited to husbands or married couples.[18,206,207] Our findings suggest that expanding these interventions to be inclusive and engaging of AGYW in all relationship types could potentially increase non-barrier contraceptive use among this population.

The literature on life course development emphasizes the importance of peers as socializing agents during adolescence.[153] Reproductive health interventions in SSA that have utilized peer-based approaches to changing non-barrier contraceptive behaviors have found a positive effect.[95] Despite these results, few studies in SSA have examined the causal pathways between peer social contexts and contraceptive behaviors beyond condom use.[208–210] Our study is one of the first to observe an association among peer contraceptive communication, peer-based contraceptive descriptive norms, and non-barrier contraceptive use. AGYW who talked to their peers about contraception and believed their peers used contraception were more likely to use non-barrier contraception compared to AGYW who didn't speak with their peers about contraception and didn't believe their peers used contraception. However, we found no association between peer-based contraceptive injunctive norms and non-barrier contraceptive use, suggesting that AGYW tend to do what they believe their peers are doing rather than what they believe their peers think they should do. These peer-based results emphasize the importance delivering

reproductive health interventions to groups of peers in youth-friendly spaces where AGYW can receive information and feel comfortable asking questions and discussing their health experiences with others.

Talking to older women in the family about contraception was only positively associated with non-barrier contraceptive use among single AGYW without children. This result was unexpected for single women without children for three reasons. First, previous studies in SSA have found parent-based contraceptive communication to be infrequent and unsuccessful at increasing AGYW contraceptive uptake.[211–214] Second, conversations about contraception are largely intended for those who are married or have already had children.[214] AGYW who initiate conversations about sex and contraception with parents are seen as disrespectful.[36,214–217] Third, despite being exposed to the reproductive preferences of their husband's family members, contraceptive communication with older women in the family was not associated with non-barrier contraceptive use.[212,214,218] One possible explanation for our findings might be that the conversations that are occurring are largely with older women in the family (i.e. grandmothers, aunts, and sisters), who might play a different role as compared to parents or mothers of AGYW.[214]

Summarizing the non-barrier contraceptive findings by groups of AGYW defined by marital status and parity, the findings suggest that contraceptive conversations with partners are influential for all, contraceptive conversations with peers are influential for single AGYW, and contraceptive conversations with older women in the family are influential for single AGYW without children. Descriptive social norms (believing that close peers used contraception) are influential for single AGYW, regardless of parity.

Despite a high prevalence of condom use among our study population, we found no association between social influence factors and condom use. A possible explanation for this result might be that condom use and non-barrier contraceptive use are different behaviors and have different purposes and thus have different determinants at the interpersonal level. Non-barrier methods are intended to prevent or delay pregnancy and are largely user independent except for birth control pills. Barrier methods, such as condoms or diaphragms, not only prevent or delay pregnancy but also reduce the risk of sexually transmitted infections and are user dependent. Existing studies have documented a variety of reasons for

the use and preference of barrier methods related to access, negotiation, and side effects. In addition, evidence suggests that selection of contraceptive method changes with length of partnership, marriage, and parity. In light of these differences between methods, the null association between intimate partner communication and condom use is surprising because AGYW often have to negotiate condom use with their partners, which inherently involves discussion. Given that the behavioral survey asked about general contraceptive communication, without differentiating by type (hormonal, non-barrier, condoms, etc.), there is a possible disconnect in regard to our two outcomes of interest. Future research that untangles the influence of non-barrier contraceptive communication from condom-related communication on contraceptive use is important, particularly in contexts of high HIV prevalence such as SSA.[65,234]

4.5 Limitations

There are limitations to this study that warrant discussion. First, due to the cross-sectional nature of the data, we cannot infer causality between social influence factors and contraceptive use because we cannot decipher the temporal order of our independent and dependent variables. Furthermore, we do not intend to suggest a causal relationship when utilizing the term social "influence" factor. Its purpose was to categorize contraceptive communication and contraceptive social norms as variables operating at the interpersonal level. Second, contraceptive use data were based on self-report which can be unreliable due to social desirability issues or memory challenges. Third, the behavioral survey asked about general contraception communication, it did not differentiate by type (hormonal, non-barrier, condoms, etc.). This creates a disconnect with our use of non-barrier contraceptive use as an outcome. Fourth, we were not able to assess fertility intention or unmet need for contraception with the questions in the behavioral survey. It is possible that AGYW in the behavioral survey were not using contraception because they wanted to become pregnant. Fifth, the injunctive norms variables did not specify who contraceptive use was approved for which creates a possible disconnect with our AGYW contraceptive use outcomes. Finally, our social influence measures (contraceptive communication, descriptive social norms, and injunctive social norms) were derived from single items on the behavioral survey. Multidimensional scales may better capture these variables of interest more accurately.

4.6 Conclusion

A reorientation of family planning policies and programs, which currently target mainly married women and women who have been pregnant once is urgently needed given the extremely high pregnancy rates and unmet need for contraception among AGYW in the region. Current approaches overlook the contraceptive needs of young women before their first pregnancy, who, as previous research illustrates, are at a high risk for unintended pregnancy. Our study suggests AGYW are influenced through contraceptive communication with older women in their family, peers, and intimate partners and perceptions of peer contraceptive use. Engaging this population in interventions that encourage interpersonal communication about contraception has the potential to make an impact on the uptake of non-barrier contraceptive methods.

Table 4.5 Frequencies of Outcome, Independent, Stratification, and Control Variables for Aim 1

	All AGYW (N = 942)		Single, No Children (N = 594)		Single, Children (N = 112)		Married, Children (N = 236)	
	N	%	N	%	N	%	N	%
Outcome Variable								
Currently Using Non-Barrier Method								
Yes	263	28%	38	6%	53	47%	172	73%
No	679	72%	556	94%	59	53%	64	27%
Currently Using Condoms								
Yes	629	67%	471	79%	76	68%	82	35%
No	313	33%	123	21%	36	32%	154	65%
Currently use Non-Barrier Method and Condoms								
Yes	127	13%	35	6%	34	30%	58	25%
No	815	87%	559	94%	78	70%	178	75%
Independent Variables								
Contraceptive Communication with Older Women in the Family								
Yes	398	42%	175	29%	60	54%	163	69%
No	544	58%	419	71%	52	46%	73	31%
Contraceptive Communication with Peers								
Yes	602	64%	324	55%	84	75%	194	82%
No	340	36%	270	45%	28	25%	42	18%
Contraceptive Communication with Partners								
Yes	472	50%	175	29%	78	70%	219	93%
No	470	50%	419	71%	34	30%	17	7%
Contraceptive Communication with Any Source								
Yes	731	78%	399	67%	101	90%	231	98%
No	211	22%	195	33%	11	10%	5	2%
Descriptive Contraceptive Social Norms – Older Women in the Family								

	All AGYW (N = 942)		Single, No Children (N = 594)		Single, Children (N = 112)		Married, Children (N = 236)	
	N	%	N	%	N	%	N	%
Yes	535	57%	276	46%	68	61%	191	81%
No	407	43%	318	54%	44	39%	45	19%
Descriptive Contraceptive Social Norms – Peers								
Yes	529	56%	246	41%	78	70%	205	87%
No	413	44%	348	59%	34	30%	31	13%
Descriptive Contraceptive Social Norms – Older Women in the Family or Peers								
Yes	686	73%	370	62%	90	80%	226	96%
No	256	27%	224	38%	22	20%	10	4%
Injunctive Contraceptive Social Norms – Older Women in the Family								
Strongly Agree	390	41%	186	31%	50	45%	154	65%
Agree	365	39%	261	44%	39	35%	65	28%
Neutral	68	7%	54	9%	7	6%	7	3%
Disagree	103	11%	78	13%	16	14%	9	4%
Strongly Disagree	16	2%	15	3%	0	0%	1	0%
Injunctive Contraceptive Social Norms – Peers								
Strongly Agree	308	33%	114	19%	42	38%	152	64%
Agree	343	36%	242	41%	35	31%	66	28%
Neutral	110	12%	89	15%	13	12%	8	3%
Disagree	141	15%	116	20%	18	16%	7	3%
Strongly Disagree	40	4%	33	6%	4	4%	3	1%
Injunctive Contraceptive Social Norms – Older Women in the Family or Peers								
Yes	833	88%	498	84%	102	91%	233	99%
No	109	12%	96	16%	10	9%	3	1%

	All AGYW (N = 942)		Single, No Children (N = 594)		Single, Children (N = 112)		Married, Children (N = 236)	
	N	%	N	%	N	%	N	%
Stratification Variables								
Marriage and Parity Group								
Single, Without Children	594	63%	594	100%	0	0%	0	0%
Single, With Children	112	12%	0	0%	112	100%	0	0%
Married, With Children	236	25%	0	0%	0	0%	236	100%
Control Variables								
Age (years)								
15-19	551	58%	455	77%	42	38%	54	23%
20-24	98	10%	139	23%	70	63%	182	77%
Education level								
Completed primary	669	71%	479	81%	81	72%	109	46%
Did not complete primary	273	29%	115	19%	31	28%	127	54%
Asset Score								
> 2 Assets	580	62%	448	75%	66	59%	66	28%
< 2 Assets	362	38%	146	25%	46	41%	170	72%
Marital status								
Single	706	75%	594	100%	112	100%	0	0%
Ever Married	236	25%	0	0%	0	0%	236	100%
Living Children								
Yes	348	37%	0	0%	112	100%	236	100%
No	594	63%	594	100%	0	0%	0	0%

Table 4.6 Means of Continuous, Independent and Control Variables for Aim 1

	All AGYW (N = 942)		Single, No Children (N = 594)		Single, Children (N = 112)		Married, Children (N = 236)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Independent Variables								
Injunctive Contraceptive Social Norms – Older Women in the Family	4.07	1.04	3.88	1.07	4.10	1.04	4.53	0.77
Injunctive Contraceptive Social Norms – Peers	3.78	1.17	3.48	1.17	3.83	1.20	4.51	0.81
Control Variables								
Age (years)	19.12	2.53	18.08	2.16	20.56	2.19	21.06	2.03

Table 4.7 Correlations between Outcome and Independent Variables for Aim 1

	1. Currently Using Non-Barrier Method	2. Currently Using Condoms	3. Currently Using Non-Barrier Method and Condoms	4. Contraceptive Communication with Older Women in the Family	5. Contraceptive Communication with Peers	6. Contraceptive Communication with Partners	7. Descriptive Contraceptive Social Norms - Older Women in the Family	8. Descriptive Contraceptive Social Norms – Peers	9. Injunctive Contraceptive Social Norms – Older Women in the Family	10. Injunctive Contraceptive Social Norms – Peers
1	1.00									
2	-0.24	1.00								
3	0.63	0.28	1.00							
4	0.26	-0.15	0.12	1.00						
5	0.28	-0.01	0.21	0.32	1.00					
6	0.48	-0.19	0.24	0.34	0.31	1.00				
7	0.19	-0.13	0.04	0.45	0.22	0.31	1.00			
8	0.34	-0.11	0.21	0.29	0.47	0.35	0.34	1.00		
9	0.18	-0.08	0.05	0.12	0.11	0.18	0.14	0.08	1.00	
10	0.26	-0.10	0.11	0.19	0.25	0.29	0.20	0.31	0.41	1.00

Table 4.8 Baseline Characteristics Among All Participants Across Marriage and Parity Groups (Aim 1)

	All AGYW (N = 942)		Single, No Children (N = 594)		Single, Children (N = 112)		Married, Children (N = 236)		Chi-Square
	N	%	N	%	N	%	N	%	p-value
Age (years)									
15-19	551	58%	455	77%	42	38%	54	23%	
20-24	98	10%	139	23%	70	63%	182	77%	<0.001
Education level									
Completed primary	669	71%	479	81%	81	72%	109	46%	
Did not complete primary	273	29%	115	19%	31	28%	127	54%	<0.001
Asset Score									
> 2 Assets	580	62%	448	75%	66	59%	66	28%	
< 2 Assets	362	38%	146	25%	46	41%	170	72%	<0.001
Age of sexual debut*									
<15 years	359	38%	235	40%	44	39%	80	34%	
16-17 years	324	34%	198	33%	40	36%	86	36%	
≥18 years	249	26%	153	26%	27	24%	69	29%	0.511
Number of lifetime sexual partners*									
0	6	1%	6	1%	0	0%	0	0%	
1	420	45%	298	50%	25	22%	97	41%	
2-3	396	42%	239	40%	57	51%	100	42%	
≥4	119	13%	51	9%	30	27%	38	16%	<0.001
Living Children									
Yes	348	37%	0	0%	112	100%	236	100%	
No	594	63%	594	100%	0	0%	0	0%	<0.001
Marital status									
Single	706	75%	594	100%	112	100%	0	0%	
Ever Married	236	25%	0	0%	0	0%	236	100%	<0.001

*Column do not add up to total due to missing data

Table 4.9. Baseline Contraceptive Use, Contraceptive Communication, Contraceptive Social Norms Across Marriage and Parity Groups (Aim 1)

	All AGYW (N = 942)		Single, No Children (N = 594)		Single, Children (N = 112)		Married, Children (N = 236)		Chi-Square
	N	%	N	%	N	%	N	%	p-value
Contraceptive Type									
Non-Barrier Contraceptive Use	263	28%	38	6%	53	47%	172	73%	<0.001
Condom Use	629	67%	471	79%	76	68%	82	35%	<0.001
Contraceptive Conversations									
Conversation with Any Source (Older Women, Peers, Partners)	731	78%	399	67%	101	90%	231	98%	<0.001
Contraceptive Social Norms									
Descriptive Norms (Peers and/or Older Women))	686	73%	370	62%	90	80%	226	96%	<0.001
Injunctive Norms (Peers and/or Older Women))	833	88%	498	84%	102	91%	233	99%	<0.001
Contraceptive Communication and Social Norms by Source									
Older Women in Family									
Contraceptive Communication	398	42%	175	29%	60	54%	163	69%	<0.001
Descriptive Norms (Known Contraceptive Use)	535	57%	276	46%	68	61%	191	81%	<0.001
Injunctive Norms (Approval for Contraceptive Use)	755	80%	447	47%	89	9%	219	23%	<0.001
Peers									
Contraceptive Communication	602	64%	324	55%	84	75%	194	82%	<0.001
Descriptive Norms (Known Contraceptive Use)	529	56%	246	41%	78	70%	205	87%	<0.001
Injunctive Norms (Approval for Contraceptive Use)	651	69%	356	60%	77	69%	218	92%	<0.001
Partners									
Contraceptive Communication	472	50%	175	29%	78	70%	219	93%	<0.001

Table 4.10 Unadjusted Associations Between Contraceptive Communication, Social Norms, and Use by Marriage and Parity Groups at Baseline (Aim 1)

	All AGYW (N = 942)		Single, No Children (N = 594)		Single, Children (N = 112)		Married, Children (N = 236)	
	OR (95% CI)		OR (95% CI)		OR (95% CI)		OR (95% CI)	
	Non-Barrier Contraceptive Use	Condom Use	Non-Barrier Contraceptive Use	Condom Use	Non-Barrier Contraceptive Use	Condom Use	Non-Barrier Contraceptive Use	Condom Use
Contraceptive Communication								
Communication with Any Source	22.47* (9.14, 55.27)	0.65* (0.46, 0.91)	6.35* (1.93, 20.88)	1.375 (0.92, 2.06)	1.10 (0.75, 1.63)	0.71 (0.18, 2.84)	4.18 (0.68, 25.62)	2.16 (0.24, 19.65)
Contraceptive Social Norms								
Descriptive Norms - Any Source	5.20* (3.32, 8.15)	0.60* (0.44, 0.82)	2.93* (1.27, 6.77)	1.18 (0.79, 1.75)	1.75 (0.67, 4.58)	0.51 (0.17, 1.50)	0.29 (0.04, 2.32)	5.03 (0.63, 40.40)
Injunctive Norms - Any Source	2.66* (1.51, 4.67)	0.70 (0.45, 1.10)	0.62 (0.28, 1.35)	1.23 (0.74, 2.05)	2.24 (0.55, 9.16)	1.33 (0.35, 5.04)	2.58 (0.94, 3.44)	1.07 (0.10, 11.93)
Communication and Norms by Source								
Older Women in Family								
Contraceptive Communication	3.30* (2.45, 4.44)	0.53* (0.40, 0.69)	2.56* (1.32, 4.97)	1.24 (0.79, 1.94)	1.26* (0.60, 2.66)	0.38* (0.16, 0.87)	0.83 (0.44, 1.57)	0.87 (0.49, 1.54)
Descriptive Norms	2.46* (1.81, 3.34)	0.56* (0.42, 0.74)	1.63 (0.84, 3.18)	1.35 (0.90, 2.01)	1.13 (0.53, 2.42)	0.39* (0.16, 0.94)	0.43 (0.18, 1.03)	0.54 (0.28, 1.04)
Injunctive Norms	1.58* (1.34, 1.86)	0.84* (0.74, 0.97)	0.77 (0.58, 1.02)	1.17 (0.97, 1.39)	1.26 (0.87, 1.82)	1.18 (0.81, 1.72)	1.32 (0.93, 1.88)	0.74 (0.53, 1.04)
Peers								
Contraceptive Communication	4.74* (3.26, 6.91)	0.94 (0.71, 1.25)	4.82* (1.98, 11.71)	1.45 (0.98, 2.17)	4.66* (1.71, 12.66)	1.53 (0.63, 3.72)	1.87 (0.93, 3.78)	2.62* (1.15, 5.97)
Descriptive Norms	5.73* (4.02, 8.17)	0.62* (0.47, 0.82)	4.34* (2.07, 9.12)	1.24 (0.82, 1.86)	2.03 (0.88, 4.67)	1.01 (0.43, 2.40)	0.93 (0.39, 2.19)	2.45 (0.96, 6.25)
Injunctive Norms	1.81* (1.55, 2.11)	0.84* (0.74, 0.94)	1.03 (0.78, 1.37)	1.17 (0.99, 1.39)	1.26 (0.91, 1.73)	1.32 (0.95, 1.83)	1.03 (0.72, 1.46)	0.89 (0.64, 1.24)
Partners								
Contraceptive Communication	14.95* (9.86, 22.68)	0.43* (0.33, 0.57)	4.06* (2.07, 8.02)	1.46 (0.92, 2.31)	5.54* (2.15, 14.28)	0.55 (0.22, 1.38)	4.37* (1.58, 12.03)	0.97 (0.35, 2.74)

*$p < 0.05$

Table 4.11 Adjusted Associations Between Contraceptive Communication, Social Norms, and Use by Marriage and Parity Groups at Baseline (Aim 1)

	All AGYW (N = 942)		Single, No Children (N = 594)		Single, Children (N = 112)		Married, Children (N = 236)	
	aOR** (95% CI)		aOR*** (95% CI)		aOR*** (95% CI)		aOR*** (95% CI)	
	Non-Barrier Contraceptive Use	Condom Use	Non-Barrier Contraceptive Use	Condom Use	Non-Barrier Contraceptive Use	Condom Use	Non-Barrier Contraceptive Use	Condom Use
Contraceptive Communication								
Communication with Any Source	6.03* (1.82, 9.95)	1.22 (0.83, 1.80)	5.80* (1.74, 9.32)	1.30 (0.86, 1.97)	3.45* (1.59, 13.65)	0.43 (0.09, 2.00)	5.55 (0.87, 16.49)	2.66 (0.28, 25.59)
Contraceptive Social Norms								
Descriptive Norms - Any Source	2.20* (1.26, 3.86)	1.18 (0.82, 1.70)	3.77* (1.53, 9.27)	1.18 (0.79, 1.76)	1.99 (0.72, 5.51)	0.44 (0.13, 1.49)	0.34 (0.04, 2.83)	7.86 (0.92, 67.19)
Injunctive Norms - Any Source	0.87 (0.43, 1.75)	1.22 (0.75, 1.96)	0.62 (0.27, 1.42)	1.17 (0.69, 1.97)	2.28 (0.54, 9.60)	1.94 (0.46, 8.20)	1.98 (0.48, 2.00)	1.61 (0.14, 18.63)
Communication and Norms by Source								
Older Women in Family								
Contraceptive Communication	1.48 (0.99, 2.20)	0.97 (0.70, 1.34)	2.60* (1.33, 5.07)	1.27 (0.81, 1.99)	1.41 (0.65, 3.02)	0.43 (0.17, 1.06)	0.92 (0.49, 1.76)	0.98 (0.53, 1.80)
Descriptive Norms	1.22 (0.80, 1.88)	1.03 (0.75, 1.43)	1.79 (0.91, 3.50)	1.40 (0.93, 2.11)	1.37 (0.63, 3.00)	0.47 (0.18, 1.22)	0.59 (0.24, 1.44)	0.80 (0.39, 1.66)
Injunctive Norms	1.01 (0.82, 1.23)	1.08 (0.92, 1.26)	0.78 (0.59, 1.02)	1.16 (0.97, 1.40)	1.21 (0.83, 1.76)	1.25 (0.82, 1.91)	1.30 (0.90, 1.86)	0.74 (0.52, 1.06)
Peers								
Contraceptive Communication	3.12* (1.96, 4.96)	1.53 (0.99, 2.13)	4.65* (1.91, 11.36)	1.38 (0.92, 2.07)	4.61* (1.66, 12.81)	1.17 (0.44, 3.11)	1.92 (0.94, 3.93)	2.78 (0.19, 3.51)
Descriptive Norms	2.58* (1.63, 4.06)	1.38 (0.97, 1.95)	4.45* (2.11, 9.39)	1.20 (0.80, 1.82)	2.54* (1.07, 6.07)	1.10 (0.40, 2.97)	1.16 (0.48, 2.83)	4.23 (0.59, 5.90)
Injunctive Norms	1.09 (0.90, 1.31)	1.15 (0.99, 1.32)	1.02 (0.77, 1.36)	1.17 (0.99, 1.39)	1.23 (0.88, 1.71)	1.28 (0.88, 1.87)	1.02 (0.71, 1.48)	0.93 (0.66, 1.32)
Partners								
Contraceptive Communication	5.15* (3.13, 8.48)	1.20 (0.82, 1.75)	4.46* (2.24, 8.86)	1.45 (0.91, 2.32)	6.53* (2.46, 17.30)	0.51 (0.18, 1.40)	5.43* (1.90, 15.50)	1.24 (0.43, 3.58)

*$p < 0.05$

**Adjusted for age, education, asset score, study clinic assignment, marriage, and parity

***Adjusted for age, education, asset score, and study clinic assignment

Table 4.12 Interactions Between Contraceptive Communication and Contraceptive Social Norms Across Marriage and Parity Groups (Aim 1)

	All AGYW (N = 942)		All AGYW (N = 942)			Single, No Children (N = 594)			Single, Children (N = 112)			Married, Children (N = 236)		
	Interaction Term**	(95% CI)	aOR**	(95% CI)		aOR***	(95% CI)		aOR***	(95% CI)		aOR***	(95% CI)	
Non-Barrier Contraceptive Use														
Older Women in Family														
Contraceptive Communication X Descriptive Norms	0.33	(-0.63, 1.28)	--	--	--	--	--	--	--	--	--	--	--	--
Contraceptive Communication X Injunctive Norms	0.12	(-0.27, 0.50)	--	--	--	--	--	--	--	--	--	--	--	--
Peers														
Contraceptive Communication X Descriptive Norms	1.11*	(0.06, 2.15)												
No Communication, Does Not Believe Peers Use			1.00	--	--	--	--	--	--	--	--	--	--	--
No Communication, Believes Peers Use Contraceptives			0.75	(0.32,	1.79)	5.19*	(1.75,	15.37)	0.35	(0.03,	3.77)	0.47	(0.12,	1.80)
Communication, Does Not Believe Peers Use			1.27*	(1.06,	2.70)	1.12	(0.30,	4.11)	2.49	(0.57,	10.78)	0.98	(0.18,	5.36)
Communication, Believes Peers Use Contraceptives			3.36*	(1.92,	5.90)	5.80*	(2.31,	14.59)	4.29*	(1.32,	13.94)	1.25	(0.42,	3.75)
Contraceptive Communication X Injunctive Norms	0.12	(-0.27, 0.51)	--	--	--	--	--	--	--	--	--	--	--	--
Condom Use														
Older Women in Family														
Contraceptive Communication X Descriptive Norms	1.00	(-0.73, 0.72)	--	--	--	--	--	--	--	--	--	--	--	--
Contraceptive Communication X Injunctive Norms	-0.21	(-0.51, 0.08)	--	--	--	--	--	--	--	--	--	--	--	--
Peers														
Contraceptive Communication X Descriptive Norms	0.09	(-0.63, 0.80)	--	--	--	--	--	--	--	--	--	--	--	--
Contraceptive Communication X Injunctive Norms	0.09	(-0.18, 0.36)	--	--	--	--	--	--	--	--	--	--	--	--

*p < 0.05

**Adjusted for age, education, asset score, study clinic assignment, marriage, and parity

***Adjusted for age, education, asset score, and study clinic assignment

CHAPTER 5: MANUSCRIPT TWO

5.1 Introduction

In 2005, the World Health Organization stated that the provision of adequate family planning is the principal means by which to reduce pregnancy-related mortality and morbidity for women of all reproductive ages.[3] Furthermore, family planning has been found to be a key approach for countries to achieve Sustainable Development Goals (SDGs) related to health and economic well-being.[5,6] Programs to promote family planning in LMICs largely began in the 1960s due to rapid population growth following improvements in child survival. By the early 2000s, the proportion of women in LMICs using contraception increased from 10% to 60%, with large variations by geographic region, age, and marital status.[57] One of the regions where progress has been limited, particularly for AGYW, is SSA. Across the region, current contraceptive use for married AGYW, age 15-19, is 12%. Though it doubles to 24% for ages 20-24, contraceptive use still remains low. Amongst those who are unmarried and sexually active, 10% of AGYW age 15-19 and 27% of AGYW age 20-24 use contraception, respectively.[60] A common way of conceptualizing the impact of underutilization of contraception is to use a measure of unmet need for family planning. Unmet need for family planning takes a variety of forms in the literature, but is most often defined as the proportion of sexually active women who wish to delay or stop childbearing but are not using a modern contraceptive.[61,62] Across LMIC regions, unmet need for family planning is the highest in SSA for both married AGYW (27.4%) and unmarried AGYW (40.1%).[7]

Programs to increase AGYW contraceptive use in SSA have been implemented across multiple levels (societal, interpersonal, individual) through interventions that use a combination of supply-side oriented strategies and demand-generating strategies.[95,131] Supply-oriented strategies include, improving the quality of services, increasing access to contraceptives by reducing costs and providing integrated, client-centered services. Strategies to generate demand often include financial-based mechanisms, mass

media campaigns, and programs utilizing interpersonal communication. The main goal of interventions using demand-generating strategies is to increase contraceptive use by changing family planning knowledge, attitudes, and barriers through the provision of information, the shifting of social norms, and improvement self-efficacy or contraceptive related resources.[112] Evidence from interventions using demand generating strategies in SSA suggests that mass media campaigns, community-based programs, and finance-based incentives can have positive effects on increasing AGYW contraceptive use.[21–34] However, limited data are available on the components of these interventions, and related intervening variables, which are responsible for their effectiveness. For example, among the above cited studies, many measured the impact of their intervention on contraceptive knowledge, attitudes, self-efficacy, interpersonal communication, perceived barriers, and perceived social norms.[21–34] Yet, none examined whether these variables were the pathways through which intervention components increased contraceptive uptake, often citing cross-sectional design as a limitation. Identifying the intervention components, and pathways through which intervention components work, is key to developing effective family planning programs for AGYW in the future.

One such pathway is interpersonal communication. Numerous theories and conceptual perspectives suggest that interpersonal communication can influence health behaviors, such as contraceptive use, by providing a structure for the diffusion of information and the enforcement of social norms.[162,163,168,219] First, family members, peers, and intimate partners often function as role models for health behaviors. Second, conversations with and among these actors provide a mechanism for the exchange and evaluation of opinions related to health behaviors. Third, the cultural value of the modeled or discussed behaviors has the potential to impact how closely the behavior is adopted and maintained.[153,163] In sum, interpersonal communication has the potential to both shape and reinforce social norms that govern health behaviors, such as contraceptive use.

In SSA, few studies have examined the role of interpersonal communication in relation to AGYW contraceptive use. Available evidence suggests that parent-adolescent communication about reproductive health is not very common.[35,36] Similarly, studies examining the association between peer based

reproductive health conversations and AGYW contraceptive use are few and those that exist have reported mixed results.[37–40] Contrary to studies examining the influence of family member and peer communication , there is strong evidence for the relationship between intimate partner communication and AGYW contraceptive use. AGYW who discuss reproductive health topics with their intimate partners are more likely to use contraceptives compared to AGYW who do not discuss reproductive health topics with their intimate partners.[53–55]

In sum, there is evidence to suggest that contraceptive related interpersonal communication positively impacts AGYW contraceptive use in SSA. Similarly, studies reporting on existing family planning interventions in the region have found a positive effect on contraceptive related interpersonal communication as well as AGYW contraceptive use. However, none have longitudinally examined the extent to which the relationship between exposure to family planning interventions and AGYW contraceptive use is mediated by contraceptive related interpersonal communication. The objective of the present analysis is to fill this gap in the literature.

Our analysis utilizes data from Girl Power – Malawi (GPM), a quasi-experimental cohort study which assessed the impact of a multi arm intervention on care-seeking and sexual risk behaviors among AGYW. GPM compared a standard of care clinic to three clinics which provided different combinations of YFHS, empowerment sessions, and conditional cash transfers. In this study, we first examine whether exposure to overall empowerment sessions and contraceptive-specific empowerment sessions are associated with self-reported, non-barrier contraceptive use and condom use. We then examine whether contraceptive communication mediated the relationship between empowerment session exposure and self-reported, non-barrier contraceptive use and condom use. Finally, we examined whether the two mediation relationships differed by source of communication as well as marital status and parity groups (Figure 5.1).

5.2 Methods

Study Context

Malawi places among the lowest in the world on the United Nations Development Program's human development index with a ranking of 165 out of 177 countries. Of Malawi's approximately 18.1 million people, 85% live in rural areas.[186,187] The main livelihood for rural Malawians is agriculture and natural resource mining, and the majority of household consumption is spent on food. More than 85% of children attend primary school, approximately 25% attend secondary school, and 72% of adult women are literate[188]. Malawi's HIV prevalence is one of the highest in the world, with 9.2% of the adult population (aged 15-49) living with HIV [189] Fertility is higher in Malawi than many other countries in SSA, and particularly higher than in South Africa and Zimbabwe. Women have more than three children on average over their lifetime and sixty percent of women experience a first birth during adolescence (ages 14-19).[8,44]

Parent Study Description

GPM was implemented from February 2016 to August 2017 across four comparable, public-sector health clinics. All clinics were located in peri-urban areas, on a main road and had antenatal volumes >200 women per month and antenatal HIV prevalence levels >5%. The purpose of the parent study was to assess the impact of a multi arm intervention on care-seeking and sexual risk behaviors among AGYW: 1) standard of care (no intervention), 2) youth-friendly health services (YFHS), 3) YFHS + empowerment sessions, 4) YFHS + empowerment sessions + cash transfer.

In the standard of care arm, AGYW received health care in the usual way with no modifications to existing clinic infrastructure. In arms 2-4, a separate, youth friendly area was created in health clinics where study participants received integrated care (HIV testing and counseling, family planning, and STI services) away from the general clinic population with extended service hours. GPM trained existing public-sector healthcare professionals to provide judgement-free YFHS with confidentiality and respect for AGYW autonomy. In the two arms in which empowerment sessions were offered, participants were invited to attend a series of 12, monthly sessions that were facilitated by a trained counselor. In arm 4,

study participants received a cash transfer for every empowerment session they attended. The small sum of money (~$5.50) was conditional on session attendance. There were no restrictions on how the money could be spent. An independent biostatistician randomly assigned each of the four clinics to one of service delivery arms.

Content for the empowerment sessions was adapted from other evidence-based sexual and reproductive health education interventions for AGYW in SSA.[220–222] Broadly, sessions addressed HIV, sexual and reproductive health, romantic relationships, basic financial literacy, and cross-cutting skills, such as problem-solving and communication. A homework activity was assigned after each session to apply concepts learned in the session and build self-efficacy. Specific session topics were:

Session 1: The Road of Life and Goals

Session 2: Healthy Romantic Relationships

Session 3: Pregnancy and Contraception

Session 4: HIV Risk and Prevention

Session 5: Sex, Money, and Older Men

Session 6: Decisions and Self-Esteem

Session 7: Intimate Partner Violence

Session 8: Finances

Session 9: Budget, Saving, and Investing

Session 10: Social Support and Social Pressure

Session 11: Sex and Sexuality

Session 12: The Road of Life Continues

Session 2 and Session 3 were the most relevant for this analysis and encouraged participants to discuss family planning and contraception with their intimate partners, peers, and family members. Session two covered communication skills that can be applied to romantic relationships and encouraged participants to practice learned skills by discussing accessing health services together, contraceptive use, outside partnerships, and delaying sexual activity with an intimate partner. Session three covered

reproductive systems, menstrual cycles, conception, and contraceptive methods. It also encouraged participants to discuss family planning with at least one person - an intimate partner, peer, or female family member - as homework.

Parent Study Recruitment, Eligibility, Enrollment, and Retention

At each of the four clinics, sexually active AGYW were purposefully recruited through a combination of community outreach activities, referrals through invitations from other participants, and self-referral. Outreach workers visited catchment areas known to be venues for at-risk AGYW to promote GPM services and distribute study participation invitations. AGYW who brought invitation cards to GPM health clinics were then screened for eligibility. Eligibility criteria include being 15-24 years old, residing in the clinic's catchment area, sexually active, and willing to be enrolled for a one-year period. Those who were eligible and provided informed consent were enrolled and provided with three study participation referrals to give to friends who they believed would also benefit. GPM began recruitment and enrollment in February 2016. Across all four health clinics, 1,109 potential participants were screened and 1,080 were eligible. The primary reason for ineligibility was age. Study enrollment closed in August 2016 with a total of 1000 AGYW, 250 at each of the four health clinics. Enrollees were recruited through community outreach by peer educators (36%), participant referral (26%), and self-referral (44%).

Participants were followed for one year, starting from their individual enrollment date. Retention was 84% at six months and 87% at twelve months. Primary reasons for non-retention included leaving the catchment area (52%), being busy (25%), and being non-locatable (18%).

Parent Study Data Collection and IRB Approval

This analysis used two sources of data collected by GPM, an interviewer administered behavioral survey and attendance logs from empowerment sessions. The behavioral survey was administered at three time points—at study enrollment (n =1000), month six (n = 853), and one year (n = 873). Behavioral surveys were conducted by trained young, female interviewers in Chichewa, the local language, using Android tablets and Open Data Kit (ODK) software. The behavioral survey contained questions about demographics, socio-economic status, health communication, past and current care-

seeking behaviors, sexual history, and psychosocial outcomes. The twelve-month version of the behavioral survey also included assessments of the empowerment sessions as well as the cash transfer. Attendance for each empowerment session was logged by the facilitator. All study activities and data collection were completed by August 2017.

GPM received approval from the University of North Carolina Institutional Review Board and the Malawi National Health Sciences Research Committee. Voluntary written informed consent was obtained from AGYW 18-24 years old. Assent and permission by a parent, guardian, or authorized representative were obtained from AGYW 15-17 years old. All informed consent procedures documents were read and discussed aloud in Chichewa and, in cases of limited literacy, an impartial witness was present.

Analytical Sample

GPM was designed to assess the impact of a multi arm intervention for AGYW. Participants in each of the intervention arms (clinics 2-4) received YFHS in addition to being offered empowerment sessions (clinic 3) or empowerment sessions and a conditional cash transfer (clinic 4). Participants in the standard of care arm (clinic 1) received services in the usual way. Given our interest in assessing the impact of empowerment sessions, we decided to limit our analyses to participants in clinics 2-4. Excluding participants in the standard of care arm provides an analytical sample where everyone is exposed to YFHS which allows us to examine the impact of the empowerment sessions rather than YFHS + empowerment sessions while still maintaining an intention-to-treat approach.

Measures

Outcome Variables: The outcomes of interest in this analysis were two dichotomous variables that measured self-reported current non-barrier contraceptive use and self-reported current condom use, based on responses to the baseline behavioral survey. All participants were asked if they have ever used the daily hormonal contraceptive pill, non-hormonal intrauterine device (IUD), hormonal injection, hormonal implants, male condoms, and female condoms. If a participant indicated they had ever used one of these methods, they were asked if they were currently using the method. To create the non-barrier

contraceptive use variable, a positive response was recorded if the participant reported currently using any of form of non-barrier contraception at baseline. Non-barrier methods included the daily hormonal contraceptive pill, IUD, hormonal injection, and hormonal implants. A null response was recorded if the participant reported not using any form of non-barrier contraception at baseline. To create the condom use variable, a positive response was recorded if the participant reported currently using either male or female condoms. A null response was recorded if the participant reported not currently using any type of condom. No participants responded "No Response" to any of the contraception measures in the behavioral survey. AGYW who indicated that they were pregnant during the one-year survey (N = 61) were dropped from the analytical sample, as non-barrier contraceptive use would not be relevant to pregnancy prevention for these individuals. The behavioral survey items used to construct the outcome variable are detailed in Table 5.1.

Table 5.1 Outcomes Variables for Aim 2

Variable Name	Measure	Response Categories
Non-Barrier Contraceptive Use (One Year)	Non-Barrier Contraceptive Use *Survey Questions:* Are you currently using birth control pills? Are you currently using Depo-provera, the 3-month injectable? Are you currently using an intrauterine device (the loop)? Are you currently using a contraceptive implant? *Response Options for all Survey Questions:* Yes No Don't Know	Recoded as: 1 = Yes (any method) 0 = No (no method)
Condom Use (Baseline)	*Survey Questions:* Are you currently using male condoms? Are you currently using female condoms? *Response Options for all Survey Questions:* Yes No No Response	Recoded as: 1 = Yes (any type of condom) 0 = No

Independent Variables: Two independent variables were used to measure intervention exposure. The first independent variable was intention to treat measure assessing overall empowerment sessions exposure and it was defined as a dichotomous variable measuring whether AGYW were assigned to Clinic 2 (unable to receive empowerment sessions) versus Clinic 3 or Clinic 4 (able to receive empowerment sessions). The second independent variable was contraceptive-communication oriented empowerment session exposure and was defined as a dichotomous variable measuring whether the participant attended both session two and session three. Session two covered communication skills that can be applied to romantic relationships and encouraged participants to practice learned skills by

discussing accessing health services together, contraceptive use, outside partnerships, and delaying sexual activity with an intimate partner. Session three covered reproductive systems, menstrual cycles, conception, and contraceptive methods. It also encouraged participants to discuss family planning with at least one person - an intimate partner, peer, or female family member - as homework. These empowerment sessions were selected because they encouraged participants to speak with social network members (older women in the family, peers, and intimate partners) about contraceptive use. Both empowerment sessions were completed before six-month data collection began. The behavioral survey items and empowerment sessions attendance data used to construct the two independent variables are detailed in Table 5.2.

Table 5.2 Independent Variables for Aim 2

Variable Name	Measure	Response Categories
Intervention Exposure (Overall)	Participant exposed to intervention *Survey Question:* What Girl Power Clinic did you enroll? *Response Options:* Clinic 1 Clinic 2 Clinic 3 Clinic 4	0 = Clinic 2 1 = Clinic 3 and Clinic 4
Intervention Exposure (Empowerment Sessions 2 & 3)	Participant attended Empowerment Session 2 and Empowerment Session 3	1 = Yes (Session 2 & Session 3) 0 = No (Only Session 2, Only Session 3, or Neither Session)

Mediator Variables: The mediators in this analysis were three dichotomous contraceptive communication variables measuring whether the participant had ever had a contraceptive conversation with older women in their family, a contraceptive conversation with their peers, or a contraceptive conversation with an intimate partner at six months, respectively. The reference to contraception in these variables was general and did not differentiate by type of contraception (hormonal, non-barrier, etc.). A positive response was recorded for each of the three variables if the participant responded "Yes" about having ever a conversation about contraception with older women in the family, peers, and intimate

partners. A null response was recorded for each of the three variables if the participant responded "No" or "Don't Know" about having a contraceptive related conversation with older women in the family, peers, and intimate partners. Only 1 participant responded "Don't Know" across each of the three variables. These variables were measured at six-month data collection. To control for the effects of these mediators prior to the intervention, baseline levels of the same variables were entered as control variables is analyses. The behavioral survey items used to construct the mediator variables are detailed in Table 5.3.

Table 5.3 Mediator Variables for Aim 2

Variable Name	Measure	Response Categories
Contraceptive Communication with Older Women in the Family (Six Months)	*Survey Question:* Have you ever talked to older women in your family about family planning or contraception? *Response Options:* Yes No Don't Know	Recoded as: 1 = Yes 0 = No or Don't Know
Contraceptive Communication with Peers (Six Months)	*Survey Question:* Have you ever talked to your close friends about family planning or contraception? *Response Options:* Yes No Don't Know	Recoded as: 1 = Yes 0 = No or Don't Know
Contraceptive Communication with Partners (Six Months)	*Survey Question:* Have you ever talked to a partner about family planning or contraception? *Response Options:* Yes No Don't Know	Recoded as: 1 = Yes 0 = No, Don't Know, Did Not Have Partner

Control Variables: Demographic control variables included age (in continuous single years), education, assets, marriage, and parity at baseline. These variables have been shown to be associated with contraceptive use for AGYW in LMICs, and SSA in particular.[56] Educational attainment was a

dichotomous variable measuring whether or not the participant completed primary education. Achieving universal primary education is an SDG, has been associated with adolescent sexual and reproductive health outcomes, and is a common indicator of measuring socio-economic position across studies of AGYW in LMICs. [193,194] Assets was a dichotomous variable measuring whether the participant scored two or greater on an asset scale. The scale was the sum of household assets from a list of 13 items (radio, phone, television, fridge, bike, stove, microwave, washing machine, mattress, computer, satellite dish, motorcycle car). A cut off point of two for the asset scale has been previously used with this population.[195] Asset-based indicators are also commonly used to measure standard of living across studies in LMICs.[193] Marriage was defined as a dichotomous variable measuring whether the participant was never married (single or no-response) or ever married (married, separated/divorced, widowed). Grouping those who are married, separated, divorced, or widowed together as ever married is consistent with other adolescent sexual and reproductive health literature and reports from LMICs. In addition, numerous qualitative studies indicate that contraception is acceptable only after marriage in Malawi.[27,91,92] There was only 1 participant who responded "no response" to the marriage item on the behavioral survey. Parity was defined as a dichotomous variable measuring whether the participant had any living children. To control for characteristics related to overall tendency to attend sessions, we included number of total empowerment sessions attended as a continuous control variable. This information was taken from the empowerment session attendance logs. The behavioral survey items and empowerment sessions attendance data used to construct the control variables are detailed in Table 5.4.

Table 5.4 Control Variables for Aim 2

Variable Name	Survey Question	Response Categories
Age **(Baseline)**	*Survey Question:* How old are you? *Response Options:* Integer (years)	Number in years (continuous)
Education **(Baseline)**	*Survey Question:* What is the highest level of education you have successfully completed? *Response Options:* Standard 1 Standard 2 Standard 3 Standard 4 Standard 5 Standard 6 Standard 7 Standard 8 Form 1 Form 2 Form 3 Form 4 Post-Secondary No response	Recoded as: 1 = Completed Primary Education (Standard 8 or greater) 0 = Less than Standard 8 or No Response
Assets **(Baseline)**	*Survey Question:* Asset Score: Do you or any other household member own any of the following? *Response Options:* Radio Mobile Phone Television Fridge Bicycle Electric or Gas Stove Microwave Washing Machine Mattress Computer Satellite Dish Motorcycle/Scooter Car or Another Vehicle None	Recoded as: 1 = Greater than 2 assets 0 = Less than 2 assets

Variable Name	Survey Question	Response Categories
Marital Status (Baseline)	*Survey Question:* What is your current marital status? *Response Options:* Single Married Separated/Divorced Widowed No Response *Recoded as:* 1 = Yes, Living Children 0 = No Living Children	Recoded as: 1 = Ever Married (Married, Separated, Divorced, Widowed) 0 = Single or No Response
Parity (Baseline)	*Survey Question:* How many living children do you have, that you have given birth to? *Response Options:* Integer (number of children)	Recoded as: 1 = Yes, Has Children 0 = No, Does Not Have Children
Non-Barrier Contraceptive Use (Baseline)	Non-Barrier Contraceptive Use *Survey Questions:* Are you currently using birth control pills? Are you currently using Depo-provera, the 3-month injectable? Are you currently using an intrauterine device (the loop)? Are you currently using a contraceptive implant? *Response Options for all Survey Questions:* Yes No No Response	Recoded as: 1 = Yes (any method) 0 = No (no method)
Contraceptive Communication with Older Women in the Family (Baseline)	*Survey Question:* Have you ever talked to older women in your family about family planning or contraception?	Recoded as: 1 = Yes 0 = No or Don't Know

Variable Name	Survey Question	Response Categories
	Response Options: Yes No Don't Know	
Contraceptive Communication with Peers (Baseline)	*Survey Question:* Have you ever talked to your close friends about family planning or contraception? *Response Options:* Yes No Don't Know	Recoded as: 1 = Yes 0 = No or Don't Know
Contraceptive Communication with Partners (Baseline)	*Survey Question:* Have you ever talked to a partner about family planning or contraception? *Response Options:* Yes No Don't Know	Recoded as: 1 = Yes 0 = No or Don't Know
Number of Empowerment Sessions Attended	Number of Empowerment Sessions Attended Range: 0-12 (Continuous)	Number of Empowerment Sessions Attended Range: 0-12 (Continuous)

Stratification Variables: To explore whether the indirect effects of intervention exposure on non-barrier contraceptive use differed by marriage and parity, four marriage and parity groups were created. These groups included single participants without children, single participants with children, married participants without children, and married participants with children. Our descriptive analyses revealed that 1% of married participants without children were currently using non-barrier method contraception at baseline. Given the lack of variability in our main outcome of interest, married participants without children were dropped from the analytical sample. Subsequently, three marriage and parity groups were used in the analysis: single participants without children, single participants with children, and married participants with children. The behavioral survey items used to construct the stratification variables are detailed in Table 5.5.

Table 5.5 Stratification Variables for Aim 2

Variable Name	Measure	Coded Values
Combined Marriage and Parity Variable (Baseline)		1 = Single, No Children 2 = Single, Children 3 = Ever Married, No Children* 4 = Ever Married, Children

*Dropped from analytical sample

Analyses

First, we cleaned the data and checked for missingness by running frequencies for each of the variables used in this analysis. There were no issues with missing data on variables of interest, as all had <3% missing or non-response. We also checked for inconsistencies and multicollinearity among outcome, independent, and mediator variables by using bivariate descriptive statistics including frequencies (Table 5.6) and correlations (Table 5.7).

Second, we calculated the number and proportion of participants with each baseline characteristic and compared across marriage and parity groups using chi-square tests. Then, we calculated the number and proportion of participants who were exposed to empowerment sessions, had contraceptive conversations, and used non-barrier contraceptive methods/condoms and compared across marriage and parity using chi-square tests (Table 5.8).

Third, we examined the total effect and meditation effects using four steps outlined by Hayes and Mackinnon.[223,224] The paths referenced in the following section are graphically depicted in Figure 5.1. In step one, we first estimated path c, which is the total effect of the independent variable on the outcome variable. Path c was estimated by regressing contraceptive use at one-year on empowerment session exposure, controlling for baseline age, education, asset score, marriage, parity, contraceptive use, older women in the family contraceptive communication, peer contraceptive communication, and intimate partner contraceptive communication. In step two, we estimated paths a_1-a_3, which are the associations between the independent variable and the mediators. We estimated paths a_1-a_3 by regressing family contraceptive communication, peer contraceptive communication, and partner contraceptive communication at six-months on empowerment session exposure, controlling for baseline age, education,

asset score, marriage, parity, contraceptive use, older women in the family contraceptive communication, peer contraceptive communication, and intimate partner contraceptive communication. In step 3, we estimated paths b_1-b_3 and c'. Paths b_1-b_3 are the association between the mediators and the outcome. Path c' is the direct effect of independent variable on the outcome, controlling for mediators. We estimated paths b_1-b_3 and c' by regressing contraceptive use at one-year use on family contraceptive communication, peer contraceptive communication, and intimate partner contraceptive communication at six-months and empowerment session exposure, controlling for baseline age, education, asset score, marriage, parity, non-barrier contraceptive use, family contraceptive communication, peer contraceptive communication, and intimate partner contraceptive communication. When both the a and b paths associated with relationships among independent, mediator, and outcome variable were significant ($p<0.05$), a fourth step was taken to determine whether the indirect effect (mediated effect), defined by the product of the regression parameter estimates for the a and b paths, was statistically significant using bootstrapping approach.

We executed steps 1-4 four times to incorporate each of the two independent variables of interest and our two outcomes of interest. The first time, our independent variable of interest, empowerment session exposure, was defined as AGYW who were assigned to clinic 3 and 4 versus AGYW assigned to clinic 2. Moving forward, this variable will be called "Overall Session Exposure". Our outcome of interest was non-barrier contraceptive use. The second time, our independent variable of interest was overall session exposure and our outcome of interest was condom use. The third time, our independent variable of interest, empowerment session exposure, was defined as AGYW who attended both session 2 and session 3 versus only session 2, session 3, or neither session. Moving forward, this variable will be called "Contraceptive-Specific Session Exposure". Our outcome variable of interest was condom use. The fourth time, our independent variable of interest was contraceptive-specific session exposure and our outcome of interest was condom use. For each of the four times, we ran our analyses first for the entire sample and then for each of the three marriage and parity groups: single participants without children,

single participants with children, and married participants without children. Marriage and parity were not included in the set of control variables when estimates were run for the three marriage and parity groups.

Given that the outcomes of interest (non-barrier contraceptive use and condom use) and three mediators (family, peer, and intimate partner contraceptive communication) are dichotomous, we used generalized linear models with a logit link and a binominal distribution to estimate mediation pathways and a bias-corrected bootstrapping approach (5,000 samples) to estimate 95% confidence intervals for indirect (mediated) effects.[225,226] Bootstrapping, which is a nonparametric method of estimating standard errors and CIs, does not make assumptions about the sampling distribution of the indirect effect and provides more accurate Type I error rates and greater power for detecting indirect effects than alternative methods.[223,224,227] All analyses were conducted in using StataSE, version 14.2, using a binary mediation package (Stata Corp., College Station, TX).

Fritz. et al determined through simulations that the sample size needed to achieve 0.80 power using a bias-corrected bootstrapping approach with mediation analyses would be at a minimum 462.[228] Given that our analytical sample included 517 AGYW, we had greater than 0.80 power for analyses for our overall sample but not our stratified groups.

5.3 Results

Characteristics of Study Population at Baseline

Complete information for the variables of interest at all three time points was available for 592 of the 750 AGYW assigned to clinics 2-4. Of the 592 AGYW, 31 were married without children, 25 were pregnant at baseline, and 41 were pregnant at one year. These three categories of AGYW were dropped from the analytic sample. Table 5.8 presents the baseline demographic characteristics of the final analytical sample (N = 517).

Median age was 19 (interquartile range 17-21 years). The majority of participants completed primary education (73%), lived in households with greater than two assets (64%), and had two living parents (64%). Ninety-nine percent had experienced sexual debut and less than half had living children (40%) or were ever married (28%). At baseline, at least half of all participants had spoken to their peers

(65%) and partners (50%) about contraception, but not to older women in their family (43%). Use of non-barrier contraceptives at baseline was 33% but varied across marriage and parity groups (single participants without children (9%), single participants with children (50%), married participants with children 76%) ($p < 0.001$)). %). The proportion of AGYW using male or female condoms at baseline was 67% and varied across marriage and parity groups (single participants without children (79%), single participants with children (68%), married participants with children (35%) ($p < 0.001$)).

Total Effects and Direct Effects of Empowerment Sessions for All AGYW in Clinics 2-4

Overall Session Exposure Among all the participants in our analytic sample in clinics 2-4 (N=517), 70% had the opportunity to attend empowerment sessions (N = 361) because they were assigned to clinics 3 or 4. At one-year data collection, 37% of participants had attended all 12 sessions (N = 137) and the median number of sessions attended was 10 (IQR 6-12). At six months-data collection, sessions 1-12 had been offered at least once. Eight percent of participants (N = 28) had completed all sessions and the median number of sessions attended was 8 (IQR 5-10) (Table 5.9).

There was a positive association between overall session exposure (i.e., assignment to clinic 3 or 4) and non-barrier contraceptive use at one year ($B_{path\_c} = 1.65$, 95% CI: 0.89, 2.40), after adjusting for the baseline measures of non-barrier contraceptive use, contraceptive communication, and demographic control variables. Potential mediation of this effect by contraceptive communication was indicated by the fact that the strength of the association between overall session exposure and non-barrier contraceptive use at one year decreased, but remained positive and significant, after including contraceptive communication mediators at six months ($B_{path\_c'} = 1.63$, 95% CI: 0.87, 2.39) (Table 5.10).

There was also a positive association positive association between overall session exposure and condom use at one year ($B_{path\_c} = 0.72$, 95% CI: 0.18, 1.26), after adjusting for the baseline measures of condom use, contraceptive communication, and demographic control variables. Potential mediation of this effect by contraceptive communication was indicated by the fact that the strength of the association between overall session exposure and condom use at one year decreased slightly, but remained positive

and significant, after including contraceptive communication mediators at six months ($B_{path\_c'}$ = 0.718, 95% CI: 0.18. 1.26) (Table 5.11)

Contraceptive Specific Session Exposure Half of the total sample (N = 517) attended both session two and session three (53%) (Table 5.9). Similar to the analysis of overall session exposure, there was a positive association between contraceptive-specific session exposure and non-barrier contraceptive use at one year (B_{path_c} = 1.12, 95% CI: 0.59, 1.65), after adjusting for total number of empowerment sessions attended and baseline measures of non-barrier contraceptive use, contraceptive communication, and demographic control variables. Again, potential mediation was indicated in that the strength of the association between contraceptive-specific session exposure and non-barrier contraceptive use at one year decreased, but remained positive and significant, after including contraceptive communication mediators at six months ($B_{path\_c'}$ = 1.05, 95% CI: 0.52, 1.59) (Table 5.12).

There was also a positive association between contraceptive-specific session exposure and condom use at one year (B_{path_c} = 0.61, 95% CI: 0.11, 1.11), after adjusting for total number of empowerment sessions attended and baseline measures of condom use, contraceptive communication, and demographic control variables. Again, potential mediation was indicated in that the strength of the association between contraceptive-specific session exposure and condom use at one year decreased, but remained positive and significant, after including contraceptive communication mediators at six months ($B_{path\_c'}$ = 0.58, 95% CI: 0.13, 1.14) (Table 5.13).

Mediation Effects for All AGYW in Clinics 2-4

Overall Session Exposure There was no association between overall session exposure and any of the three sources of contraceptive communication at six months (older women in the family (B_{path_a1} = -0.21, 95% CI: -0.69, 0.27), peers (B_{path_a2} = 0.18, 95% CI-0.43, 0.79), or intimate partners (B_{path_a3} = 0.26, 95% CI: -0.28, 0.79)). Only contraceptive communication with intimate partners at six months was positively associated with non-barrier contraceptive use at one year (B_{path_b3} = 1.08, 95% CI: 0.58, 1.59). There was no association between contraceptive communication with older women in the family (B_{path_b1} = -0.14, 95% CI: -0.67, 0.39) or peers (B_{path_b2} = 0.02, 95% CI: -0.65, 0.70) and non-barrier contraceptive

use at one year. Given that all corresponding a and b paths were not significant, we can conclude that the relationship between overall session exposure and non-barrier contraceptive use was not mediated by contraceptive communication with older women in the family, peers, or intimate partners at six-months (Table 5.10).

Turning to condom use, there was no association between overall session exposure and any of the three sources of contraceptive communication at six months (older women in the family (B_{path_a1} = -0.27, 95% CI: -0.75, 0.22), peers (B_{path_a2} = 0.14, 95% CI: -0.48, 0.75), or intimate partners (B_{path_a3} = 0.21, 95% CI: -0.32, 0.75)). There was also no association between contraceptive communication with older women in the family (B_{path_b1} = -0.05, 95% CI: -0.62, 0.52), peers (B_{path_b2} = 0.46, 95% CI: -0.23, 1.15), or intimate partners (B_{path_b3} = -0.13, 95% CI: -0.72, 0.47). and condom use at one year. Given that all corresponding a and b paths were not significant, we can conclude that the relationship between overall session exposure and condom use was not mediated by contraceptive communication with older women in the family, peers, or intimate partners at six-months (Table 5.11).

Contraceptive Specific Session Exposure Contraceptive-specific session exposure was positively associated with contraception communication with intimate partners (B_{path_a3} = 0.61, 95% CI: 0.18, 1.04) but not with older women in the family (B_{path_a2} = 0.10, 95% CI: -0.30, 0.49) or peers (B_{path_a2} = 0.11, 95% CI: -0.39, 0.60). Similarly, contraceptive communication with intimate partners was positively associated with non-barrier contraceptive use at one year (B_{path_b3} = 1.01, 95% CI: 0.51, 1.52) but there was no association between contraceptive communication with older women in the family (B_{path_b1} = -0.21, 95% CI: -0.73, 0.32) or peers (B_{path_b2} = 0.03, 95% CI: -0.64, 0.72) and non-barrier contraceptive use at one year. Given that the corresponding a and b paths for intimate partner communication were significant, we conducted a Sobel test to estimate the significance of the indirect effect. We found that the relationship between contraceptive-specific session exposure and non-barrier contraceptive use at one year was mediated by contraceptive communication with intimate partners (indirect effect = 0.04, 95% CI: 0.01, 0.08) (Table 5.12).

Turning to condom use, contraceptive-specific session exposure was positively associated with contraception communication with intimate partners (B_{path_a3} = 0.61, 95% CI: 0.17, 1.04) but not with older women in the family (B_{path_a2} = 0.19, 95% CI: -0.31, 0.48) or peers (B_{path_a2} = 0.11, 95% CI: -0.39, 0.60). There was no association between contraceptive communication with older women in the family (B_{path_b1} = -0.09, 95% CI: -0.66, 0.48), peers (B_{path_b2} = 0.50, 95% CI: -0.19, 1.18), or intimate partners (B_{path_b3} = -0.19, 95% CI: -0.79, 0.41). and condom use at one year. Given that all corresponding a and b paths were not significant, we can conclude that the relationship between contraceptive-specific session exposure and condom use was not mediated by contraceptive communication with older women in the family, peers, or intimate partners at six-months (Table 5.13).

Mediation Effects for Marriage and Parity Groups for AGYW in Clinics 2-4

When we stratified results by the three marriage and parity groups, no group had a sufficient sample size to detect statistical significance with a bias-corrected bootstrapping approach (minimum N = 462): single AGYW without children (N = 310), single AGYW with children (N = 64), married AGYW with children (N = 143). Given our low sample sizes, the following results are highly susceptible to Type II Error.

Overall Session Exposure The relationship between overall session exposure and non-barrier contraceptive use at one-year was not mediated by contraceptive communication with any source for any of the marriage and parity groups (single AGYW without children (total indirect effect = 0.012 95% CI: -0.014, 0.07), single AGYW with children (total indirect effect = -0.20, 95% CI: -0.55, 0.15), or married AGYW with children (total indirect effect = -0.02, 95% CI: -0.11, 0.08)) (Table 5.10).

Similarly, the relationship between overall session exposure and condom use at one-year was not mediated by contraceptive communication with any source for any of the marriage and parity groups (single AGYW without children (total indirect effect = 0.002, 95% CI: -0.04, 0.04), single AGYW with children (total indirect effect = 0.02, 95% CI: --0.48, 0.52), or married AGYW with children (total indirect effect = 0.03, 95% CI: -0.11, 0.17)) (Table 5.11).

Contraceptive Specific Session Exposure The relationship between contraceptive-specific session exposure and non-barrier contraceptive use at one-year was mediated contraceptive communication with intimate partners for single AGYW without children (indirect effect = 0.06, 95% CI: 0.01, 0.12) (Table 5.12).

The relationship between contraceptive specific session exposure and condom use at one-year was not mediated by contraceptive communication with any source for any of the marriage and parity groups (single AGYW without children (total indirect effect = 0.001, 95% CI: -0.05, 0.06), single AGYW with children (total indirect effect = 0.08, 95% CI: -0.19, 0.35), or married AGYW with children (total indirect effect = 0.01, 95% CI: -0.12, 0.14)) (Table 5.13).

Sensitivity Analysis of Total, Direct, and Mediation Effects for Clinics 2 & 3

Empowerment session were offered to all participants in Clinic 3 and Clinic 4. Participants in Clinic 4 also received a cash transfer conditional on empowerment session attendance. Given our interest in examining the effect of only empowerment sessions, our intention was to compare participants in Clinic 2 (YFHS) and Clinic 3 (YFHS + empowerment sessions). However, restricting our sample to participants in Clinic 2 & 3 would reduce power to less than 0.80 and increase the possibility of Type II error. In light of this limitation, we expanded our sample to include participants in Clinics 2-4. However, we conducted a set of mediation analyses for participants in Clinics 2 & 3 and found results similar to those from our analyses for Clinics 2-4.

Overall Session Exposure There was a positive association between overall session exposure and non-barrier contraceptive use at one year (B_{path_c} = 0.93, 95% CI: 0.05, 1.82), after adjusting for the baseline measures of non-barrier contraceptive use, contraceptive communication, and demographic control variables. Potential mediation of this effect by contraceptive communication was indicated by the fact that the strength of the association between overall exposure to overall empowerment sessions and non-barrier contraceptive use at one year decreased, but remained positive and significant, after including contraceptive communication mediators at six months ($B_{path\_c'}$ = 0.92, 95% CI: 0.02, 1.82) (Table 6.12). However, an examination of the indirect effects revealed that contraceptive communication with older

women in the family (indirect effect = 0.02, 95% CI: -0.02, 0.06), peers (indirect effect = 0.004, 95% CI: -0.02, 0.03), and intimate partners (indirect effect = -0.02, 95% CI: -0.07, 0.03) did not mediate the relationship between overall empowerment session exposure and non-barrier contraceptive use at one year (Table 5.14).

Turning to condom use, we found that there was no association between overall session exposure and condom use at one year after adjusting for total number of empowerment sessions attended and baseline measures of condom use, contraceptive communication, and demographic control variables. The relationship between overall session exposure and condom use at one-year was not mediated by contraceptive communication at six months with older women in the family (indirect effect = 0.02, 95% CI: -0.02, 0.05), peers (indirect effect = 0.004, 95% CI: -0.02, 0.03), and intimate partners (indirect effect = -0.02, 95% CI: -0.07, 0.03).

Contraceptive Specific Sessions There was a positive association between contraceptive-specific session exposure and non-barrier contraceptive use at one year (B_{path_c} = 0.61, 95% CI: 0.12, 1.10), after adjusting for the baseline measures of non-barrier contraceptive use, contraceptive communication, and demographic control variables. Potential mediation of this effect by contraceptive communication was indicated by the fact that the strength of the association between contraceptive-specific session exposure and non-barrier contraceptive use at one year decreased, but remained positive and significant, after including contraceptive communication mediators at six months ($B_{path\_c'}$ = 0.51, 95% CI: 0.23, 1.24). Examination of the indirect effects revealed that only contraceptive communication with intimate partners (indirect effect = 0.03, 95% CI: 0.00, 0.07) mediated the relationship between contraceptive-specific session exposure and non-barrier contraceptive use at one year.

Turning to condom use, we found that there was no association between contraceptive-specific session exposure and condom use at one year after adjusting for total number of empowerment sessions attended and baseline measures of condom use, contraceptive communication, and demographic control variables. The relationship between contraceptive-specific session exposure and condom use at one-year was not mediated by contraceptive communication at six months with older women in the family (indirect

effect = 0.004, 95% CI: -0.02, 0.03), peers (indirect effect = 0.004, 95% CI: -0.02, 0.03), and intimate partners (indirect effect = -0.01, 95% CI: -0.04, 0.02).

5.4 Discussion

The main objectives of this study were to 1) examine whether exposure to empowerment sessions was associated with contraceptive use and 2) whether the relationship between exposure to empowerment sessions and contraceptive use was mediated by contraceptive communication. We found that exposure to empowerment sessions was positively associated with non-barrier contraceptive use and that the relationship was mediated by contraceptive communication. However, there were notable differences in the association across type of empowerment session exposure, source of contraceptive communication, and marital status and parity groups. We also found that exposure to empowerment sessions was positively associated with condom use but the relationship was not mediated by contraceptive communication.

Overall session exposure and contraceptive-specific session exposure were both positively associated with non-barrier contraceptive use. However, contraceptive communication was a significant mediator only for the relationship between contraceptive-specific session exposure and non-barrier contraceptive use. These results suggest that general exposure, or overall session exposure, does not encourage AGYW to speak with their social network members about contraception. Rather, it might be the provision of contraceptive specific information and communication specific skills through sessions 2 & 3 that is effective at getting AGYW to speak to partners. This finding is largely consistent with the purpose of the larger GPM intervention as well as the existing behavior change literature. First, GPM was designed to address the clinical, behavioral, and structural challenges that AGYW face to improving their sexual and reproductive health. The empowerment sessions covered a wide range of topics that are known to be risk factors for care seeking as well as sexual behaviors: self-esteem, social support, relationships with intimate partners, communication, and finances. In addition, empowerment sessions were provided in conjunction with YFHS and, for those in Clinic 4, a conditional cash transfer.[229] Given that GPM was attempting to off-set system level barriers such as clinical services and poverty, it is unsurprising that

contraceptive communication was not the primary pathway through which the overall intervention worked. Second, numerous conceptual perspectives across the health behavior literature indicate that interventions that provide both behavior specific knowledge and behavioral specific skills are likely to achieve changes in the behavior of interest.[230] Our results similarly showed that providing AGYW with contraceptive information and interpersonal communication skills has the potential to increase contraceptive communication and in turn, increase non-barrier contraceptive use. Taken together, these findings suggest that contraceptive communication is an important and modifiable determinant of AGYW non-barrier contraceptive use.

Intimate partner contraceptive communication was the only significant mediator between contraceptive-specific empowerment sessions and non-barrier contraceptive use. This result is important given the existing literature on relationship-related barriers to AGYW contraceptive use. First, contraceptive communication with intimate partners is an important determinant of AGYW contraceptive use but couple-based communication about family planning has been found to be infrequent.[56,65] Second, prevailing gender norms in the region emphasize male-dominated decision making regarding sexual and reproductive health issues.[56,88,90] Third, norms related to femininity often influence AGYW into submissive roles and prevent them from asserting themselves in their sexual relationships.[231] Given this complex relationship context, interventions that equip AGYW to broach the topic of contraception with their partners but also counteract existing gender imbalances in family planning decision making are vital. Furthermore, while it is possible to use non-barrier contraceptive methods (pills, injectables, IUDs, and implants) discretely, studies among AGYW in the region have found that concealment of contraceptive use generally contributes to shorter duration of use and higher discontinuation rates.[56,225] Family planning interventions that empower AGYW to openly communicate with partners about contraception have the potential to help AGYW not only initiate non-barrier contraceptive use but also continue it.

We observed an increase in contraceptive communication with peers at each time point of the behavioral survey. However, contraceptive-specific session exposure was not associated with increased contraceptive communication with peers and contraceptive communication with peers did not mediate the

relationship between contraceptive-specific session exposure and non-barrier contraceptive use. This result was surprising given that peers have been found to be important socializing agents during adolescence.[153,232] Furthermore, empowerment sessions, in the context of YFHS, were intended to be opportunities for AGYW to regularly meet and discuss sexual, reproductive, and life-related issues in a judgement free environment. One possible explanation might be that contraceptive communication with peers occurred during clinic visits or the sessions and thus there was little need to discuss the topics with additional friends. Future research on the types of peers AGYW engage with, and the places where contraceptive conversations occur, and the content of peer-based contraceptive communication would help to elucidate our findings.

Similar to peers, we observed an increase in contraceptive communication with older women in the family at each time point of the behavioral survey. However, contraceptive-specific session exposure was not associated with increased contraceptive communication with older women in the family and contraceptive communication with older women in the family did not mediate the relationship between contraceptive-specific session exposure and non-barrier contraceptive use. These results reflect existing research from SSA settings that show that contraceptive communication with family members is very limited.[36,224] Barriers to contraceptive communication among AGYW and family members include sex being a taboo topic, lack of parental contraceptive knowledge, and a perception that talking about contraception encourages sex.[224–226] Furthermore, AGYW who initiate conversations about sex and contraception with parents are seen as disrespectful.[36,224–227] Given these barriers, it is unsurprising that even AGYW exposed to the contraceptive-specific empower sessions would still be wary of discussing contraception with older women in their family. Family planning interventions at the community level might be a more effective channel for changing perceptions related to AGYW contraceptive use for older adults, which in turn might increase contraceptive communication with AGYW.

Overall empowerment session exposure and contraceptive-specific empowerment exposure were both associated with condom use but the relationships were not mediated by contraceptive communication with any source. These results suggest although GPM was effective at increasing condom

uptake among AGYW, contraceptive communication was not the pathway through which the intervention worked. In comparison to positive association between intimate partner communication and non-barrier contraceptive use, the null association between intimate partner communication and condom use is surprising given that AGYW have to negotiate condom use with their partners, which inherently involves some form of discussion. Given that the behavioral survey asked about general contraception communication, without differentiating by type (hormonal, non-barrier, condoms, etc.), there is a possible disconnect in regard to our two contraceptive outcomes. Future research that untangles the influence of non-barrier contraceptive communication from condom-related communication on contraceptive use is important.

Our interest in examining differences in mediation by marriage and parity was compromised by our low sample sizes for each of the three groups. Though our results are highly susceptible to Type II error, we did find that communication with intimate partners mediated the relationship between exposure to contraceptive-specific empowerment sessions and non-barrier contraceptive use for single AGYW without children. The relationship between contraceptive-specific empowerment sessions and non-barrier contraceptive use was not mediated by contraceptive communication with any source for single AGYW with children or married AGYW with children. One possible explanation for these results might be related to contraceptive norms in Malawi. Qualitative studies have found that contraception is socially endorsed for women who are married or who are have proven their fertility.[27,91,92] AGYW who already have children may not feel the need to discuss their interest in contraceptive use with social network members.

Despite a high prevalence of condom use among our study population, we found no association between social influence factors and condom use. A possible explanation for this result might be that condom use and non-barrier contraceptive use are different behaviors and thus have different determinants at the interpersonal level. The null association between intimate partner communication and condom use is surprising given that AGYW have to negotiate condom use with their partners, which is inherently involves communication. Given that the behavioral survey asked about general contraception

communication, without differentiating by type (hormonal, non-barrier, condoms, etc.), there is a possible disconnect in regard to our two contraceptive outcomes. Future research that untangles the influence of non-barrier contraceptive communication from condom-related communication is important.

5.5 Limitations

There are limitations to this study that warrant discussion. First, the way contraceptive communication was measured by the behavioral survey weakens our ability to make meaningful inferences. At each time point, participants were asked if they had *ever* spoken with a communication source about contraception, rather than spoken with a contraceptive source since the last survey, limiting our ability to know whether the conversations took place before the study, during the study, or both. As temporality is a critical part of mediation analyses, this is an important limitation. Relatedly, the behavioral survey asked about general contraception communication, it did not differentiate by type (hormonal, non-barrier, condoms, etc.). This creates a disconnect with our use of non-barrier contraceptive use as an outcome. Second, contraceptive use data are based on self-report which can be unreliable due to social desirability issues or memory challenges. Third, we were not able to assess fertility intention or unmet need with the questions in the behavioral survey. It is possible that AGYW were not using contraception in order to become pregnant. Fourth, participants in clinic four received empowerment sessions and a conditional cash transfer. We were not able to control for the effect of this monetary incentive without excluding clinic four participants and reducing our sample size. Sensitivity analyses among clinic two and three participants showed that main effects and mediation effects reflected our findings for participants in clinics 2-4.

5.6 Conclusion

Our results suggest that overall exposure to empowerment sessions as well as exposure to contraceptive-specific empowerment sessions can increase non-barrier contraceptive use among AGYW. One of the pathways through which contraceptive-specific empowerment sessions increased non-barrier contraceptive use was intimate partner communication. We found this mediation pathway to be important for single AGYW without children.

Table 5.6 Frequencies of Outcome, Mediator, and Independent Variables by Clinic for Aim 2

	All AGYW (N = 517)		Clinic (N = 156)		Clinic 3 (N = 182)		Clinic 4 (N = 179)	
	N	%	N	%	N	%	N	%
Exposure to Empowerment Sessions								
Offered Empowerment Sessions	361	70%	0	0%	182	100%	179	100%
Attended Contraceptive-Specific Sessions	272	53%	0	0%	123	68%	149	83%
Contraceptive Communication								
Older Women in the Family								
Baseline	220	43%	93	60%	48	26%	79	44%
Six Months	304	59%	110	71%	79	43%	115	64%
One Year	349	68%	115	74%	108	59%	126	70%
Peers								
Baseline	338	65%	117	75%	98	54%	123	69%
Six Months	425	82%	134	86%	142	78%	149	83%
One Year	436	84%	134	86%	145	80%	157	88%
Intimate Partners								
Baseline	253	49%	110	71%	56	31%	87	49%
Six Months	308	60%	111	71%	72	40%	125	70%
One Year	344	67%	120	77%	92	51%	132	74%
Current Contraceptive Use								
Non-Barrier								
Baseline	170	33%	73	47%	30	16%	67	37%
Six Months	242	47%	88	56%	46	25%	108	60%
One Year	244	47%	85	54%	49	27%	110	61%
Condom								
Baseline	347	67%	71	46%	152	84%	124	69%
Six Months	362	70%	90	58%	134	74%	138	77%
One Year	418	81%	104	67%	155	85%	159	89%

Table 5.7 Correlations Among Outcome, Independent, and Mediator Variables in Aim 2

		1. Empowerment Session Exposure		2. Contraceptive Communication with Older Women in the Family			3. Contraceptive Communication with Peers			4. Contraceptive Communication with Intimate Partners			5. Non-Barrier Contraceptive Use			6. Condom Use		
		Overall	Contraceptive-Specific	Baseline	Six Months	One Year	Baseline	Six Months	One Year	Baseline	Six Months	One Year	Baseline	Six Months	One Year	Baseline	Six Months	One Year
1	Overall	1.00																
	Contraceptive-Specific	0.69	1.00															
2	Baseline	-0.23	-0.15	1.00														
	Six Months	-0.16	-0.05	0.32	1.00													
	One Year	-0.09	-0.01	0.27	0.37	1.00												
3	Baseline	-0.13	-0.10	0.30	0.15	0.18	1.00											
	Six Months	-0.06	-0.04	0.18	0.36	0.34	0.29	1.00										
	One Year	-0.03	0.03	0.13	0.20	0.35	0.21	0.38	1.00									
4	Baseline	-0.28	-0.12	0.38	0.27	0.27	0.28	0.20	0.18	1.00								
	Six Months	-0.16	0.00	0.20	0.26	0.27	0.23	0.27	0.25	0.40	1.00							
	One Year	-0.14	0.00	0.19	0.21	0.36	0.22	0.29	0.29	0.43	0.49	1.00						
5	Baseline	-0.19	-0.10	0.34	0.23	0.23	0.28	0.19	0.15	0.55	0.38	0.37	1.00					
	Six Months	-0.13	0.01	0.27	0.26	0.25	0.21	0.16	0.15	0.45	0.42	0.34	0.56	1.00				
	One Year	-0.10	0.01	0.25	0.18	0.27	0.23	0.17	0.18	0.45	0.43	0.46	0.50	0.62	1.00			
6	Baseline	0.30	0.15	-0.19	-0.05	-0.09	0.00	0.00	-0.01	-0.28	-0.12	-0.16	-0.26	-0.22	-0.22	1.00		
	Six Months	0.18	0.10	-0.13	0.02	-0.08	-0.06	0.00	-0.01	-0.23	-0.01	-0.12	-0.23	-0.09	-0.10	0.40	1.00	
	One Year	0.24	0.17	-0.10	-0.06	-0.03	0.00	0.02	-0.01	-0.19	-0.10	-0.04	-0.14	-0.11	-0.05	0.29	0.40	1.00

Table 5.8 Baseline Characteristics Among Study Participants (Aim 2)

	All AGYW (N = 517)		Single, No Children (N = 310)		Single, Children (N = 64)		Married, Children (N = 143)		Chi-Square
	N	%	N	%	N	%	N	%	p-value
Demographic Characteristics									
Age (years)									
15-19	284	55%	230	74%	24	38%	30	21%	
20-24	233	45%	80	26%	40	63%	113	79%	<0.001
Education level									
Completed primary	378	73%	268	86%	46	72%	64	45%	
Did not complete primary	139	27%	42	14%	18	28%	79	55%	<0.001
Asset Score									
> 2 Assets	329	64%	248	80%	42	66%	39	27%	
< 2 Assets	188	36%	62	20%	22	34%	104	73%	<0.001
Orphan hood*									
Both parents alive	333	64%	217	70%	39	61%	77	54%	
One parent alive	142	27%	74	24%	21	33%	47	33%	
Neither parent alive	40	8%	17	5%	4	6%	19	13%	0.076
Age of sexual debut*									
<15 years	157	30%	91	29%	19	30%	47	33%	
16-17 years	191	37%	112	36%	30	47%	49	34%	
≥18 years	163	32%	102	33%	15	23%	46	32%	0.505
Number of lifetime sexual partners*									
0	4	1%	4	1%	0	0%	0	0%	
1	251	49%	170	55%	14	22%	67	47%	
2-3	204	39%	111	36%	34	53%	59	41%	
≥4	57	11%	25	8%	16	25%	16	11%	<0.001
Living Children									
Yes	207	40%	0	0%	64	100%	143	0%	
No	310	60%	310	100%	0	0%	0	100%	<0.001
Marital status									
Single	374	72%	310	100%	64	100%	0	0%	
Ever Married	143	28%	0	0%	0	0%	143	100%	<0.001

*Column totals do not add up total due to missing data.

Table 5.9 Intervention Exposure, Contraceptive Communication, and Contraceptive Use Among Study Participants (Aim 2)

	All AGYW (N = 517)		Single, No Children (N = 310)		Single, Children (N = 64)		Married, Children (N = 143)		Chi-Square
	N	%	N	%	N	%	N	%	p-value
Intervention Exposure									
Empowerment Session Exposure									
Clinics 3 & 4 (Empowerment Sessions)	361	70%	260	84%	48	75%	53	37%	
Clinic 2 (YFHS)	156	30%	50	16%	16	25%	90	63%	<0.001
Both Sessions (Session 2 & Session 3)									
Yes	272	53%	119	38%	28	44%	98	69%	<0.001
Contraceptive Communication									
Older Women in the Family									
Baseline	220	43%	86	28%	33	52%	101	71%	<0.001
Six Months	304	59%	149	48%	42	66%	113	79%	<0.001
One Year	349	68%	181	58%	47	73%	121	85%	<0.001
Peers									
Baseline	338	65%	171	55%	50	78%	117	82%	<0.001
Six Months	425	82%	236	76%	57	89%	132	92%	<0.001
One Year	436	84%	243	78%	60	94%	133	93%	<0.001
Intimate Partners									
Baseline	253	49%	74	24%	45	70%	134	94%	<0.001
Six Months	308	60%	131	42%	47	73%	130	91%	<0.001
One Year	344	67%	153	49%	55	86%	136	95%	<0.001
Contraceptive Use									
Currently Using Non-Barrier Methods									
Baseline	170	33%	29	9%	32	50%	109	76%	<0.001
Six Months	242	47%	81	26%	39	61%	122	85%	<0.001
One Year	244	47%	73	24%	47	73%	124	87%	<0.001
Currently Using Condoms									
Baseline	347	67%	71	46%	152	84%	124	69%	<0.001
Six Months	362	70%	90	58%	134	74%	138	77%	<0.001
One Year	418	81%	104	67%	155	85%	159	89%	<0.001

Figure 5.1 Conceptual Model for Mediation Analysis

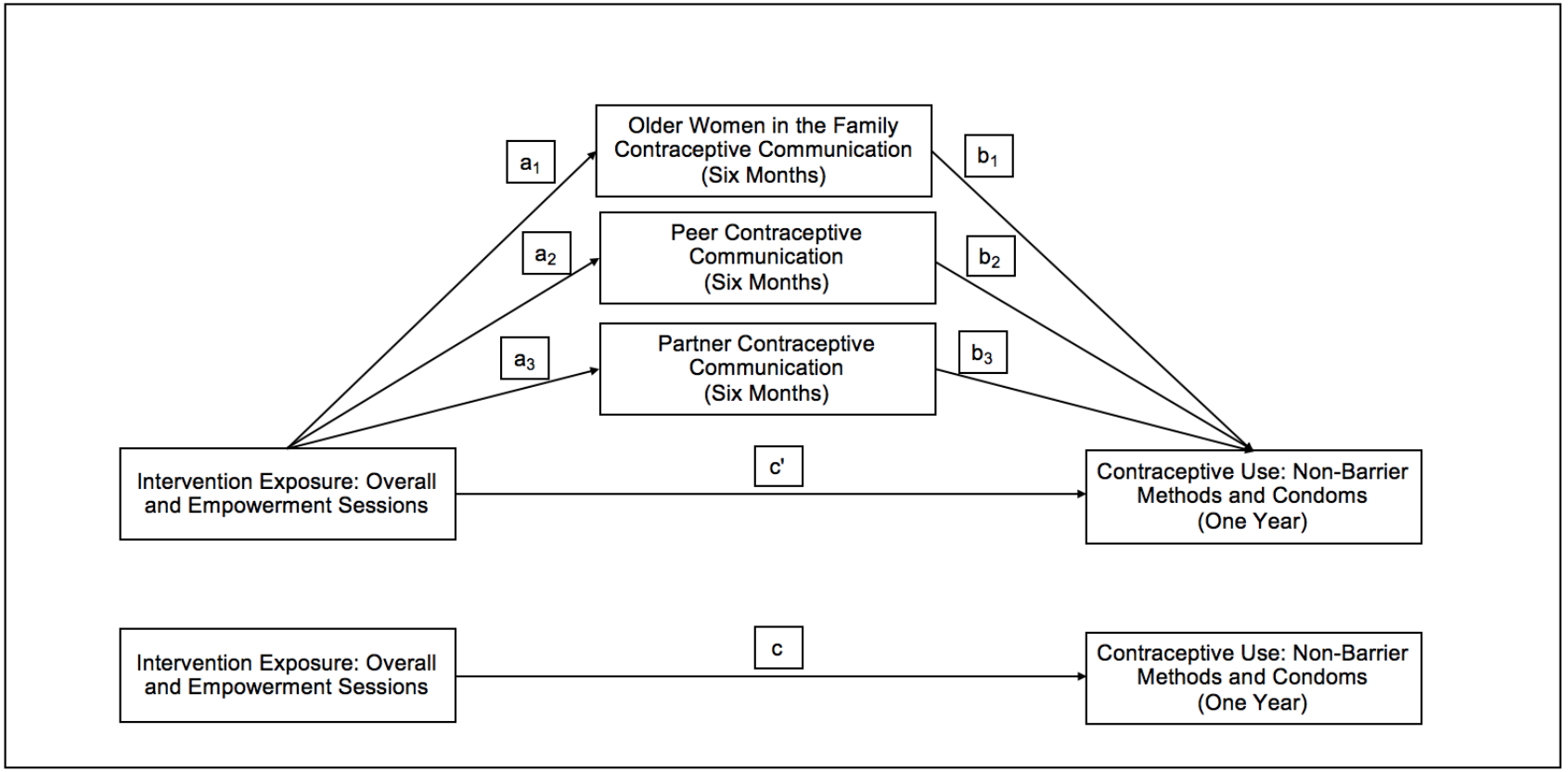


Table 5.10 Mediation Results for the Association Between Overall Empowerment Session Exposure and Non-Barrier Contraceptive (NBCU) Use for All Participants and by Marriage and Parity Groups for Clinics 2-4 (N=517) (Aim 2)

	All Participants (N = 517)		Single, No Children (N = 310)		Single, Children (N = 64)		Married, Children (N = 143)	
	Coeff.**	(95% CI)	Coeff.***	(95% CI)	Coeff.***	(95% CI)	Coeff.***	(95% CI)
Path A1								
Overall Sessions to Family Communication	-0.21	(-0.69, 0.27)	0.03	(-0.62, 0.67)	-0.16	(-1.47, 1.14)	-0.63	(-1.55, 0.29)
Path A2								
Overall Sessions to Peer Communication	0.18	(-0.43, 0.79)	0.01	(-0.75, 0.76)	2.69	(-0.02, 5.39)	0.19	(-1.25, 1.64)
Path A3								
Overall Sessions to Partner Communication	0.26	(-0.28, 0.79)	0.18	(-0.48, 0.85)	-0.13	(-1.47, 1.21)	0.51	(-0.88, 1.90)
Path B1								
Family Communication to NBCU	-0.14	(-0.67, 0.39)	-0.30	(-0.94, 0.34)	-0.04	(-1.52, 1.44)	0.29	(-1.08, 1.66)
Path B2								
Peer Communication to NBCU	0.02	(-0.65, 0.70)	0.33	(-0.50, 1.15)	-2.46	(-5.24, 0.31)	-0.77	(-3.10, 1.55)
Path B3								
Partner Communication to NBCU	1.08*	(0.58, 1.59)	1.51*	(0.86, 2.16)	0.44	(-1.02, 1.90)	-0.06	(-1.75, 1.63)
Path C								
Overall Sessions to NBCU	1.65*	(0.89, 2.40)	2.39*	(0.90, 3.87)	1.54	(0.11, 2.98)	1.17	(-0.19, 2.53)
Path C'								
Overall Sessions to NBCU	1.63*	(0.87, 2.39)	2.38*	(0.89, 3.88)	2.12	(0.44, 3.80)	1.24	(-0.18, 2.67)
Indirect Effects								
Overall Sessions -> Family -> NBCU	0.00	(-0.01, 0.01)	0.00	(-0.01, 0.01)	0.00	(-0.10, 0.10)	-0.01	(-0.07, 0.05)
Overall Sessions -> Peers -> NBCU	0.00	(-0.01, 0.01)	0.00	(-0.02, 0.02)	-0.20	(-0.49, 0.09)	-0.01	(-0.06, 0.05)
Overall Sessions -> Partner -> NBCU	0.02	(-0.03, 0.06)	0.01	(-0.04, 0.06)	0.00	(-0.09, 0.08)	0.00	(-0.05, 0.05)
Total Indirect Effect	0.02	(-0.03, 0.06)	0.01	(-0.04, 0.07)	-0.20	(-0.55, 0.15)	-0.02	(-0.11, 0.08)
Total Effect	0.39*	(0.24, 0.54)	0.42*	(0.26, 0.57)	0.23	(-0.17, 0.64)	0.30	(0.05, 0.55)

* $p < 0.05$

**Covariates include education, asset score, marital status, parity, non-barrier contraceptive use, and contraceptive communication at baseline

***Covariates include education, asset score, non-barrier contraceptive use, and contraceptive communication at baseline

Table 5.11 Mediation Results for the Association Between Overall Empowerment Session Exposure and Condom Use for All Participants and by Marriage and Parity Groups for Clinics 2-4 (N=517) (Aim 2)

	All Participants (N = 517)		Single, No Children (N = 310)		Single, Children (N = 64)		Married, Children (N = 143)	
	Coeff.**	(95% CI)	Coeff.***	(95% CI)	Coeff.***	(95% CI)	Coeff.***	(95% CI)
Path A1								
Overall Sessions to Family Communication	-0.27	(-0.75, 0.22)	-0.01	(-0.66, 0.64)	-0.06	(-1.41, 1.28)	-0.69	(-1.63, 0.26)
Path A2								
Overall Sessions to Peer Communication	0.14	(-0.48, 0.75)	-0.07	(0.83, 0.70)	2.65	(-0.08, 5.37)	0.41	(-1.07, 1.89)
Path A3								
Overall Sessions to Partner Communication	0.21	(-0.32, 0.75)	0.14	(-0.53, 0.81)	-0.12	(-1.46, 1.23)	0.41	(-1.02, 1.83)
Path B1								
Family Communication to Condom Use	-0.05	(-0.62, 0.52)	-0.40	(-1.20, 0.39)	1.73	(-0.17, 3.63)	-0.37	(-1.44, 0.69)
Path B2								
Peer Communication to Condom Use	0.46	(-0.23, 1.15)	-1.20	(-0.56, 1.24)	0.34	(-2.40, 3.07)	1.07	(-0.49, 2.62)
Path B3								
Partner Communication to Condom Use	-0.13	(-0.72, 0.47)	0.31	(-0.49, 1.10)	-0.78	(-2.82, 1.27)	-0.13	(-1.45, 1.19)
Path C								
Overall Sessions to Condom Use	0.72*	(0.18, 1.26)	0.59	(-0.28, 1.47)	2.21*	(0.49, 3.93)	0.46	(-0.41, 1.32)
Path C'								
Overall Sessions to Condom Use	0.72*	(0.18, 1.26)	0.60	(-0.28, 1.48)	2.60*	(0.42, 4.78)	0.41	(-0.48, 1.29)
Indirect Effects								
Overall Sessions -> Family -> Condom Use	0.00	(-0.01, 0.01)	0.00	(-0.02, 0.02)	-0.01	(-0.20, 0.19)	0.01	(-0.04, 0.07)
Overall Sessions -> Peers -> Condom Use	0.00	(-0.01, 0.01)	0.00	(-0.02, 0.02)	0.02	(-0.34, 0.39)	0.02	(-0.10, 0.13)
Overall Sessions -> Partner -> Condom Use	0.01	(-0.03, 0.06)	0.00	(-0.02, 0.03)	0.00	(-0.16, 0.17)	0.00	(-0.05, 0.05)
Total Indirect Effect	0.02	(-0.03, 0.06)	0.00	(-0.04, 0.04)	0.02	(-0.48, 0.52)	0.03	(-0.11, 0.17)
Total Effect	0.40*	(0.25, 0.54)	0.12	(-0.07, 0.32)	0.51*	(0.02, 1.00)	0.14	(-0.12, 0.39)

* $p < 0.05$

**Covariates include education, asset score, marital status, parity, non-barrier contraceptive use, and contraceptive communication at baseline

***Covariates include education, asset score, marital status, parity, non-barrier contraceptive use, condom use, and contraceptive communication at baseline

Table 5.12 Mediation Results for the Association Between Contraceptive-Specific Empowerment Session Exposure and Non-Barrier Contraceptive Use (NBCU) for All Participants and by Marriage and Parity Groups for Clinics 2-4 (N=517) (Aim 2)

	All Participants (N = 517)		Single, No Children (N = 310)		Single, Children (N = 64)		Married, Children (N = 143)	
	Coeff.**	(95% CI)	Coeff.**	(95% CI)	Coeff.***	(95% CI)	Coeff.***	(95% CI)
Path A1								
Both Sessions to Family Communication	0.10	(-0.30, 0.49)	0.32	(-0.15, 0.80)	0.17	(-0.94, 1.28)	-0.72	(-1.66, 0.21)
Path A2								
Both Sessions to Peer Communication	0.11	(-0.39, 0.60)	0.05	(-0.52, 0.61)	1.11	(-0.75, 2.98)	0.00	(-1.47, 1.48)
Path A3								
Both Sessions to Partner Communication	0.61*	(0.18, 1.04)	0.69*	(0.19, 1.20)	-0.23	(-1.40, 0.94)	0.80	(-0.80, 2.41)
Path B1								
Family Communication to NBCU	-0.21	(-0.73, 0.32)	-0.33	(-0.97, 0.31)	-0.36	(-1.84, 1.12)	0.19	(-1.17, 1.55)
Path B2								
Peer Communication to NBCU	0.04	(-0.64, 0.72)	0.28	(-0.55, 1.12)	-0.36	(-4.46, 0.59)	-0.69	(-3.00, 1.62)
Path B3								
Partner Communication to NBCU	1.01*	(0.51, 1.52)	1.41*	(0.75, 2.06)	0.62	(-0.85, 2.09)	-0.05	(-1.73, 1.64)
Path C								
Both Sessions to NBCU	1.12*	(0.59, 1.65)	1.13*	(0.48, 1.78)	1.40*	(0.11, 2.69)	0.92	(-0.46, 2.31)
Path C'								
Both Sessions to NBCU	1.05*	(0.52, 1.59)	0.99*	(0.32, 1.66)	1.80*	(0.32, 3.28)	0.97	(-0.47, 2.41)
Indirect Effects								
Both Sessions -> Family -> NBCU	0.00	(-0.01, 0.01)	-0.01	(-0.03, 0.01)	0.00	(-0.09, 0.08)	-0.01	(-0.09, 0.07)
Both Sessions -> Peers -> NBCU	0.00	(-0.01, 0.01)	0.00	(-0.02, 0.02)	-0.08	(-0.29, 0.13)	0.00	(-0.06, 0.06)
Both Sessions -> Partner -> NBCU	0.04*	(0.00, 0.08)	0.06*	(0.01, 0.12)	-0.01	(-0.14, 0.12)	0.00	(-0.07, 0.06)
Total Indirect Effect	0.04*	(0.00, 0.08)	0.04*	(0.00, 0.12)	-0.10	(-0.35, 0.16)	-0.01	(-0.11, 0.10)
Total Effect	0.31*	(0.17, 0.45)	0.29*	(0.14, 0.45)	0.33	(-0.13, 0.79)	0.23	(-0.05, 0.51)

* $p < 0.05$

**Covariates include baseline education, asset score, marital status, parity, non-barrier contraceptive use, and number of empowerment sessions completed

***Covariates include baseline education, asset score, non-barrier contraceptive use, and number of empowerment sessions completed

Table 5.13 Mediation Results for the Association Between Contraceptive-Specific Empowerment Session Exposure and Condom Use for All Participants and by Marriage and Parity Groups for Clinics 2-4 (N=517) (Aim 2)

	All Participants (N = 517)		Single, No Children (N = 310)		Single, Children (N = 64)		Married, Children (N = 143)	
	Coeff.**	(95% CI)	Coeff.**	(95% CI)	Coeff.***	(95% CI)	Coeff.***	(95% CI)
Path A1								
Both Sessions to Family Communication	0.09	(-0.31, 0.48)	0.33	(-0.15, 0.81)	0.44	(-0.75, 1.62)	-0.78	(-1.70, 0.14)
Path A2								
Both Sessions to Peer Communication	0.11	(-0.39, 0.60)	0.04	(-0.53, 0.61)	0.80	(-1.03, 2.64)	0.00	(-1.45, 1.45)
Path A3								
Both Sessions to Partner Communication	0.61*	(0.17, 1.04)	0.71*	(0.20, 1.21)	-0.17	(-1.36, 1.02)	0.82	(-0.80, 2.44)
Path B1								
Family Communication to Condom Use	-0.09	(-0.66, 0.48)	-0.45	(-1.25, 0.35)	1.31	(-0.37, 2.98)	-0.36	(-1.43, 0.71)
Path B2								
Peer Communication to Condom Use	0.50	(-0.19, 1.18)	0.41	(-0.49, 1.31)	1.07	(-1.20, 3.34)	1.09	(-0.46, 2.64)
Path B3								
Partner Communication to Condom Use	-0.19	(-0.79, 0.41)	0.21	(-0.58, 1.01)	-0.93	(-2.99, 1.13)	-0.16	(-1.47, 1.15)
Path C								
Both Sessions to Condom Use	0.61*	(0.11, 1.11)	0.63	(-0.08, 1.34)	1.44	(-0.28, 3.17)	0.51	(-0.39, 1.41)
Path C'								
Both Sessions to Condom Use	0.58*	(0.13, 1.14)	0.66	(-0.07, 1.40)	1.46	(-0.46, 3.39)	0.49	(-0.43, 1.42)
Indirect Effects								
Both Sessions -> Family -> Condom Use	0.00	(-0.01, 0.01)	-0.01	(-0.04, 0.02)	0.03	(-0.12, 0.18)	0.02	(-0.05, 0.09)
Both Sessions -> Peers -> Condom Use	0.00	(-0.01, 0.02)	0.00	(-0.02, 0.02)	0.03	(-0.10, 0.17)	0.00	(-0.11, 0.11)
Both Sessions -> Partner -> Condom Use	0.04	(-0.00, 0.07)	0.01	(-0.03, 0.06)	0.01	(-0.14, 0.16)	-0.01	(-0.06, 0.05)
Total Indirect Effect	0.04	(-0.00, 0.08)	0.00	(-0.05, 0.06)	0.08	(-0.19, 0.35)	0.01	(-0.12, 0.14)
Total Effect	0.29*	(0.17, 0.41)	0.17	(-0.05, 0.39)	0.41	(-0.06, 0.89)	0.13	(-0.11, 0.38)

* $p < 0.05$

**Covariates include baseline education, asset score, marital status, parity, condom use, and number of empowerment sessions completed

***Covariates include baseline education, asset score, condom use, and number of empowerment sessions completed

Table 5.14. Mediation Results for the Association Between Overall & Contraceptive-Specific Empowerment Session Exposure and Contraceptive Use (CU) for Participants in Clinics 2-3 (N=338) (Aim 2)

	Non-Barrier Contraceptive Use				Condom Use			
	Overall Empowerment Session Exoosure		Contraceptive-Specific Empowerment Session Exposure		Overall Empowerment Session Exoosure		Contraceptive-Specific Empowerment Session Exposure	
	Coeff.**	(95% CI)	Coeff.***	(95% CI)	Coeff.**	(95% CI)	Coeff.***	(95% CI)
Path A1								
Sessions to Family Communication	-0.38	(-0.94, 0.19)	-0.09	(-0.60, 0.41)	-0.42	(-0.99, 0.16)	-0.11	(-0.63, 0.40)
Path A2								
Sessions to Peer Communication	0.19	(-0.50, 0.89)	0.11	(-0.50, 0.73)	0.16	(-0.54, 0.86)	0.10	(-0.51, 0.72)
Path A3								
Sessions to Partner Communication	-0.29	(-0.89, 0.31)	0.43*	(0.23, 0.65)	-0.30	(-0.90, 0.30)	0.48	(-0.07, 1.04)
Path B1								
Family Communication to CU	-0.66	(-1.41, 0.10)	-0.73	(-1.48, 0.03)	-0.51	(-1.19, 0.18)	-0.52	(-1.20, 0.16)
Path B2								
Peer Communication to CU	0.34	(-0.60, 1.28)	0.39	(-0.55, 1.33)	0.73	(-0.08, 1.54)	0.75	(-0.05, 1.56)
Path B3								
Partner Convo to CU	0.91*	(0.24, 1.59)	0.82*	(0.15, 1.49)	-0.31	(-0.98, 0.37)	-0.367	(-1.04, 0.31)
Path C								
Sessions to CU	0.93*	(0.05, 1.82)	0.61*	(0.12, 1.10)	0.37	(-0.32, 1.05)	0.47	(-0.20, 1.14)
Path C'								
Sessions to CU	0.92*	(0.02, 1.82)	0.51*	(0.23, 1.24)	0.29	(-0.41, 0.99)	0.49	(-0.19, 1.18)
Indirect Effects								
Sessions -> Family -> CU	0.02	(-0.02, 0.06)	0.00	(-0.03, 0.03)	0.02	(-0.02, 0.05)	0.00	(-0.02, 0.03)
Sessions -> Peers -> CU	0.00	(-0.02, 0.03)	0.00	(-0.02, 0.03)	0.01	(-0.04, 0.05)	0.00	(-0.02, 0.03)
Sessions -> Partner -> CU	-0.02	(-0.07, 0.03)	0.03*	(0.00, 0.07)	0.01	(-0.02, 0.03)	-0.01	(-0.04, 0.02)
Total Indirect Effect	0.00	(-0.06, 0.07)	0.04*	(0.00, 0.08)	0.03	(-0.02, 0.08)	0.00	(-0.05, 0.04)
Total Effect	0.24*	(0.00, 0.48)	0.16*	(0.01, 0.31)	0.11	(-0.11, 0.32)	0.12	(-0.06, 0.30)

* $p < 0.05$

**Covariates include education, asset score, marital status, parity, non-barrier contraceptive/condom use, and contraceptive communication at baseline

***Covariates include baseline education, asset score, marital status, parity, non-barrier contraceptive/condom use, and number of empowerment sessions completed

CHAPTER 6: CONCLUSION

This chapter first summarizes the findings from the dissertation, then acknowledges study strengths and limitations, and concludes by providing directions for future research and practice.

6.1 Summary of Findings

Complications from pregnancy and childbirth are the leading cause of death for adolescent girls (age 15-19) and the second leading cause of death for young women (age 20-24) in LMICs.[2] In 2005, the World Health Organization stated that the provision of adequate family planning is the principal strategy by which to reduce pregnancy-related mortality and morbidity.[3,4] Effectively intervening with AGYW to prevent unintended pregnancy thus requires an in-depth understanding of the determinants of contraceptive use as well as the mechanisms through which reproductive health programs might increase contraceptive use. As discussed in Chapters 2 & 3, less is known about the determinants of AGYW contraceptive use at the interpersonal level, whether it is possible to modify determinants of AGYW contraceptive use at the interpersonal level, and if reproductive health programs can increase contraceptive use by targeting determinants of AGYW contraceptive use at the interpersonal level. The purpose of this dissertation was to fill these gaps in the literature through two studies.

The main objective of Study One was to examine the association between non-barrier contraceptive use and a set of social influence factors operating at the interpersonal level: contraceptive communication, contraceptive descriptive norms, and contraceptive injunctive norms. We found contraceptive communication and contraceptive descriptive norms to be associated with non-barrier contraceptive use. However, there were notable differences across sources of social influence as well as among groups differing by marriage and parity:

- Contraceptive communication with intimate partners was influential for all AGYW.
- Contraceptive communication with peers was influential for single AGYW, regardless of parity.

- Contraceptive communication with older women in the family was influential for single AGYW without children.
- Descriptive social norms related to peers were influential for single AGYW, regardless of parity.

In addition to these relationships of individual variables with contraceptive use, we found an additive effect when single AGYW discussed contraception with peers and believed peers used contraception. Taken together, the results from Study One suggest that AGYW are influenced through contraceptive conversations with all three types of social ties and through perceptions of contraceptive use among their peers. Additionally, the role of communication with partners across all AGYW reflects findings from other research pointing to the importance of communication with partners.[15–20] Engaging this population in interventions that encourage interpersonal communication about contraception has the potential to make an impact on the uptake of non-barrier contraceptive methods.

The main objective of Study Two was to examine whether exposure to *Girl Power*, and exposure to contraceptive-specific empowerment sessions within *Girl Power*, was associated with non-barrier contraceptive use and whether the associations were mediated by contraceptive communication.

We found that exposure to contraceptive-specific empowerment sessions was positively associated with non-barrier contraceptive use and that the relationship was modestly mediated by contraceptive communication with partners. However, there were notable differences across sources of contraceptive communication and marriage and parity groups. Among sources of contraceptive communication, discussing contraception with intimate partners was the only significant mediator between contraceptive-specific empowerment sessions and non-barrier contraceptive use. Though an increase in contraceptive communication with peers and older women in the family was observed at each time point of the behavioral survey, contraceptive-specific intervention exposure did not increase contraceptive communication with either source, and contraceptive communication with either source did not mediate the relationship between contraceptive-specific empowerment session exposure and non-barrier contraceptive use. Disaggregating mediation results by marriage and parity groups revealed that

communication with intimate partners mediated the relationship between exposure to contraceptive-specific empowerment sessions and non-barrier contraceptive use only for single AGYW without children. These results should be interpreted with caution given reduced power for the three marriage and parity groups. Taken together, the findings from Study Two suggest that contraceptive communication with intimate partners through reproductive health interventions is modifiable and important for AGYW contraceptive use.

6.2 Strengths

This dissertation had a number of strengths. First, this dissertation relied on data from an important population and setting – AGYW in SSA. Rates of unintended pregnancy and unmet contraceptive need among AGYW in SSA are the highest in the world.[56,65] Furthermore, our study sample included unmarried and nulliparous AGYW who are often overlooked in the family planning literature as well as in family planning programing. Second, this dissertation explored determinants of contraceptive use at the interpersonal level, a large gap in the AGYW contraceptive use literature. Third, this dissertation used advanced statistical techniques – mediation analysis with longitudinal data – to help disentangle and appropriately assess the impact of exposure to reproductive health intervention on contraceptive use.

6.3 Limitations

There are also a number of limitations to this dissertation that should be noted. First, due to study design and measurement of certain variables, we were unable to infer causality and make causal inferences. In Study One, all variables were measured at one time period and therefore we cannot decipher the order of our independent and dependent variables. In Study Two, we were unable to assess true changes in contraception communication given that at each time point, participants were asked if they had ever spoken with a communication source about contraception, rather than spoken with a contraceptive source since the last survey. This weakened our ability to know whether the conversations took place before the study, during the study, or both. As temporality is a critical part of mediation analyses, this is an important limitation. Second, contraceptive use data were based on self-report which

can be unreliable due to social desirability issues or memory challenges. Third, the survey items assessing contraceptive communication asked about general contraception communication. They did not differentiate by type (hormonal, non-barrier, condoms, etc.). This wording creates a disconnect with our use of non-barrier contraceptive use as an outcome. Fourth, we were not able to assess fertility intention or unmet need for contraception with the questions in the behavioral survey. It is possible that AGYW were not using contraception because they wanted to become pregnant. Fifth, our social influence measures (contraceptive communication, descriptive social norms, and injunctive social norms) were derived from single items. Validated multidimensional or multi-item scales would likely capture these variables of interest more accurately. Sixth, participants in clinic four received empowerment sessions and a conditional cash transfer. We were not able to control for the effect of this monetary incentive without reducing our sample size by excluding participants in this clinic. Sensitivity analyses among clinic two and three participants, however, showed that main effects and mediation effects reflected our findings for participants in clinics 2-4, suggesting the monetary incentive in the one clinic did not appreciably confound the effects of intervention elements addressing communication. Finally, this study relied on a specific population—AGYW in Lilongwe, Malawi. The use of this specific population may limit generalizability to other settings, such as other areas in Malawi or other countries in SSA.

6.4 Directions for Future Research

This dissertation raised important questions for future research. These questions are detailed below.

What other sources and mechanisms of social influence are relevant for AGYW contraceptive use?

Results from Study One suggest that interpersonal communication about contraceptives use with older women in the family, peers, and intimate partners is influential for AGYW contraceptive use. Extending this work to other levels of the social ecological model, additional sources of social influence, and to the content of contraceptive conversations is necessary to gain a comprehensive understanding of how the social environment impacts AGYW contraceptive use. First, existing research suggests that community level or collective fertility norms impact contraceptive use among adult women in

SSA.[84,235,236] Though norms are products of the social environment, they are often measured at the individual level. Examining norms at the community level provides an opportunity to assess how social structures can be either risky or protective for health. Second, existing qualitative evidence among AGYW in SSA suggests that there are social ties beyond household members, peers, and intimate partners who influence reproductive health service utilization.[237] Two additional types of social ties are healthcare providers and individuals in educational or income-generating settings. Given the increased interest in multi-level interventions that address the structural, economic, and educational barriers to using health services, examining the influence of social ties that exist in these contexts is key. Third, examining the content of contraceptive related conversations by source of social influence would provide insight into who AGYW might turn to for information, permission, or support in accessing and utilizing contraception.

What other methods and measures can be utilized to examine the relationship between social influence and AGYW contraceptive use?

This dissertation used cross-sectional and longitudinal mediation analyses to examine the relationship among social influence factors, exposure to empowerment sessions, and contraceptive use. Extending this work to incorporate social influence factors at the community level and additional sources of social influence requires the use of advanced statistical techniques such as multilevel modeling and social network analysis. Multilevel modeling techniques provide a means for measuring the influence of group level effects while accounting for hierarchically clustered data. Combining a multilevel approach with social network analysis would allow for the examination of how group factors interact with individual factors to influence contraceptive use. Social network analysis also provides the opportunity to sort individuals based on different conceptualizations of networks (e.g. friendship, income-generating relationships, educational) beyond geographically defined communities or those designed by an intervention. Combining multilevel and social network analysis would also allow for investigation into what types of health-related norms, beliefs, and behaviors are more social compared to more

individualistic. Finally, social network analysis has been used to evaluate patterns of diffusion of innovations in health. Extending this work to examine how the structure of a social network determines the degree of adoption of health behaviors, the existence of spillover effects, and how networks change after individuals change their health behaviors is an important area for future research. Collecting long-term longitudinal measures of social influence is also important in thinking about the evolution of contraceptive decision-making among AGYW. Future research that incorporates longitudinal measures could be used to evaluate the role of social network members at all stages of contraceptive use (i.e. initiation, continuation, and discontinuation).

6.5 Directions for Future Practice

Findings from this dissertation have a number of implications for family planning interventions in the future. These implications are detailed below.

Interventions That Engage Men and Empower Women

In Study One, we found contraceptive communication with intimate partners to be influential for all AGYW, regardless of marital status or parity. In Study Two, we found that it was possible to increase contraceptive use through contraceptive communication with intimate partners by engaging AGYW in contraceptive-specific empowerment sessions. These results are consistent with existing family planning literature and policy recommendations that recognize intimate partner influence as a significant determinant of adult women's contraceptive use.[238]

The 1994 International Conference on Population and Development in Cairo, Egypt, emphasized that family-planning interventions should engage men and acknowledge their role in reproductive health services as a means to improve reproductive health for all genders.[239] However, given existing gender-power dynamics of many relationships in LMICs, there are concerns that engaging men would further inhibit women's decisions making ability and capacity for contraceptive use. "Gender-transformative" interventions—those that aim to make relationships between men and women more equitable and change men's gender ideology—have been shown to be effective at changing men's ideology and increasing contraceptive use among adult women in Malawi and India.[18,240–242] One of the primary components of

these interventions has been to encourage contraceptive related communication within the couple context. Combining these types of interventions with empowerment sessions that equip AGYW with the information and communication skills to advocate for their reproductive needs has the potential to have an impact on AGYW contraceptive use. Furthermore, existing family planning interventions in SSA that involve male partners are largely limited to husbands or married couples.[18,216,217] Our findings suggest that expanding these interventions to be inclusive and engaging of AGYW in all relationship types could potentially increase contraceptive use among this population.

Interventions that Create Youth Friendly Spaces

In Study One, we found that discussing contraception with peers, and believing that peers use contraception, were associated with AGYW contraceptive use. Furthermore, we found an additive effect on contraceptive use when AGYW talked to their friends about contraception and believed their friends used contraception. Taken together, these results suggest the importance of peers in the contraceptive decision-making process for AGYW. Interventions that provide a space where AGYW can regularly meet and discuss sexual, reproductive, and life-related issues amongst themselves in a judgement free environment could be beneficial. Existing family planning interventions have attempted to provide youth-friendly spaces within clinics and through after-school programs.[95] However, it might be possible that these spaces are embedded within institutions that inhibit AGYW from open conversation. Future family planning interventions should explore additional spaces that have the potential to be health-promoting and therapeutic for AGYW.

Interventions that Increase Family-AGYW Interpersonal Communication

In Study One, we found that talking to older women in the family about contraception was only influential for contraceptive use among single AGYW without children. In Study Two, we found that exposure to contraceptive-specific empowerment sessions was not associated with contraceptive communication with older women in the family. Furthermore, contraceptive communication with older women in the family did not mediate the relationship between contraceptive-specific empowerment session exposure and contraceptive use. Taken together, these results suggest that contraceptive

conversations with older women in the family are important for some AGYW but empowerment sessions may not be the best way to encourage conversations about contraception between AGYW and older women in the family. Existing evidence regarding contraceptive communication between AGYW and family members describes a complex social situation. First, previous studies in SSA have found parent-based contraceptive communication to be infrequent and unsuccessful at increasing AGYW contraceptive uptake.[221–224] Second, conversations about contraception are largely intended for those who are married or have already had children.[214] Third, AGYW who initiate conversations about sex and contraception with parents are seen as disrespectful.[36,224–227] Given these barriers, it is unsurprising that AGYW exposed to the contraceptive-specific empower sessions would still be wary of discussing contraception with older women in their family. Family planning interventions at the community level might be a more effective channel for changing perceptions related to AGYW contraceptive use among older adults, which in turn might increase contraceptive communication with AGYW.

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