AN EXPLORATION OF CONTRACEPTION USE AS A PARENTAL INVESTMENT TOOL AMONG RURAL SIDAMA FEMALES IN SOUTHWESTERN ETHIOPIA

By

KATHERINE ELIZABETH FLORES

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To the Faculty of Washington State University:

The members of the Committee appointed to examine the dissertation of KATHERINE ELIZABETH FLORES find it satisfactory and recommend that it be accepted.

_____
Marsha B. Quinlan, Ph.D., Chair

_____
Robert J. Quinlan, Ph.D.

_____
Courtney L. Meehan, Ph.D.

_____
Caitlyn D. Placek, Ph.D.

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Abstract

by Katherine Elizabeth Flores, Ph.D.
Washington State University
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Chair: Marsha B. Quinlan

Despite family planning and parental investment being common research domains in anthropology, gaps remain, particularly regarding investigations of the latter employing the former as a tool. Early life history events can influence parental investment behaviors, with individuals in risky locations being more likely to prefer offspring quantity over quality. In exploring the relationship between contraception use and parental effort, however, we cannot ignore embodied capital. Within modernizing societies, embodied capital concerns shift towards extrasomatic capital, e.g., wealth and formalized education, and offspring quality over quantity may be desired. This project took place in Ethiopia, a high-risk transitioning country with a suite of institutional programs designated to propel the country to lower-middle-income status by 2025. The following hypotheses drove this research: 1) Women who experienced lower levels of early life risk will invest more in their children's extrasomatic embodied capital; 2) Households with higher educated parents will have greater odds of children enrolled in school; 3) Women who reported higher levels of social support will be more likely to contracept; 4) Women who

reported higher levels of social support will have greater odds of children enrolled in school; 5) Women who lived closer to health clinics and reported greater interactions with health agents will be more likely to contracept. Semi-structured interviews (N=439 women) collected information regarding contraception use, early life experiences, educational background, finances, offspring, and their perceptions of social support. Statistical analyses comprised of negative binomial, logistic, and Poisson regressions. Hypotheses for number of children in school were not supported in any models. Several models for current contraceptive use indicated potentially important effects for early life stress and social support; however, results for different types of stressful events and different sources of social support had opposite effects on contraception contrary to predictions, and conservative analyses with multiple comparisons yielded false discovery rates indicating that the null hypothesis could not be rejected. Though greater research is needed to understand parental investment in this manner, this project is novel in its efforts to combine life history and embodied capital theories to explore the effects of risky transitioning societies on family planning behaviors.

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Dedication

This dissertation is dedicated to Bunny, Bowser, Mama, and Padre. This accomplishment is just as much yours as it is mine. I would not be here without the four of you.

CHAPTER 1

INTRODUCTION

"Raising children" is a concept with considerable cultural variation in its expression. Regardless of its manifestation, some degree of investment must occur for said "raising" to take place. Researchers studying parental investment may evaluate life history characteristics to understand how environmental risk influences investment. For example, environments with substantial social and/or physical risks typically result in faster life histories (Ellis et al., 2009; Promislow & Harvey, 1990; Mittal & Griskevicius, 2014), which are characterized by earlier sexual maturation, younger parenthood, a preference of offspring quantity over quality, and relatively low parental investment (Belsky et al., 1991; Borgerhoff Mulder, 1992; Caudell & Quinlan, 2012; Draper and Harpending, 1982; Ellis et al., 2009; Nettle 2010; Quinlan, 2007; Roff, 2002; Stearns, 1992; Trivers, 1972). By understanding an individual's life history, we can predict what their parental and mating efforts may look like in the future.

Though this pattern is clear, the theory does not account for agency and the choices parents must make in response to certain external stimuli. In developing countries, intervention and outreach programs are common and typically have a shared goal of modernization. Part of the modernization process includes increasing formal education access and consistent attendance, as well as increasing exposure to and promoting the use of Western hormonal contraception.

Life history theory is not well-equipped to evaluate these modernizing forms of environmental influence, mainly because their source and purpose are cultural. For that reason, embodied capital theory merits consideration. Embodied capital theory combines life history theory and capital investment theory from economics (Kaplan, 1996; 1997; Kaplan et al., 2000). It posits that everyone has an "income," of time that s/he can allocate to certain activities. With this income, comes an individual's budget for parental investment, fertility, and other life

actions. As individuals age, they must balance their budgets and invest in the embodied capital, or the physical and functional components to life, of themselves and/or their offspring. Embodied capital theory evaluates the influence of extrasomatic capital, e.g. wealth and education, can have on humans. For example, in environments in which formal education and skill mastery are essential, it is more beneficial for an individual to invest in their own embodied capital first. Individuals with greater wealth and higher levels of education invest more in their offspring's embodied capital (Hill and Kaplan, 1999; Kaplan, 1996; Kaplan and Lancaster, 2000), thus they tend to favor offspring quality over quantity. Though embodied capital theory incorporates aspects of life history theory, it does not consider risk in the same manner. As previously stated, life history theory disregards agency and cultural stimuli that promote rapid change. I argue that the strengths of embodied capital theory compensate for the pitfalls of life history theory.

To truly gain a holistic understanding in how parents' investments come to fruition, one must consider the role of family planning. Family planning been extensively studied, though gaps remain. One of the main limitations is that motives for modern family planning research differ greatly from motives in developing countries. Regarding the latter, unmet need and uptake, in relation to socioeconomic factors, dominate research aims (Bledsoe, 2002; Chaurasia, 2014; Gakidou and Vayena, 2007; Genet et al., 2015; Gizaw and Regassa, 2011; Greenhalgh, 1995; Hailu, 2015; Jiang and Hardee, 2014; Korra, 2002; Obwoya et al., 2018; Regassa, 2006; 2007a; 2007b; Sundaram et al., 2010; United Nations, 2015; Wulifan et al., 2016). Although seemingly contradictive, contraception is a mode of parental investment. Yet studies linking contraception to parental investment, particularly in transitioning societies, is limited, both in presence and in theoretical explorations. Furthermore, because human childrearing is a cooperative behavior, we

must take individuals' perceptions of the amount of social support they receive into account. Perceptions of one's environment drives behavior, so it is likely that individuals consider their reproductive options and apply behaviors that their family, partner(s), and friends influence. Fitness is not a direct concern for many humans; however, humans put forth effort toward current and future offspring. By combining environmental risk, embodied capital, social support, and contraception, we can gain a clearer image of parental investment.

This project takes place in Ethiopia, specifically among Sidama people, the fifth largest ethnic group in the country. Ethiopia is an appropriate candidate to study these topics because it is a high-risk, transitioning country with plans to reach lower-middle-income status by 2025 (World Bank Group, 2019b). In its efforts to modernize, the Ethiopian government has launched various programs over the past two decades to help its citizens to transition. Education and family planning are two significant areas of foci for the government. In Sidama culture, large families denote wealth and are socially valued. Sidama do not display or discuss strong social stigma against contraception, unless an unmarried woman wants to use it. They perceive modern contraception as a tool solely used for pregnancy prevention, unlike Westerners who may consider it a multipurpose medication. In the West, combination hormonal contraception serves as a pregnancy prevention tool as well as a medication to treat, prevent, and/or decrease the occurrences of conditions such as acne, anemia, certain reproductive cancers, breast and ovarian cysts, menstrual discomfort, and ectopic pregnancy (Planned Parenthood, n.d.). When considering the amount of risk present in the country, combined with efforts to modernize, Ethiopia is the perfect location to track generational changes in parental investment.

My overarching research question is: *What are the life history effects of risky environments and perceptions of social support? In particular, what are the relationships between environmental risk and perceptions of social support, and women's reproductive outcomes?*

To address this larger question, I will test the following hypotheses:

1. I predict that Sidama women who have experienced lower levels of early life risk invest more in their offspring's extrasomatic embodied capital, represented by the number of their biological school-aged children who are enrolled in school (while controlling for their total number of children), compared to women who have experienced higher levels of early life risk and are primed to expect risks for their own children, setting them up for quantity over quality life history pattern. Or, conversely, there is no significant association between the number of biological school-aged children enrolled in school and parental early life risk, possibly due to the Sidama living in rural locations and maintaining much of their traditional lifeways.
2. Based on embodied capital theory, I predict that households with higher educated parents will have more biological school-aged children who are enrolled in school (while controlling for their total number of children), than households with less educated parents. Or, conversely, there is no significant association between parental education background and their offspring's school enrollment, possibly due to governmental modernization programs effectively improving educational outcomes for all citizens, thereby negating the effects of parents' education.
3. I predict that women who feel they have greater levels of social support will be more likely to use contraception than women who feel they have lower levels of social support because

better-supported women may have the help they need to allow them to focus on offspring quality over quantity. Alternatively, less social support (fewer potential alloparents) may drive contraception use as mothers with less help have more constraints on their time budgets.

4. Building on the previous hypothesis, I predict that women who feel they have greater levels of social support will have more biological school-aged children who are enrolled (while controlling for their total number of children) in school than women with lower levels of perceived social support because better-supported mothers may have the help they need to allow them to focus on offspring quality over quantity. Alternatively, less social support may decrease the number of biological school-aged children who are enrolled in school because mothers may not have the support, they need to allow for extrasomatic investments.
5. I predict that exposure will play an important role, such that women who live closer to health extension posts (local health clinics) and have greater interactions with health extension workers (healthcare agents who work in said clinics) will be more likely to contracept than women who live further from health posts and have fewer interactions with healthcare agents. Conversely, health clinic and health care agent exposure may not have a significant association with contraception use, possibly due to traditional household composition norms and values taking precedence regarding family size.

Dissertation structure

Chapter 2 delves into the theoretical frameworks, predominantly life history and embodied capital theories, on which this project is based. It explains my theorizing behind examining women's life history in terms of risky environments and perceptions of social support as influencers of reproductive outcomes and contraception use. Chapter 3 reviews reproduction and family planning, and the research that is typically associated with these topics. It discusses

the gap I attempt to fill here by identifying key areas of research that usually do not take place in developing countries both in subject matter, i.e. contraception as a parental investment tool, as well as theoretically.

Chapter 4 highlights Ethiopia and introduces the study population: the Sidama. Ethiopia is a developing country with a modernizing agenda, so I breakdown the healthcare system that the Ethiopian Ministry of Health implemented in the early 2000s, which is still functioning today. I discuss Sidama culture, specifically highlighting Sidama household and gender roles, as well as fertility. The Sidama are a people who traditionally value large families but who have incorporated Western contraceptives into their lives (mainly due to outreach), making them an appropriate fit to understand parental investment in the face of socioeconomic change.

Chapter 5 breaks down the research questions and hypotheses that drive this exploration. Chapter 6 discusses the two rural regions in which these data were collected, the instrument used to facilitate data collection (semi-structured interviews with an adjusted Multidimensional Scale of Perceived Social Support), and the analyses conducted on each hypothesis. Analysis conducted include negative binomial, logistic, and Poisson regressions.

Chapter 7 solely reports the results from the aforementioned analyses. In Chapter 8, I discuss each hypothesis to contextualize my findings. I also review the project's limitations and provide insights regarding improving this research in the future. I argue that the theoretical framework I employed was novel for both this topic and region, thus supporting the overall merit of this project.

CHAPTER 2

THEORETICAL BACKGROUND AND FRAMEWORK

Life History Theory

According to life history theory (LHT), energetic tradeoffs are made throughout an individual's life; energy dedicated to one function or activity cannot be allocated towards another function or activity (Chisholm, 1993; 1999; Ellis et al., 2009; Promislow & Harvey, 1990; Roff, 2002; Stearns, 1989; 1992; Trivers, 1972). Ultimately, these tradeoffs become a balancing act of "growth, maturation, reproduction, and death" (Hill and Kaplan, 1999:398) and should enhance fitness (Chisholm, 1993; 1999; Ellis et al., 2009; Hill and Kaplan, 1999; Promislow & Harvey, 1990; Roff, 2002; Stearns, 1989; 1992; Trivers, 1972). Tradeoffs are subconscious behaviors and may be influenced by stressful environmental conditions, both physical and social, during early life thereby creating individual variation (Belsky et al., 1991; Chisholm, 1993; Draper & Harpending, 1982; Ellis, 2004; Ellis et al., 2009; Mittal & Griskevicius, 2014). Stressful social environments include factors such as lower socioeconomic status, non-conjugal families (particularly father-absent homes), neglectful caretakers, warfare, etc., while stressful physical environments can include natural disasters, disease/parasitic load, famine/food insecurity, etc. Overall, these act as risk factors. Risk is "uncertainty regarding probability and outcomes of alternative strategies" (Boholm, 2015, p. 9). Unpacking this further, uncertainty "is the possibility that basic human needs might not be fulfilled should events unfold in particular ways" (ibid).

When evaluating tradeoffs, it is important to understand extrinsic and intrinsic mortality. Stearns (1992, p. 182) defines extrinsic mortality as deaths "that are not sensitive to changes in reproductive decisions" or behaviors. In these situations, mortality is heavily influenced by physical environmental factors such as "predation, parasitism, [and] climate" (Promislow & Harvey, 1990, p. 430). Stearns (1992, p.182) defines intrinsic mortality as decisions and

behaviors “that can be influenced by changes in allocation among reproduction, maintenance, and defensive structures.” Depending on the degree to which these risk factors are present, individuals must make tradeoffs between somatic and reproductive effort. Somatic effort refers to processes associated with “survival, maintenance, and growth and development” (Chisholm, 1993:2) while reproductive effort is based on reproductive success (Chisholm, 1993; 1999; Mittal & Griskevicius, 2014). Mating and parenting effort are the subcategories that comprise reproductive effort (Chisholm, 1993; Clutton-Brock, 1991; Daly & Wilson, 1983). Mating effort pertains to decisions and behaviors concerning “finding, attracting, and retaining mates” as well as “producing offspring” (Ellis et al., 2009, p. 210). Parenting effort, on the other hand, concerns “parental care, protection, teaching, [and] socialization” (ibid). It refers to the “total cost of caring for all progeny” (Clutton-Brock, 1991, p. 9).

Life history strategies, described via a slow-fast continuum, represent the collection of tradeoffs an individual makes or may make in his/her life and are influenced by social and physical environmental risks (Ellis et al., 2009; Promislow & Harvey, 1990; Mittal & Griskevicius, 2014). The tradeoff between current and future reproductive effort is “the most fundamental [life history] trade-off” (Ellis et al., 2009, p. 209) and indicates the ‘speed’ of an individual’s life history. Effort, e.g. resources and energy, applied towards current reproductive decisions are not available for future use (Ellis et al., 2009). Essentially, life histories are adaptive to specific environments (Ellis, 2004). Slow life history strategies support somatic effort over reproductive effort and are usually adaptive for low-risk environments. A common characteristic of these strategies is delayed sexual maturation, later childbirth, and higher levels of parental investment (PI hereafter) (Belsky et al., 1991; Chisholm, 1993; Draper and Harpending, 1982). Fast life histories, on the other hand, display the opposite relationship and

tend to be more adaptive in high-risk environments (Ellis et al., 2009; Quinlan, 2007). Earlier sexual maturation and earlier childbirth characterize fast life histories (Belsky et al., 1991; Caudell & Quinlan, 2012; Chisholm, 1993; Ellis, 2004; Mittal & Griskevicius, 2014; Nettle, 2010; Placek & Quinlan, 2012; Quinlan, 2007). For this reason, fast life histories prioritize offspring quantity over quality and PI is usually low (Belsky et al., 1991; Borgerhoff Mulder, 1992; Caudell & Quinlan, 2012; Draper and Harpending, 1982; Ellis et al., 2009; Nettle 2010; Quinlan, 2007; Roff, 2002; Stearns, 1992; Trivers, 1972).

Parental Investment Theory (PIT) finds itself situated well within the LHT framework (Coleman & Gross, 1991). PIT explores the relationship between parents, offspring, and resources (Trivers, 1972). Trivers (1972, p. 139) defines PI as "any investment by the parent in an individual offspring that increases the offspring's chance of surviving (and hence reproductive success) at the cost of the parent's ability to invest in other offspring." PI falls under parental effort, a subcategory of reproductive effort, in LHT (Clutton-Brock, 1991; Chisholm, 1993; Daly & Wilson, 1983; Ellis et al., 2009). Trivers (1972) argues that investment from both sexes is rarely identical, even when performing joint tasks, and women tend to display higher investment outputs. In addition, women are at risk of being deserted by their mates (Trivers, 1972). Each parent must decide between placing energy towards mating *or* parenting effort. The energy and resources dedicated to offspring reduce the amount of energy and resources available for each parent. Wade and Shuster (2002) argue that male parental investment is more likely when the indirect effects of offspring investment exceed the direct effects of desertion and mating elsewhere.

The foundation for reproductive effort behaviors, including PI, are argued to be established in early life and are connected to the amount of stress an individual may experience

during that time (Belsky et al., 1991; Chisholm, 1999; Draper and Harpending, 1982). A feedback loop is apparent: early life experiences shape adulthood which in turn can affect rearing patterns for the subsequent generation. As previously stated, high-stress environments are related to low levels of parental investment. Most research concerning PI focuses on the effects of fast life histories, and thus risky environments, on levels of investment and their effects on offspring (Belsky et al., 1991; Borgerhoff Mulder, 1992; Chisholm, 1999; Draper & Harpending, 1982; Fouts & Silverman, 2015; Ellis, 2004; Ellis et al., 2009; 2012; Mittal & Griskevicius, 2014; Nettle, 2010; Quinlan, 2003; 2006; 2007). In sum, earlier reproductive effort should be favored in stressful environments due to looming mortality risks, thereby increasing individual fitness. A quantity-over-quality perspective is more adaptive when resources are scarce, hence PI should be low. In a low-stress environment, however, mortality risks may not be applying as much pressure. In these safer conditions, it may be more adaptive to produce fewer, higher-quality offspring, which, in turn, could enhance inclusive fitness.

Although LHT significantly guides our understanding of human reproductive behaviors, it can be limiting because it does not always consider agency or cultural learning. For that reason, some researchers have expanded upon this theory to encompass deliberate psychological choices humans may make in response to their social and physical environments. Because humans are biocultural organisms, knowledge acquisition and skill mastery are equally as important as physical growth and development.

Embodied Capital Theory

Embodied capital theory (ECT) combines LHT with capital investment theory from economics (Kaplan, 1996; 1997; Kaplan et al., 2000). ECT initially focused on explaining the evolution of the human lifespan, prolonged periods of juvenile dependence, and the post-

menopausal period for women (Kaplan 1996; 1997; Kaplan et al., 2000; 2002; 2003; 2009). Foraging populations, which were the initial foci for this modeling, rely heavily on knowledge and skill for resource acquisition in risky environments. Efficient resource acquisition and processing takes years to master, and humans "are adapted to a skill-intensive foraging niche" (Kaplan et al., 2002, p. 234). ECT, therefore, argues that natural selection shaped humans to be psychologically sensitive to learning opportunities and the payoffs these opportunities provide in a given environment (ibid). In reacting to their environment, individuals must decide how much they can invest in themselves as well as in their offspring.

According to ECT, everyone has their own 'income,' which refers to the time that can be allocated to activities. It sets up an individual's 'budget' for parental investment, fertility, and other actions (Kaplan, 1996). As individuals age, embodied capital largely impacts said income, specifically its appreciation or depreciation. Embodied capital is comprised of physical and functional components. The former refers to somatic tissues, e.g. brain, muscle, digestive, etc., while the latter refers to characteristics such as speed, strength, knowledge, immune function, etc. (Kaplan, 1996; 1997). The latter, known as functional capital, influences the intrinsic activities to which one must deliberately elect to dedicate energy, e.g. obtaining resources, mating, parenting, defense, etc., thereby making it a form of capital that requires psychological considerations. Essentially, individuals are investing stock in their own, and possibly their offspring's, embodied capital. Because living organisms age and gradually deteriorate, maintenance behaviors such as feeding, tissue repair, and vigilance, are also forms of capital investment (Kaplan, 1997). Overall, embodied capital investments and income maintain a feedback loop. Investments in one area may affect, either positively or negatively, the allocations

that individuals can apply to another. Humans adapt to their environments by balancing these allocations.

Like LHT, ECT must also consider trade-offs such as present and future reproduction as well as offspring quality and quantity. Reproduction is a costly process, and those costs could have inter-generational effects (Stulp and Barrett, 2015). Regarding present-future reproduction, organisms are essentially balancing their own embodied capital allocations with reproduction, while quality-quantity tradeoffs equate to stock investments in offspring embodied capital (Hill and Kaplan, 1999; Kaplan, 1996; 1997; Kaplan and Bock, 2001). Essentially, parents should seek to optimize their income by balancing their own fertility allocations with the allocations they make towards their offspring's embodied capital, thus boosting the allocations offspring can—and ideally, will—make towards their own future reproductive efforts (Kaplan, 1997). For example, is investing in somatic capital over functional capital better suited for a given environment, or vice versa? If the effects of parental investment do not pay off until the offspring reaches adulthood, it is advantageous for parents to invest in capital that will ensure the offspring's survival, thereby ensuring the payout will come to fruition.

In foraging populations, for example, somatic investments directly translate into fertility outcomes: the greater the somatic wealth, the greater the fertility (Kaplan et al., 2002). In modern contexts, our attention must shift to the types of embodied capital that are present and helpful in transitioning and urbanizing environments. ECT takes LHT one step further and incorporates socioeconomic influences into its investigation of how humans navigate their social and physical environments. In doing so, ECT allows us to understand how "social, cultural, economic, and ecological contexts" affect human reproductive decision-making and parental investment (Kaplan and Bock, 2001, p. 5562). This is particularly important because parental investment not

only affects offspring survival, but it also influences an offspring's socioeconomic status in adulthood. The longer an individual spends growing and learning, prior to reproducing, the more natural selection favors behaviors and investments that allow an organism to benefit from said investments (Kaplan and Bock, 2001).

Skill-based labor markets dominate economic institutions (Kaplan, 1997; Kaplan and Lancaster, 2000); therefore, a shift in embodied capital priorities due to industrialization arises, thereby causing the reevaluation of offspring quality versus quantity. These factors change human reactions to social and physical environments. Extrasomatic capital, for instance, becomes an increased priority. Wealth consumption, particularly in the form of consumer goods, intensifies (Kaplan et al., 2002). From this, we see a change in payoffs for embodied capital investments (Kaplan and Bock, 2001). Fertility thus becomes affected, typically via modern reproductive technology and other sexual behavior changes. Parents must evaluate their own extrasomatic capital, e.g. wealth, and compare it to the number of children in which they can afford to invest and rear (Kaplan et al., 2002). For example, land and money are forms of physical capital that parents can store and later invest in offspring through means of inheritance and/or in areas of learning, such as formalized education. Parental involvement in their child's education (a form of parental investment) may affect how well a child can perform in school and the former's investment in this domain may influence their mating efforts. Additionally, advances in medical technology and public health have decreased mortality rates across all age groups (Kaplan and Bock, 2001). Under these conditions, parental investment begins to favor offspring quality over quantity. As individuals survive longer, they, and potentially their parents, can reap the benefits of their educational investments for a longer period. This prolonged period of return can incentivize parents to invest in education as a form of embodied capital.

Regarding learning and mastering skills, individuals may choose to invest in their own embodied capital and delay the onset of reproduction (Kaplan et al., 2002). According to ECT better-educated, wealthier parents will invest more in their offspring than parents with less education and wealth (Hill and Kaplan, 1999; Kaplan, 1996; Kaplan and Lancaster, 2000). As individuals plan their families, parents must decide if it is more beneficial to have fewer, higher-educated, skilled offspring or more less-educated, unskilled offspring. Lower mortality rates provide parents with some stability in their reproductive decision making, thereby allowing them to decide on the size of their household, because the number of children born may more reliably live to adulthood (Kaplan, 1997; Kaplan and Bock, 2001) than in non-industrialized settings. As a result, we see fertility rates decline in industrialized environments (Kaplan, 1996; 1997; Kaplan et al., 2002; Shenk et al., 2016). Contraception may contribute to this situation; however, declining fertility may also be due to concerns over investing in embodied capital (Kaplan et al., 2002; Shenk et al., 2016), e.g. education and industrialized skill-based knowledge, aimed at producing the type of desired offspring.

One of the pitfalls of ECT, however, is that it is predominantly used to explore changing fertility phenomena in Western and industrialized societies, aside from the human evolutionary history building that took place in early foraging population investigations. Although ECT builds on LHT, it negates to emphasize risk in the manner that the latter does. This is particularly important when focusing on developing countries and transitioning societies because risky environments are not necessarily buffered, thereby altering the concerns that individuals have, particularly when reproductive effort is concerned. For this reason, both LHT and ECT provide the theoretical backbone of this project.

Other theoretical orientations

Social ecological theory (SET hereafter) incorporates a multidisciplinary approach to explore personal and environmental factors that influence human health and behavior. Nested in SET is the social ecological model (SEM hereafter), a level-based analysis technique that categorizes health-influencing factors. The SEM provides a framework for establishing and maintaining health promotion and disease prevention programs because it recognizes that individuals juggle their own knowledge and behaviors with external stimuli they receive from their respective social and physical environments (McLeroy et al., 1988; Stokols, 1996).

According to SET, there are five levels of analysis to consider: intrapersonal, interpersonal, institutional, community, and public policy. The intrapersonal level, also known as the personal level, incorporates the individual and their developmental history, knowledge, skills, opinions, and behaviors, etc. The interpersonal level captures the individual's social networks and social support systems. Institutional factors include social institutions that maintain an organizational component via operational rules and regulations, i.e. school, worksites, etc. The community level captures the aforementioned levels as well as an individual's population, including the geographic and political entities that envelop said population. The policy factors focus on laws and policies that are enacted and enforced on local, state, and national platforms (McLeroy et al., 1988). SEMs are appropriate methods to evaluate human health and behaviors because they always incorporate at least two analysis levels, thus recognizing that health is multidimensional (Stokols, 1996). Placek and colleagues (2019) argue that combining evolutionary theory and SET can provided a more well-rounded framework for understanding individuals' health perceptions. In considering both social-ecological and evolutionary factors, we can better explore the effectiveness of public health communications and initiatives.

CHAPTER 3

REPRODUCTION AND FAMILY PLANNING

Reproduction and family planning have been common foci of anthropological research for decades. Throughout the years, social scientists have focused on reproduction and its place within kinship systems, socialization, social identities, power/political struggles, reproductive rights, and female empowerment (see Bledsoe, 2002 as well as Ginsburg and Rapp, 1991 for a comprehensive overview). At times, reproduction and contraception use are highly politicized (Greenhalgh, 1995; Kaler, 2000; Maternowksa, 2000; Thompson, 2000) mainly due to state-level economic interests and international concerns regarding population control (Ginsburg and Rapp, 1991; Thompson, 2000).

Most modern contraceptives are developed for female physiology, and thus women tend to the be sole focus of contraception studies. This may also be a result of the feminist movement in the 1960s and 1970s (Bledsoe, 2002). Therefore, reproductive health, as a category, finds itself nested in "women's issues" (Kabagenyi et al., 2014:7). Research regarding men and contraception exists (Crosby et al., 2004; Dudgeon & Inhorn, 2004; Ellen et al., 1996; Higgins & Hirsch, 2008; Kabagenyi et al., 2014; Ott et al., 2002; Raine et al., 2010; Sternberg and Hubley, 2004; Terefe & Larson, 1993; Tuloro et al., 2006); however, it is scarce in comparison. Research pertaining to condoms, which double to prevent both sexually transmitted infections (STIs) and pregnancy, is typically divided into these two camps. It is important for family planning researchers keep in mind that some individuals may avoid condoms for reasons specifically associated with STIs (e.g. condom use is not necessary if a partner does not have an STI) as opposed to perceiving them as a method of pregnancy prevention.

Research in developing countries (including projects conducted by government and nongovernment organizations) typically focus on unmet contraceptive need and/or overall use patterns associated with socioeconomic factors (Bledsoe, 2002; Chaurasia, 2014; Gakidou and

Vayena, 2007; Genet et al., 2015; Gizaw and Regassa, 2011; Greenhalgh, 1995; Hailu, 2015; Jiang and Hardee, 2014; Korra, 2002; Obwoya et al., 2018; Regassa, 2006; 2007a; 2007b; Sundaram et al., 2010; United Nations, 2015; Wulifan et al., 2016). Research in developed countries is more common. Use patterns, however, are still heavily incorporated (Mosher et al., 2004; Oddens, 1997; Riphagen and Lehert, 1989). Other topics such as emergency contraception (Free et al., 2002; Nappi et al., 2014; Kosunen, 1997; Nelson, 2006; Graham et al., 2002; Shoveller et al., 2007;), perceptions (Oddens, 1997), and demographic effects (Leridon, 1981; 2006) are popular areas for research within developed countries. In addition, age at first intercourse (Magnusson et al., 2012) and sexuality (Higgins and Hirsch, 2008) are important concepts that researchers are exploring and may relate to environmental risk. The expansion into new areas of research, e.g. sexuality, is likely to be more feasible in developed countries since women in these regions have had more time to use and more options of modern contraceptives. Regardless of location, quality of care has also been a major focus (Blanc et al., 2002; Bruce, 1990; Chakraborty et al., 2015; Dehlendorf et al., 2010; Jain et al., 1992; Koenig et al., 1997; Nalwadda et al., 2011; Steyn et al., 2016; RamaRao et al., 2003; Tappis et al., 2015).

Researchers have extensively explored the role social networks and social support play in determining family planning behaviors (Agha, 2010; Behrman et al., 2002; Bongaarts and Watkins, 1996; Gayen and Raeside, 2010; Godley, 2001; Kar and Cumberland, 1984; Kar and Talbot, 1980; Kohler, 1997; Lowe and Moore, 2014; Montgomery and Casterline, 1996; Valente et al., 1997). Generally, women whose social networks are supportive of contraception are more likely to use it. Within this network, husbands play a key role. Understanding males' roles associated with contraceptives, fertility, and overall reproduction is crucial. Cross-culturally, positive spousal support and involvement increases women's contraceptive use and continuation

(Bawah, 2002; Ezeanolue et al., 2015; Hartmann et al., 2012; Olaitan, 2011; Raine et al., 2010; Samandari et al., 2010; Sharan and Valente, 2002; Sternberg and Hubley, 2004; Terefe and Larson, 1993; Tuloro et al., 2006).

In developing countries, contracepting women have decreased incidents of maternal death rates, infant mortality, unwanted pregnancy, and unsafe abortions (Cleland et al., 2012). It is estimated that contraception use has decreased fertility by 75% in developing nations over the past 60 years (Cleland et al., 2012). The United Nations (UN) (2015, p. 19) estimates that "[n]early 800 million married or in-union women [will be] using contraception in 2030." Currently, 142 million married or in-union women experience an unmet need for contraception. The UN estimates that this number will increase to 143 million by 2030 (ibid). Researchers are fully aware of this gap and though the main goal is clear, the path to take may not be. To gain a reliable and holistic understanding of contraception use patterns and family planning behaviors and values, Russel and Thompson (2000, p. 7) argue that researchers must understand "the political and economic structures, and social and cultural forms, of the people amongst whom they are found and (perhaps) used, and the local realities that mediate and ultimately define a global phenomenon such as contraception." In multicultural areas, generalized programs may not work, and therefore, researchers must be open and willing to be flexible in their explorations of the subject.

Ginsburg and Rapp (1991, p. 318) label Western intervention as "medical hegemony" that ultimately interferes with local cultural constructs. For public health and outreach programs to be effective, they must cater to their target demographic. Although population control is a major concern for governments (Chaurasia, 2014; Ginsburg and Rapp, 1991; Jiang and Hardee, 2014; Thompson, 2000), individuals may not share the same concern; thus, it is important to

incorporate other cultural processes that influence perceptions of reproduction and family planning. For example, in some regions “high fertility is a social achievement” (Bledsoe, 2002, p. 6). In these situations, this concept is deeply embedded within cultural institutions that heavily influence social life, e.g. economics and politics. Anything related to contraception cannot necessarily be treated as a mutually exclusive cultural phenomenon. Any influence that cultural institutions have, regardless of their effect sizes, should be fully addressed and explored. Part of exploring contraception perceptions, use patterns, and needs involves focusing on males’ and women’ agency. This includes considering all their positions within their unions, not only their union’s place within the overarching social context, and that these contexts may combine with social and physical environments to influence behavior (Carter, 1995). Carter (1995) argues that culture and agency are not binary and should not be treated as such. In maintaining this viewpoint, researchers can better understand everyone’s “concerns regarding side effects and health risks,” which “are the [some of] the most common reasons for non-use in countries with high levels of unmet need for family planning” (United Nations, 2015, p. 12; Sedgh & Hussain, 2014).

Demographic and Health Surveys (DHS hereafter), conducted from 2005-2014 in 52 countries, provide insight into the relationship between women and contraception (Sedgh et al., 2016). For example, 26% of married women who report not using contraception are concerned about side effects and health risks. Survey participants are more likely, on average, to report their own opposition to contraception as the main reason for nonuse, while 23% report that individuals to whom they are close oppose the use of contraception. Amongst women who are sexually active and single, 29% report that their single status prevents them from using contraception. This is likely due to cultural norms that may prohibit premarital sex. Women who are more

educated, who are nonpoor, and/or who live in urban environments have lower levels of unmet need than their counterparts. In Africa, unmet need is high and relatively equal across all age-groups, except amongst women aged 45-49. I note that lack of awareness regarding contraception nonuse is rarely the reason why women report nonuse, and married women rarely report lack of access as a factor of nonuse (Sedgh et al., 2016).

Much of the theoretical explorations of contraception use revolve around demographic transitions and understanding fertility declines in response to environmental stimuli (Colleran, 2016; Lawson and Borgerhoff Mulder, 2016; Sear et al., 2016). Evolutionary demographers largely focus understanding *how* and *why* population shifts occur. In doing so, they predominantly concentrate on industrialized populations (Stulp et al., 2016a; 2016b). There are some trends, however, that appear to be consistent cross-culturally. For example, as societies modernize, we see a shift in fertility levels. Wealth and education are the two most commonly investigated factors in fertility decline. Increases in wealth typically negatively influence family size (Clark and Cummins, 2009; Lawson and Mace, 2011; Livi-Bacci, 1986; Myrskylä et al., 2009); while, increased education, regardless of location, positively predicts modern contraception use (Alvergne et al., 2011; Colleran and Snopkowski, 2017; Muhindo et al., 2015; Obwoya et al., 2018; Olaitan, 2011; Tuloro et al., 2006). Colleran and Snopkowski (2017) found that wealth in populations positively predicted fertility in high-fertility populations but had the opposite effect in low-fertility populations. Because wealth and education are so heavily intertwined, it can be difficult to tease them apart. Overall, demographic researchers argue that more holistic and multidimensional frameworks are required to further our understanding on the topic (Colleran, 2016; Lawson and Borgerhoff Mulder, 2016).

Wilson and Pison (2004) estimate that more than half of the world's population live in regions in which fertility rates are below replacement levels. Kaplan (1996) argues that the use of modern contraception is the result of a demographic transition, not its cause. I note that much of the research focusing on demographic transitions in "traditional" societies, e.g. natural fertility populations, is used to compare trends in modernized ones. Although these studies are important and provide insight into human population shifts, they leave little room for societies in between the two ends of the development spectrum. For example, what happens when a society is currently modernizing, and yet traditional norms—particularly those revolving around family composition and social requirements—are strongly maintained? Although understanding the *how* and *why* of demographic shifts is important, we cannot neglect *what* parents are actually doing as they navigate these social and economic changes.

One area of family planning research that is underexplored in developing or transitioning societies is the consideration of modern contraception as a parental investment tool. Alvergne and colleagues (2013) investigated early contraception uptake as a mode of parental investment in Ethiopia and its impact on offspring survivorship. They used inter-birth intervals as a proxy for parents' motives, e.g. parental or mating effort. Alvergne and colleagues found that women with high fertility and low infant mortality are more likely to use modern contraceptives. Furthermore, contraception use did not have an impact on offspring survivorship, likely due to structural improvements that come along with socioeconomic development. This study is novel because micro-level studies exploring contraception use as a parental investment technique are far and few between. Although their work is important, it does not necessarily account for ecological risk, which plays a significant role in parental investment decisions. The study

population lives in high-risk locations; however, the risk these individuals face was not incorporated into the models.

Understanding contraception onset is vital; but, a more holistic framework is necessary to fully understand this topic. Women may have, or may be expecting to have, sporadic contraception use patterns. The reasons for this may vary by their social and physical environments. Incorporating current and future plans is important because it provides us with a psychological pathway for their reproductive behaviors and/or perceptions. Contraception can and does interfere with fecundity, thus affecting fertility rates. I argue, though, that this should not be the main focus of current evolutionary explorations of contraceptives, particularly those based in modernizing societies. Concerns over fitness do not solely drive individuals. Rather, they may be more concerned on ensuring the social, in addition to the physical, survivorship of their offspring. Planning for their offspring's future, particularly while juggling various forms of risk, can affect the choices parents make before they have begun, or during, their reproductive careers. Redirecting our focus is the only way we can get a clearer picture of parental investment via contraceptives.

In addition to restructuring our approach towards family planning motivations, we must also understand another internal driver of reproductive decision-making. Although researchers have clearly demonstrated the power social networks have over a woman's decision to contracept, we have not fully explored how their perceptions of their own social support (in general, not specifically relating to contraception/family planning) combined with environmental risk influence their reproductive behaviors. I argue that the reality of their situations, i.e. whether they have support in positive and/or negative life situations, may not always need consideration. The ideas/opinions women may maintain are real to them and can influence the realities of their

lives, thereby making these perceptions a critical area for exploration. For example, women's perceptions of their peers' contracepting knowledge/behaviors within their social networks is strongly associated with their own contraception use (Montgomery and Chung, 1999), especially if peers encourage women to contracept (Valente et al., 1997). The reality of her peers' family planning behaviors, though important, does not necessarily determine whether a woman will contracept (Montgomery and Chung, 1999). Taking this idea a step further, I argue that the importance of a woman's perceptions can be applied to other areas of her life, i.e. social support. A woman's self-assessment of the social support she receives may influence her decision to start, continue, or to resume contracepting, specifically when incorporating the amount of risk in her life. These perceptions, regardless if they match up with reality, are powerful drivers of contracepting behaviors that we cannot ignore.

Though many facets of family planning and reproductive behaviors have been explored, I argue that there are theoretical gaps that remain, particularly as they pertain to developing countries with substantial risk. By considering women's perceptions of their social situations, their efforts towards offspring investment, and the environments in which these women live, we can unlock a more holistic framework for family planning research.

CHAPTER 4

POPULATION BACKGROUND AND DESCRIPTION

Overview of the Federal Democratic Republic of Ethiopia

Ethiopia is an East African country in the Horn of Africa. It is situated within 3.30°–15°N, 33°–48°E (Korecha and Barnston, 2006), between the equator and the Tropic of Cancer. Ethiopia is a landlocked country that shares borders with Sudan and South Sudan (west), Eritrea (north), Djibouti (northeast), Somalia (east), and Kenya (south). There are three distinct seasons: *Kiremt* (main rainy season, June-September), *Bega* (dry season, October-January), and *Belg* (small rainy season, February-May) (Korecha and Barnston, 2006; Seleshi and Zanke, 2004). The *Kiremt* season accounts for 50-80% of rainfall the country receives. Decreases in rainfall during these months can cause severe droughts in the country, which can have damaging effects on Ethiopia's agricultural sector and overall water needs (Korecha and Barnston, 2006). Geographically, Ethiopia is diverse. The country has a mean elevation of 1,330 m, with the highest point, Ras Gejen mountain, standing at 4,500 m, and the lowest, Danakil Depression, sitting at 125 m below sea level. Throughout the country are highland mountains, plateaus, and lakes. The Great Rift Valley runs diagonally through the country, from the northeast region down to the southwest. Lowlands and steppes surround the Great Rift Valley (Ethiopia Geography, 2017). Thirty-four percent of Ethiopia's land is dedicated to agriculture. Cereals (such as teff, barley, wheat, maize, and sorghum), pulses, and oilseeds are the three crop groups that dominate Ethiopia's agriculture sector, respectively (Taffesse et al., 2012). Other crops, such as coffee, *chat*, and enset, are economically important (Taffesse et al., 2012), and much of their importance largely rests in their place within local cultures. Ethiopia boasts the fifth largest cattle stock in the world. Nearly all farmers own livestock, with cattle, sheep, goats, and poultry being the most popular options (Bachewe et al., 2012).

Ethiopia maintains a federal parliamentary republic, with the Prime Minster serving as the head of government (Pariona, 2019). Ethiopia is a country rich in diversity, home to more than 80 ethnic groups. Because Ethiopia is so diverse, the country is administratively divided into nine ethnically based, semiautonomous states, or *kililoch*: Afar, Amara (Amhara), Binshangul Gumuz, Gambela Hizhoch (Gambela Peoples), Hareri Hizb (Hararai People), Oromiya (Oromia), Sumale (Somali), Tigray, Ye Debub Biheroch Bihereseboch na Hizboch (Southern Nations, Nationalities and Peoples). In addition to these nine regional states, two self-governing administrations, *astedaderoch*, also exist: Adis Abeba (Addis Ababa, the country's capital) and Dire Dawa. Each regional state is comprised of administrative zones, based on ethno-linguistic territoriality. Each zone is comprised of districts, or *woredas*; and each *woreda* is comprised of neighborhoods, or municipalities, called *kebeles*. The Oromo and Amhara are the two largest ethnic groups in the country, respectively. Combined, they account for more than half of the Ethiopian population (Sawe, 2019). Although the Oromo is the largest ethnic group in the country, Amharic, the native language of the Amhara people, is Ethiopia's national language (ibid). Orthodox Christianity is the most practiced religion in Ethiopia, with 43.5% of the population claiming membership. Following Orthodox Christians are Muslims (33.9%), Protestant (18.5%), and other religions taking the balance (Central Intelligence Agency [CIA hereafter], 2019).

Of the 109 million individuals who live in Ethiopia nearly 80% of them live in rural areas (United Nations Development Programme [UNDP hereafter], 2019). The United Nations has identified Ethiopia as a low income, highly indebted country and one of the least developed countries on the African continent. As of 2018, the country's gross domestic product (GDP hereafter) is $84.36 billion USD, while the gross national income (GNI hereafter) per capita is

$2,010 USD (World Bank Group, 2019a). The service, agriculture, and industry sectors are the leading contributors to Ethiopia's GDP, respectively (UNDP, 2018). Ethiopia's Human Development Index (HDI hereafter) value is 0.470, ranking the country at 173 of 189 countries. Life expectancy at birth is 66.2 years. Nationwide, individuals are expected to go to school for 8 years; however, the national average is 2.8 years (UNDP, 2019). Though these labels and statistics initially appear grim, they are signs that the Ethiopian government's plans to eradicate poverty are working. Due to increased government programs and outreach, Ethiopia has seen significant positive changes in access to social services and infrastructure over the past decade and a half (UNDP, 2018).

The Ethiopian Ministry of Health has actively attempted to increase and improve access to health services and care. Four layers make up the national health system beginning with the primary health care unit (PHCU hereafter), followed by district, zonal, and specialized hospitals. Though the PHCUs are the lowest level of the system, they are immensely important, especially in rural areas. Each PHCU is composed of one health center and five satellite health posts, with the former administratively overseeing the latter. The health center provides primary health care and maintains a wide range of health providers, e.g. health officers, nurses, midwives, and lab technicians. The satellite posts, which everyone refers to as health extension posts (HEP hereafter), are run by health extension workers (HEW hereafter) (Medhanyie et al., 2012). The HEW positions were created in 2003 when the Federal Ministry of Health launched the Health Extension Program. Under this program, women who are at least 18 years of age and who have completed 10^{th} grade are eligible to undergo one year of training. Trainees learn about a wide variety of topics which include maternal, newborn, and child health, family planning, hygiene and sanitation practices, STIs and testing, immunizations, first aid, nutrition, and disease, e.g.

malaria and tuberculosis, prevention and control. After becoming an HEW, these women are paid a government salary and are assigned to a HEP. Generally, two HEW run one post; however, up to four HEW may work at a post if the community it serves is larger in size (Mangham-Jefferies et al., 2014). Typically, one HEP serves one *kebele,* which equates to about 1,000 families, roughly 5,000 individuals (Mangham-Jefferies et al., 2014; Medhanyie et al., 2012). Since the program's creation, the government has trained more than 35,000 HEW and they work in more than 14,000 rural HEP. Their main job is health promotion and outreach. Mangham-Jefferies and colleagues (2014) found that HEW spend about 70% of their time in contact with individuals in their *kebele*. In the average week, HEW spend 51% of their time at their respective health post and 37% of their time with their respective communities. Because much of the country's population is rural, HEW and HEP may be the first option families have when seeking healthcare. For this reason, the rapport HEW have their respective communities is vital. Individuals generally trust these women and respect the knowledge and services they provide (Flores personal notes, 2015).

Southern Nations, Nationalities, and Peoples' Region

The Southern Nations, Nationalities, and Peoples' Region (hereafter SNNPR) is a state, or *kilil* (singular form of *kililoch*), located in Ethiopia's southwestern region. Hawassa is the *kilil*'s capital and administrative hub. It is one of the most rural federal states in the country (Quinlan et al., 2015; Regassa, 2007a; Regassa, 2007b), and is comprised of 22 administrative zones. The most densely populated *kilil* in Ethiopia (Hailemariam and Haddis, 2011), SNNPR's overall population size is 14,929,548 individuals (Central Statistical Agency-Ethiopia [CSAE hereafter], 2007).

Sidama and the Sidama Zone

The Sidama are the largest ethnic group in SNNPR and the fifth largest ethnic group in the country. They traditionally practice agropastoralism and predominantly live in the Sidama Zone of northern SNNPR, the least developed zone in the state (Regassa, 2007a; 2007b). More than 2.9 million individuals reside in this region (CSAE, 2007). The Sidama Zone shares its western border with the Wolayita Zone and a portion of its southern border with Gedeo Zone. The Oromia *kilil* borders the remaining areas. Within the Sidama Zone are 19 *woredas*, and Awassa serves as the zone's administrative center (Asegid et al., 2014). The region varies geographically with mountainous highlands and lowland plains, ranging in altitude from 1,001 to 3,200 m above sea level (Asmare et al., 2010). Roughly 84% of individuals in the Sidama Zone identify as "Protestant," others follow Islam (5%), Orthodox Christianity (3%), Catholicism (3%), traditional Sidama religious beliefs (3%), and other religions (2%) (CSAE, 2007).

Sidama subsistence

The East African cattle complex is a term used to describe East African pastoralist cultures who not only raise cattle, but who also heavily incorporate them into much of their cultural institutions (Herksovits, 1926). Many well-known cultures, such as Dinka (Deng, 1972), Nuer (Evans-Pritchard, 1940), Maasai (Merker, 1910), Turkana (Gulliver, 1951), Nandi, and Zulu (Herksovits, 1926) are included in this complex. "Cattle have become the dominant element in the cultures of these peoples" (Herksovits, 1926, p. 652); however, that is not to say that these cultures are identical. Rather, the cattle complex label was created to show that cattle "are associated almost universally with birth, death, and marriage ceremonies, are the chief form of wealth, and the most prominent measure of power, prestige, and status, and the proper animals for feasts or ceremonies" (Schneider, 1957, p. 278). Some researchers (Mtetwa, 1978; Schneider,

1957) argue that the generalized idea of the cattle complex may not be representative of all the cultures that fall into Herksovits' geographic outline. Gulliver (1951) argues that the Turkana cannot be regarded as "purely and simply a cattle people" (p. 16) and that they "do not despise agricultural activities and would grow more if they could" (p. 32). According to Jacobs (1965, p. 149), "livestock appear to be important measures of wealth and social position *only* in those societies in which they are secondary sources of subsistence." Clearly, there is always going to be variation and not each culture will directly fit into descriptive labels that are created. Regardless, the cattle complex provides a good outline for most of the pastoralist groups in East Africa.

The enset complex of southwest Ethiopia is a term used to describe cultures whose staple crop is *Ensete ventricosum* (Welw.) Cheesman, more commonly known as enset or false banana (Pijls et al., 1995; Quinlan et al., 2014; Shack, 1963). In Sidaminya, it is known as *wesse* (Hameso 2006). *E. ventricosum* was domesticated in SW Ethiopia (Murdock, 1959:182). Except for the Gurage, the cultures that rely on this crop are Cushitic-speaking peoples (Shack, 1963). These cultures are unique in that they exhibit "a complexity of social, political, economic, and ritual practices…[that are] comparable to the yam and taro planting cultures…in Micronesia and New Guinea…" (Shack, 1963, p. 73). Of the cultures included in the complex, the Sidama and the Gurage and the most heavily dependent upon enset (Brandt et al., 1997; Quinlan et al., 2014). Enset is cultivated via hoe technology (Shack, 1963). Enset plant fibers can be used to create useful household materials, e.g. "rope, sieves, and cleaning material" (Piljs et al., 1995, p. 2) and are important trade items (Shack, 1963). It is also used to feed livestock (Brandt et al., 1997; Quinlan et al., 2014) and is used in medicine (Brandt et al., 1997). In addition to being economically useful, enset also plays a significant role in rituals, ceremonies, and supernatural

beliefs. In some cultures, such as the Gurage, terms used to track enset growth are also applied to male age-groups (Shack, 1963). Division of labor is applied to enset production: men cultivate and harvest the plants while women and girls process them into food (for a full breakdown of this process, see Pijls et al., 1995). Women may also aid in manuring fields (Brandt et al., 1997).

The cattle and enset complexes described above merge together in Sidama culture. Sidama raise zebu cattle (*Bos primigenius indicus*) and are heavily reliant upon enset (Quinlan et al., 2014). The Sidama, cattle, and enset are said to live in a symbiotic relationship (Hamer, 1987; Hamer & Hamer, 1994; Quinlan et al., 2014). Cattle, and other livestock, sleep in the same dwelling as humans. Cattle consume the inedible portions of the enset plant. Their waste products are used to fertilize enset fields. Their byproducts, e.g. milk and butter, are commonly eaten with enset foods, thus providing a reliable protein source (Brandt et al., 1997; Quinlan et al., 2014). Sidama raise other livestock, e.g. goats, sheep, chickens, and cultivate other plant foods, e.g. fruits, vegetables, other starches (Quinlan et al., 2014); however, cattle and enset are the most economically and symbolically important to Sidama. In the Ethiopian highlands, the Sidama have an extensive folk taxonomy for enset which indicates the significance of enset within the Sidama culture (Quinlan et al., 2014).

Among the Sidama, coffee (*Coffea arabica* L.) and *chat* (*Chata edulis* Forssk.) serve as cash crops. In addition, eucalyptus (*Eucalyptus globulus* Labill. and *E. camaldulensis* Dehnh.), and African highland bamboo (*Yushania alpina* (K.Schum.) are grown with the intent of selling (Quinlan et al., 2014). Not all Sidama grow these cash crops because they live in varying environments. For example, coffee is not a common cash crop in the Arbegona *woreda* (located in the highlands) (Flores personal notes, 2016; Quinlan et al., 2015) but is common in the Boricha *woreda* (located in the lowlands) (Flores personal notes, 2016). Additionally, eucalyptus

and bamboo are not as commonly grown in Boricha but are found throughout Arbegona (Flores personal notes, 2016). Maize (*Zea mays* subsp. *mays* L.) has become a popular crop among some Sidama populations due to its ease of maintenance compared to other cereal crops, its quick maturation time, and its ability to grow well in dry environments (Quinlan et al., 2015; 2016). Maize can recovery more quickly than enset when crop loss has occurred (ibid). These reasons are particularly important, especially since some Sidama populations are struggling with the effects of climate change, e.g. decreased rainfall and drought. Although maize is becoming more common, enset remains as a dominant symbol of Sidama economics and identity (Quinlan et al., 2016).

Highland Sidama, e.g. Sidama communities who live in the highlands such as the Arbegona *woreda*, experience regular rainfall and therefore are buffered from risks such as crop loss and livestock loss (Quinlan et al., 2015). Sidama in midland, lowland, and peri-urban zones (e.g. Boricha, Lokka Abaya, and Hawassa Zuria *woredas*, respectively), however, are at higher risk due to "erratic rainfall, recurrent drought, crop failure, livestock loss, and subsequent food shortage" (Quinlan et al., 2015 in Dira & Hewlett, 2016, p. 17). Due to the environmental pressures experienced by the latter three *woredas*, maize is becoming a more common crop. Hawassa Zuria places the heaviest dependence on maize and experiences the highest risk of the four *woredas* (Quinlan et al., 2015). When rainfall is erratic and droughts set in, livestock are also affected. Households may be forced to sell their cattle in exchange for food. Once this pattern begins, it can be difficult for households to recover their original level of wealth and it can also be difficult for the cattle population to recover (Quinlan et al., 2016). For the Sidama, cattle are of major importance in economics and identity. This is apparent as perceptions of individual wealth and status have changed. Before droughts were common in Boricha, 20 cattle

indicated a man's economic and social standing. In current conditions, five cattle is the new norm (Quinlan et al., 2016).

In addition to physical environmental shocks, Sidama in these areas are also exposed to social shocks such as warfare and disease (Quinlan et al., 2016). In the 1960s, the Sidama were at war with the Oromo. Around 1981, the Sidama Liberation Front began combating the Derg which resulted in raids and killings. During times of war, men were not home to tend to their crops, thus causing food shortages. Ultimately, this, combined with warfare, severely affected the Sidama population. In these situations, recovering crops and livestock is difficult and can take years (Quinlan et al., 2016, p. 639-640). During the 1950s, a smallpox outbreak took place. In addition, *ajiite,* a terminal disease if not treated, and typhus outbreaks were taking place about 40 years ago. All three of these outbreaks resulting in the deaths of many. Fears of babies contracting HIV from breastmilk has also changed childrearing practices. Mothers no longer allow alloparents, including relatives, to breastfeed their babies (Quinlan et al., 2016).

The risk factors described above have additional social implications for individuals. Quinlan and colleagues (2016) identified impulsivity behaviors among the Sidama. They found that when social shocks arise, individuals in the enset regime are more likely to be careful and controlled. When crop loss occurs, these individuals are less likely to act without thinking. On the other hand, individuals in the maize regime, whom Quinlan and colleagues identify as "transitional maize farmers," are less likely to be careful and controlled when social shocks arise and are more likely to act without thinking when crop loss occurs. In both regimes, social shocks showed a positive relationship with acting without thinking. Impulsivity may serve as an adaptive response and could be viewed as active niche construction (Quinlan et al., 2016). This

impulsivity may be attempting to mediate the effects of high-risk environments in a way in which traditional cultural institutions cannot.

Sidama household and gender roles

Sidama are patrilineal and patrilocal (Hamer, 1987). Household composition varies. Households may be nuclear with a set of parents and their child(ren), polygynous with a husband, his wives, and their children, and/or they may include extended family members, e.g. husband's parent(s), siblings, etc. A male is always the head of the household (Hamer, 1987). Sixteen percent of married women in SNNPR report being in a polygynous union, which is five percentage points higher than the national statistic (CSAE and ICF, 2017). Hamer estimates that the average Sidama household is 4.43 individuals (1987, p. 36).

Division of labor and gender roles are markedly rigid. Within the Sidama household, men tend to cattle (Hamer, 1987), cultivate and harvests crop (Pijls et al., 1995), prepare and maintain farm land (Hamer, 1987), construct and maintain the architectural integrity of their homes and fences, discipline their children (Hailu & Regassa, 2007; Flores personal notes, 2015; 2016), and handle conflict resolution (Hamer, 1987; Hamer & Hamer, 1994). In addition, they are responsible for other economic concerns such as crop-related decisions, buying clothing, deciding if and which children can attend school, deciding when family members can seek healthcare, and providing the finances to make the latter three happen (Flores personal notes, 2015; 2016; Hamer & Hamer, 1994). Typically, the decision regarding family size is a father's decision (Flores personal notes, 2015). Women, on the other hand, are responsible for the domestic duties of their households. They rear children, process and prepare food, maintain their homes, tend to livestock (Flores personal notes, 2015; 2016; Hamer, 1987), and manure fields (Brandt et al., 1997; Flores personal notes, 2015; 2016; Hamer, 1987). In polygynous situations,

if cowives get along, they may care for each other's children; however, they avoid reprimanding non-consanguineal children (Flores personal notes, 2015). Boys aid their fathers in male-associated work while girls assist their mothers in domestic activities, e.g. retrieving firewood and water (Hamer, 1987). Women are rarely community leaders (Hailu & Regassa, 2007). Domestic violence is somewhat tolerated among the Sidama and is usually performed by males (Hamer & Hamer, 1994).

Power differences between men and women are apparent. Gender roles began to clash when a cash economy was introduced to the Sidama culture (Hamer, 1987; Hamer & Hamer, 1994). Coffee is their most lucrative cash crop. At the market, women are generally responsible for selling and trading products associated with their domestic duties, e.g. dairy and enset products, while men have become responsible for selling livestock, cash crops, and other resources (Hamer, 1987; Hamer & Hamer, 1994). Since men handle these types of transactions, they are more likely to be in control over their household's income. Hamer (1987) describes situations in which men accuse women of spendthrift behaviors thus harming the livelihood of the household. Women may refute this claim and resort to stealing coffee cherries to sell for cash (Hamer, 1987; Hamer & Hamer 1994). Women are in a particularly difficult situation because they are unable to control resources that bring in the most income. Wives spend the money they make on resources for their households while husbands are expected to provide additional income for any other needs his wife (or wives) and children have (Hamer & Hamer, 1994).

While conducting focus groups in Arbegona and Boricha, I uncovered perceptions Sidama children, teenagers, and young adults have regarding their parents. Focus group participants revealed that children fear their fathers because they are responsible for physical punishment, while on the other hand, children fear their mothers because they can withhold food

should the latter become upset with the former. When asked who takes care of children when they are ill, participants identified this activity as a father's responsibility. During pilot interviews, I asked adult men and women the same question. All participants responded that it is the job of both parents: fathers decide when to go to the clinic and provide the finances while mothers tend to children during this time. It is possible that children, teenagers, and young adults perceive their fathers as being solely responsible because clinic visits cannot happen without their consent. Ideas regarding disparities in power recognition that children, teenagers, and young adults appear have are particularly interesting. They essentially reveal that mothers have, or are perceived by their children to have, less control over the care of their families than would normally be assumed. Even if participants' responses (both in focus groups and pilot interviews) were merely a perception and not necessarily reflecting the actual behaviors or power of mothers, it provides a telling view into the extent of Sidama gender roles (Flores field notes, 2015; 2016).

Son preference is a dominant characteristic in Sidama kinship and economics. The Ethiopian Constitution requires equal inheritance rights for both men and women (Ethiopian Const., art. XXXV, §7); cultural inheritance practices, however, dictate that males inherit land, thus creating a son preference among Sidama families. Due to exogamous marriage practices and unilineal descent, women generally do not inherit resources (Hamer, 1987). During childhood, girls are denoted to as "theirs," referring to her future husband's family. This label reinforces cultural norms of women leaving their natal kin after they marry. For this reason, parents may not invest much into their daughters since they will not reap the benefits of regularly having her around later in life (Flores, personal notes 2015; 2016). Hadley and colleagues (2008) found that girls in Jimma, Ethiopia were more food insecure than boys. This could shed some light onto the

cultural gender differences Sidama boys and girls experience. Men inherit land and cattle from their fathers which is meant to aid them in establishing their own households (Hamer, 1987). This culturally instituted lack of resources combined with women's inability to obtain greater amounts of money leaves women with relatively little power in their lives. Hailu and Regassa (2007) argue that educating girls will improve their positions and allow them to have greater control over decision making and resources when they become adults.

Large families are common, especially in rural communities, and indicate a family's wealth (Yemane et al., 1999). Having sons is particularly important for mothers because they will take care of her in her old age and/or if anything should happen to her husband (Hamer, 1987; Regassa, 2007b). Age differences, combined with patriarchy, contribute to the amount of interpersonal power a husband may have. Depending on the age difference between a husband and his wife, the latter may be unable to effectively communicate with the former, particularly regarding family planning, and must adhere to his choices (Regassa, 2007b). A woman is generally unable to begin using contraception if her husband does not provide consent (Flores field notes, 2015; 2016; Regassa, 2007b). Husbands may decide which method(s) their wives try, and they have the authority to tell wives when to start and stop using them. When it comes to family planning situations, HEW may have greater influence over husbands than their own wives. Terefe and Larson (1993) found that including husbands in outreach has a positive effect on contraception use. Sometimes wives will recruit HEW to convince their husbands to authorize contraception use. There are situations, however, in which wives may secretly use contraception. Due to the positive rapport HEW have with their communities, they are usually aware of which women are doing this. They aid women in choosing the method that best fits their lifestyles and best conceals their secret (Flores field notes, 2015; 2016).

Sidama and fertility

Ethiopia's total fertility rate (TFR hereafter) is 4.6 children per woman. Upon further examination, however, rural mothers average nearly three more children per woman than their urban counterparts (5.2 and 2.3 children, respectively) (CSAE and ICF, 2017). In SNNPR, the TFR is 4.4 children. Ethiopian women are more likely than men to want no more children, regardless of the number they currently have. In general, the more children a woman has, the more likely it is that her most recent delivery was unwanted (CSAE and ICF, 2017). Urban women, in general, report preferring fewer children than the rural women. As education and wealth increase, the desire for children decreases (ibid).

Since males are the preferred sex, couples will continue to have children until they reckon they have enough sons (Flores personal notes, 2015; Regassa, 2007b). Although Sidama men and women report that a family size of 4-5 children, per wife, is ideal, many women are reaching these numbers early in their reproductive career (Flores personal notes, 2015). The Sidama Zone TFR is 3.17 children per woman. Upon closer inspection, rural women are having more children (3.21 children) than urban mothers (2.93 children) (CSAE, 2007). Regassa (2007a) reports that the average time between pregnancies is about 13.88 months among the Sidama. High fertility and limited resource opportunities are problematic. The benefits of smaller families (e.g., less stress on household resources and reduction in child and maternal morbidity and mortality [Mutombo et al., 2014]) make it important to understand barriers to effective family planning. Moreover, men predominantly conduct the family planning research in Ethiopia (Alemayehu et al., 2012; Bogale et al., 2011; Hogan & Biratu, 2004; Hogan et al., 1999; Mekonnen & Worku, 2011; Regassa, 2007a; 2007b). This may be problematic because Ethiopian

women generally do not openly discuss reproductive behaviors or ethnomedical beliefs with men present (Flores personal notes, 2015).

The Ethiopian government has been promoting voluntary contraception use since 1993 (Alvergne et al., 2011), and hormonal contraception is freely available for all Ethiopian women (Flores personal notes, 2015). Through outreach and social programs, the contraception prevalence rate rose from 8% in 2000 to 42% in 2014 (FDRE MOH, 2016). The latter figure has remained steady with approximately 41% of married women reporting using modern contraceptives in 2019 (EPHI and ICF, 2019). In general, hormonal contraception is not considered as a medication that can treat other conditions, e.g. endometriosis, polycystic ovarian syndrome, acne, etc., so the public views it something that only married women should consume (Flores personal notes, 2015).

In 2015, I discovered that some women in Arbegona find the contraceptive pill to be inconvenient as it is difficult to remember to regularly take and it is a method that requires a monthly refill. Some women dislike the contraceptive implant (effective for approximately three years) because they believe it may travel throughout their body and/or it causes arm pain which inhibits their ability to work. Some women avoid the contraceptive injection (effective for 8-13 weeks) because it makes them fat or causes them to bleed too much, thus making them weak. Condoms are not regularly used as they are only associated with STI, particularly HIV, prevention. It is important to understand women's concerns because they are largely tied to economics and ethnomedical beliefs. HEW are aware of these complaints and yet, they do not appear to have other ways to mediate these issues. Among women in Boricha, on the other hand, the contraceptive implant is a more popular choice (Flores personal notes, 2015). This further supports the argument that generalized family planning programs are not the ideal mode of

operation. All the women discussed above identify as Sidama; however, their environments may be influencing their perceptions differently.

CHAPTER 5

RESEARCH QUESTION AND HYPOTHESES

My overarching research questions are: *What are the life history effects of risky environments and perceptions of social support? In particular, what are the relationships between environmental risk and perceptions of social support, and women's reproductive outcomes?*

Hypothesis I

According to LHT, individuals who have faced lower levels of risk in early life generally maintain slow life history strategies, which includes displaying higher levels of PI (Belsky et al., 1991; Chisholm, 1993; Draper and Harpending, 1982). Since Ethiopian societies are transitioning towards globalized development, there is a push for parents to formally educate their offspring and invest in their socioeconomic futures (Kaplan et al., 2002). I predict that Sidama women who have experienced lower levels of early life risk invest more in their offspring's extrasomatic embodied capital, represented by the number of their biological school-aged children who are enrolled in school (while controlling for their total number of children), compared to women who have experienced higher levels of early life risk and are primed to expect risks for their own children, setting them up for quantity over quality life history pattern. Or, conversely, there is no significant association between the number of biological school-aged children enrolled in school and parental early life risk, possibly due to the Sidama living in rural locations and maintaining much of their traditional lifeways.

Hypothesis II

The Ethiopian government is actively attempting to increase attendance and adherence to formalized education programs. Based on ECT (Hill and Kaplan, 1999; Kaplan, 1996; Kaplan and Lancaster, 2000), I predict that households with higher educated parents will have more biological school-aged children who are enrolled in school (while controlling for their total number of children), than households with less educated parents. Or,

conversely, there is no significant association between parental education background and their offspring's school enrollment, possibly due to governmental modernization programs effectively improving educational outcomes for all citizens, thereby negating the effects of parents' education.

Hypothesis III

Based on the interpersonal level of the SEM (McLeroy et al., 1988; Stokols, 1996), I predict that women who feel they have greater levels of social support will be more likely to use contraception than women who feel they have lower levels of social support because better-supported women may have the help they need to allow them to focus on offspring quality over quantity. Alternatively, less social support (fewer potential alloparents) may drive contraception use as mother with less help have more constraints on their time budgets.

Hypothesis IV

Based on the interpersonal level of the SEM (McLeroy et al., 1988; Stokols, 1996), I predict that women who feel they have greater levels of social support will have more biological school-aged children who are enrolled (while controlling for their total number of children) in school than women with lower levels of perceived social support because better-supported mothers may have the help they need to allow them to focus on offspring quality over quantity. Alternatively, less social support may decrease the number of biological school-aged children who are enrolled in school because mothers may not have the support they need to allow for extrasomatic investments.

Hypothesis V

Based on the community level of the SEM (McLeroy et al., 1988; Stokols, 1996), I predict that women who live closer to HEP and have greater interactions with HEW will

be more likely to contracept than women who live further from HEP and have fewer interactions with HEW. Conversely, HEP and HEW exposure may not have a significant association with contraception use, possibly due to traditional household composition norms and values taking precedence regarding family size.

I note that this project does not focus on general fertility decline, nor does it focus on overall fitness. Rather, my aim is to understand the relationship between risk, perceptions of social support, reproduction, and parental investment. This research is novel in that no other individuals, to my knowledge, are exploring reproductive decision-making within this combined theoretical background. More specifically, LHT and ECT generally predict natural fertility and studies that do incorporate family planning are conducted among Western societies. The extent to which LHT and ECT can predict use patterns in developing countries is unknown. This lack of knowledge significantly impacts our ability to understand how parental investment manifests in real-life, high-risk settings. I also note that though I have established hypotheses for testing, this project is exploratory in nature. The implications of this will be discussed further in Chapter 8.

CHAPTER 6

METHODOLOGY

Study sites

Data for this project come from Southwest Ethiopia, specifically from two Sidama subpopulations: one that occupies the low-risk, highland *woreda* (district) of Arbegona, and another that lives in Boricha, a high-risk lowland *woreda*. The Sidama are fitting for this project because they maintain their traditional culture but also embrace external influences, in this case, modern hormonal contraception. Modern contraception is free and is easily accessible due to the existence of HEP and HEW's outreach efforts. Men and women understand the purpose of hormonal contraception and do not believe it to be something to avoid. HEW regularly promote contraception use and will often mitigate any concerns individuals may have about its use. Since Sidama do not view hormonal contraception as a medication used to treat other conditions (e.g. acne, menorrhagia) (Flores personal notes, 2015), its use is solely related to reproduction, thus making this population ideal for understanding reproductive decision-making. I note that the purpose of this project is to understand Sidama women as a whole, rather than solely comparing these two subpopulations.

Arbegona

Arbegona is located in the eastern highlands of the Sidama Zone, about 74 kilometers from Hawassa (Quinlan et al., 2015), at an elevation of 2600 m (Quinlan et al., 2016). It is home to 135,862 individuals (urban: 6,745, rural: 129,117) (CSAE, 2007). Because of its location, Arbegona experiences regular seasonal rainfall, with most of it (nearly 2,500 m) occurring during the *Kiremt* season (June to September). This reliable rainfall protects the area from the droughts its neighbors have experienced in recent history. Highland Sidama *woredas* are considered as the archetype of Sidama culture and the Sidama Zone (Quinlan et al., 2016). Households in Arbegona predominantly grow *enset*, and other subsistence vegetable crops, e.g. root crops, leafy greens, etc. On average, Sidama in Arbegona have the greatest mean of

landholding per household, about 2.6 hectares, and the greatest mean of cattle per household, 3.4 cattle (Quinlan et al., 2015). Ironically, Ethiopians describe Arbegona as one of the poorest *woredas* in Sidama Zone (Flores personal notes, 2015). Though Arbegona is relatively buffered from environmental risk, armed conflict was common in the region during the 1980s (Quinlan et al., 2016).

Boricha

Boricha, considered a lowland region, is located about 39 miles south of Hawassa (Quinlan et al., 2015), ranging in elevation from 560-1700 m (Quinlan et al., 2016). Boricha maintains a population of 250,260 individuals (urban: 10,402, rural: 239,858) (CSAE, 2007). The area receives sporadic bimodal rainfall between March-May (about 56 mm) and June-October (180 mm). Sidama in Boricha are at higher risk of crop loss due to "erratic rainfall, recurrent drought, crop failure, livestock loss, and subsequent food shortage" (Quinlan et al., 2015 in Dira & Hewlett, 2016:17). Quinlan and colleagues (2016) note that the region experienced famine in 1998-1999, 2001, 2003, and 2008. Commonly grown crops in Boricha are: enset, maize, coffee, chat, and subsistence vegetables, e.g. root crops, leafy greens, and legumes. Boricha families have the lowest mean of cattle per household, 1.6 cattle. During times of crop failure, farmers may sell livestock to pay for food. The small number of cattle per household in Boricha could be reflective of periodic droughts (Quinlan et al., 2015).

Preparation

Before data collection began, semi-structured interviews, consent forms, and other project materials were composed in English, translated to *Sidamigna*, and re-translated into English (Bernard, 2011). We did this to ensure the preservation of each question's intention, while also ensuring all materials were culturally appropriate. During this process, two multilingual individuals, both of whom are native *Sigamigna* speakers, independently translated

and re-translated all project materials. After each translation stage was complete, the translators discussed the results of their work and negotiated the most appropriate formatting.

Although contraception use taboos are not necessarily present in Sidama society (aside from the widely accepted idea that only married women should contracept), gender roles discourage the discussion of reproductive health and decision-making in mixed company (Flores personal notes 2014, 2015). For this reason, male research assistants were not an appropriate fit. To ensure that the participants felt comfortable and willing to discuss personal information, my project manager and friend, a Sidama man, suggested that I hire four teachers, two per *woreda*, as research assistants. These women would likely already have positive rapport with their respective communities due to their occupation, and they were guaranteed to be literate. An anthropologist, who is a friend and colleague, conducted day-long training sessions, under my advisement, in Hawassa town for all research assistants. This individual has conducted anthropological fieldwork in Arbegona, is married to a Sidama man, and lives in Hawassa, making her an appropriate fit for the task. During the training workshops, interview questions, consent forms, and other interview materials were explained to ensure the research assistants understood the purpose of the project as well as the questions they would be asking. They also learned interview techniques to ensure they were systematically collecting data.

Data collection

Data collection spanned five months, running from September 2018-January 2019. Four hundred thirty-nine semi-structured interviews were conducted with Sidama women (N=439) in Arbegona (n=236) and Boricha (n=203). To qualify for participation, participants had to be Sidama women between 18 and 45 years of age and residing in rural *kebeles* of Arbegona or Boricha. Women younger than 18-years-old are unlikely to be using contraception, due to cultural norms, and women over 45-years-old have likely entered the post-reproductive phase of

life, thus making younger and older populations unfit for this study. Urban residents were ineligible because they do not represent the majority of the Sidama population and are more likely to hold urbane, homogenized, acculturated views. Individuals could participate in the study, however, if they lived in a rural area, but worked in an urban setting, e.g. road construction, restaurant cook, shop owner/employee, etc. Research assistants recruited participants via convenience and snowball sampling (Bernard, 2011). Based on my own fieldwork experiences in these regions, I have found that these methods are the most efficient ways to recruit participants. The rural *kebeles* in Arbegona and Boricha are far reaching and households vary in distance from one another, thus making systematic sampling somewhat difficult. To prevent translation errors and other unforeseeable biases during the data collection process, each research assistant conducted her interviews in *Sidamigna*.

The semi-structured interviews captured data regarding demography, fertility and family planning, health status and healthcare-seeking behaviors, children's education, early life experiences, current life conflicts, perceptions of social support, and household resources and finances. I also incorporated Zimet and colleagues' (1988) Multidimensional Scale of Perceived Social Support (MSPSS hereafter). I chose this scale because, although the reality of each participant's life is important, I argue her perceptions are as equally worthwhile to explore as the realities of her social networks. Much research has focused on reproductive decision making and the influence that social networks have, but there is little research on how perceptions of a woman's social support are influencing her family planning decisions and outcomes. The MSPSS was determined to be a reliable instrument outside of Western settings (Nakigudde, Musisi, Ehnvall, Airaksinen, & Agren, 2009). Ugandan participants in Nakigudde and colleagues' study population (ibid) had little to no experience with a Likert scale response

system, thereby making the 7-point system in the original measure unsuitable (Zimet et al., 1988). To overcome this problem, Nakigudde and colleagues (2009) reduced the response options from a 7- to a 5-point scale, thus making it easier for participants to respond. Additionally, they created a facial expression scale that corresponded with each of the 5-point response options to ensure that participants correctly understood the intent behind each response. Because the study population in this project is also unfamiliar with Likert scales, I used the same 5-point response system as Nakigudde and colleagues (ibid). I also adapted the illustrated facial expression scale utilized in Uganda. The facial expressions remained the same; however, I altered the appearance of the headscarf depicted in the original illustration after taking my project manager's advice about its appearance. We also placed the *Sidaminya* translations for each response option above the faces to indicate the emotion/interpretation of each option.

We compensated study participants with a bar of laundry soap and a bar of body soap. I chose these items as participation gifts after consulting with my project manager, who provided the suggestion for these items. These products are popular commodities in every Sidama household; however, individuals may not consistently purchase them due to their cost. The soap brands we purchased were the higher-end options available in Hawassa markets and we specifically chose them for their quality and size. These brands may be more difficult for households in rural communities to regularly obtain with ease.

Washington State University's Institutional Review Board evaluated and certified this study as exempt. Furthermore, this study was acknowledged by the College of Social Sciences and Humanities at Hawassa University. Before initiating data collection, *kebele* leaders in Arbegona and Boricha were informed of the study's intent and offered their support of our presence.

Analysis

Data were analyzed via R version 3.6.3 for Macintosh. Of the 439 individuals enrolled in the study, two individuals were removed from data analyses due to incomplete interviews. For each hypothesis, I investigated whether I could reject the null hypothesis. To do this, I tested for significantly associated covariates and, if they existed, used them in each model to adjust for any confounds. I also ran association tests with and without the independent variables of interest and investigated whether the addition of the independent variable provides any benefit. All relevant *p*-values were false discovery rate adjusted using the Benjamini-Hochberg method (Benjamini and Hochberg, 1995). This method is less conservative than the Bonferroni method, and reveals the proportion of false positives among significant results (Storey and Tibshirani, 2003). All the variables were log-transformed prior to conducting association tests. The Cronbach's alpha score for the MSPSS scale was 0.93, indicating high internal consistency, thereby making it a reliable measure to include.

Association tests

To deal with missing data, first, variables with greater than 20% missing data were dropped from the analysis. Second, any remaining missing values were median imputed. I chose this type of imputation due to data skewness (Acuña and Rodriguez, 2004). Previous analyses have shown that there are many zeroes and low values, contributing to overdispersion. Two methods were used to control the present overdispersion: negative binomial regression and generalized linear mixed modeling. Overdispersion occurs when the variance is greater than the mean, and therefore, a negative binomial regression is an appropriate and preferred analysis technique (Hilbe, 2011). Generalized linear mixed models allow the variance to change according to a grouping variable (random vs. fixed effects) and are useful when analyzing

nonnormal data with random effects (Bolker et al., 2009). For these tests, location is chosen as the random effect, which allows variation to behave differently in each location.

Additional covariate selection via LASSO

For each hypothesis, I used the least absolute shrinkage and selection operator (LASSO) to select additional covariates for the regression models. Because there could be other factors that may influence participants' behaviors, I felt that LASSO could help me determine other meaningful measures. LASSO saves power and prevents model overfitting by shrinking some beta coefficients toward zero while setting others to zero (Tibshirani, 1996). In the case of the latter situation, these beta coefficients are not strongly associated with the outcome variable. Setting these values to zero is the equivalent to removing them from the model. In doing so, LASSO assists with variable selection and model design (Tibshirani, 1996; Least Absolute Shrinkage and Selection Operator, 2019). Using the variables from LASSO, the pairwise correlation between the key independent variables, i.e. the variables predicted to have the biggest impact on the dependent variable per each hypothesis, is calculated, and if any pair of variables has a correlation higher than 0.5., one variable is dropped. In each of the hypothesis breakdowns below, note the variables onto which the dependent variable is regressed, aside from the key independent variables and any necessary control variable, were selected via LASSO.

Hypothesis 1

To test this hypothesis, any non-normally distributed variables were log-transformed. Early risk is a variable that captures early life history characteristics. It represents the total sum of the participants' responses (0=no, 1=yes) regarding events that took place during childhood such as: losing a sibling, crop loss, livestock loss, experiencing moments of hunger during childhood, experiencing a serious health problem, witnessing armed conflict, and having a family member experience a serious health problem. The Cronbach's alpha score for the early

risk predictors was 0.6048. Though this figure is below the generally accepted score (≥0.70), I decided to maintain this variable and incorporate it into my analyses. Hair et al., (2014) argue that a score of 0.60 to 0.70 is acceptable for exploration; though Cho and Kim (2015) argue that the one-size fits all mentality is not always appropriate. Lance and colleagues (2006) note that Nunnally's (1978) argument for a coefficient alpha standard being set at 0.70 is misleading and is not the fixed rule that many researchers believe it to be. Nunnally argued that the cut off researchers use will depend on a measure's use and argued that 0.70 could help researchers save time and energy (Nunnally, 1978, pp. 245-46). For this reason, I argue that these predictors are valid indicators of early life risk within my sample.

In testing this hypothesis two models were created, and each were analyzed via negative binomial and Poisson regressions. In the first model, the number of a woman's biological children who were enrolled in school was regressed on: location, age at first marriage, occupation, if one of her parents passed away during her childhood, if she witnessed armed conflict in adulthood, her responses from two MSPSS questions ("There is a special person with whom I can share joys and sorrows," and "I can count on my friends when things go wrong"), the number of cattle she owns, if she has or is currently attending college or a vocational school, and the total number of her living children (this variable serves as a control variable). The second model was like the first, but with early risk incorporated into its analysis.

Hypothesis 2

To test this hypothesis, one base model was created and analyzed with and without the education variables (no formal education, primary education, secondary education, college/vocational school, or university for participants and husbands, if applicable) through negative binomial and Poisson regressions. I chose to analyze each educational variable separately to avoid multicollinearity. In the base model, the number of a woman's biological

children who were enrolled in school was regressed on: location, marital status, number of her marriages, age at first marriage, occupation, number of children she has lost, if one of her parents passed away during her childhood, if she experienced a major health problem during her childhood, if a family member experienced a major health problem during her childhood, if she witnessed armed conflict during her childhood, if she witnessed armed conflict as an adult, her responses from two MSPSS questions ("There is a special person with whom I can share joys and sorrows," and "I can count on my friends when things go wrong"), the number of cattle she owns, and the total number of her living children (this variable serves as a control variable). Each education variable, in its original ordinal form, was then treated separately to investigate if there are any education level-specific effects.

Hypothesis 3

To test this hypothesis, one base model was created and analyzed with and without the social support variables through negative binomial and logistic regressions. In the base model, a participant's current contraception use was regressed on: location, marital status, number of her marriages, number of her husband's wives, if one of her parents passed away during her childhood, if one of her parents abused alcohol during her childhood, if her family experienced periods of not having enough to eat during her childhood, if she moved to a different community during her childhood, if someone in her household participated armed conflict during her childhood, if she witnessed armed conflict during adulthood, if she grows enset, if she grows maize, if she grows coffee, the amount of coffee she grows, the number of cattle she owns, her husband's education (no formal education; college/vocational school), her mother's education (no formal education; college/vocational school), and the total number of her living children (this variable serves as a control variable). This model was independently analyzed to establish a baseline. Each social support variable was treated separately to avoid multicollinearity, as well as

to investigate if there are specific areas of perceived social support, that are influencing her contraception use. In addition to independently running each social support variable in the base model, the three subscales and total score of the MSPSS (significant other subscale, family subscale, friend subscale, and her total MSPSS score) were also incorporated.

Hypothesis 4

To test this hypothesis, one base model was created and analyzed with and without the social support variables via negative binomial and Poisson regressions. In the base model, the number of a participant's the number of a woman's biological children who were enrolled in school was regressed on: location, marital status, number of her marriages, age at first marriage, occupation, if one of her parents passed away during her childhood, if her family experienced crop loss or failure during her childhood, if she experienced a major health problem during her childhood, if she witnessed armed conflict during adulthood, the number of cattle she owns, if she has or is currently attending college or a vocational school, if her husband has or is currently attending college or a vocational school, and the total number of her living children (this variable serves as a control variable). Each social support variable was then incorporated separately, to avoid multicollinearity, as well as to investigate if there are specific areas of perceived social support, that are influencing the number of her children who are enrolled in school. In addition to independently running each social support variable in the base model, the four scales of the MSPSS (significant other subscale, family subscale, friend subscale, and her total MSPSS score) were also incorporated. In doing this, I can understand if generalized areas of social support play a role in her behavior.

Hypothesis 5

To test this hypothesis, a base model was created and analyzed with and without the healthcare variables via negative binomial and logistic regressions. In the first model, a

participant's current contraception use was regressed on: location, marital status, number of her marriages, the number of individuals (including the participant) living in her home, the number of her husband's wives, the number of her biological children who are enrolled in school, if one of her parents passed away during her childhood, if her family experienced periods of not having enough to eat during her childhood, if someone in her household participated armed conflict during her childhood, if she witnessed armed conflict during adulthood, her responses from one MSPSS question ("My family is willing to help me make decisions"), if she grows enset, if she grows maize, the number of cattle she owns, if her husband has or is currently attending college or a vocational school, and the total number of her living children (this variable serves as a control variable). The number of times in which she interacted with a health extension worker in the past year and the amount of time it takes her to travel to the nearest health facility were independently added into the base model.

CHAPTER 7

RESULTS

The mean participant age for the entire sample (N=437) is 30.55 years. Ninety-four percent (n=408) of the sample were married, and the mean age at first marriage was 18.79 years. Amongst Arbegona participants, their number of living children ranged from 0-10 children, with a mean of 3.10 children (*SD*: 2.39). In Boricha, participating women had smaller family sizes. The number of living children ranged from 0-7 children, with a mean of 2.67 children (*SD*: 1.68). These differences were statistically significant [t(430)=2.14, *p*=0.03]. Of the entire sample, 257 women (59.35%) reported using contraception. In Arbegona, 47.86% (n=112) of women reported to be currently using contraception, while in Boricha 72.86% (n=145) of women reported to be currently using contraception. Regarding education levels, 34.55% of the entire sample reported having no formal education, 49.89% attended at least some primary school, and 14.42% attended high schools. Two individuals (0.46%) reported attending college or vocational school, while three individuals (0.69%) reported attending university. Table 7.01 breaks down these demographics by location.

Table 7.01 Participant demographics by location

		Arbegona (n=236)	Boricha (n=201)	Entire Sample (N=437)
Age	Mean participant age	30.78 (*SD*: 8.13)	30.29 (*SD*: 6.17)	30.55 (*SD*: 7.29)
	Mean age at first marriage	18.14 (*SD*: 2.36)	19.46 (*SD*: 3.93)	18.79 (*SD*: 3.29)
Education	No formal education	111	40	151
	Elementary school (Grade 1-8)	77	141	218
	Secondary school (Grades 9-12)	44	19	63
	College or vocational school	1	1	2
	University	3	0	3
Occupation	No formal employment	193	85	278
	Formal employment	42	115	157
Fertility	Mean age at first birth	20.37 (*SD*: 2.26)	21.28 (*SD*: 3.93)	20.82 (*SD*: 3.22)
	Mean number of pregnancies	3.51 (*SD*: 2.39)	2.95 (*SD*: 2.12)	3.24 (*SD*: 2.78)
	Mean number of live births	3.77 (*SD*: 2.20)	2.69 (*SD*: 1.66)	3.23 (*SD*: 2.02)
	Mean number of living children	3.10 (*SD*: 2.39)	2.67 (*SD*: 1.68)	2.91 (*SD*: 2.10)

Hypothesis 1

Women who experienced lower levels of early life risk will invest more in their children's extrasomatic embodied capital, represented by the number of their children enrolled in school.

One cannot reject the null hypothesis, based on the analyses. Adding early risk to each model does not have significant results or add any explanatory power to the model. Both the negative binomial and Poisson model failed to show any significant results for early risk. Similar results were reached without imputation and with mean imputation. Table 7.02 displays the results of the negative binomial regressions and Table 7.03 displays the results of the Poisson regressions conducted for the same models.

Table 7.02 Negative binomial regression results (evaluating the relationship between a participant's early life risk and the number of biological children each participant has enrolled in school)

	Number of biological children enrolled in school					
Predictors	*IRR*	*CI*	*p*	*IRR*	*CI*	*p*
(Intercept)	1.09	0.39 – 3.05	0.86	1.05	0.33 – 3.34	0.94
Age at first marriage	0.92	0.66 – 1.28	0.62	0.93	0.64 – 1.34	0.68
Job*	1.19	0.89 – 1.59	0.24	1.17	0.90 – 1.52	0.24
Experienced a parent passing during childhood**	1.08	0.91 – 1.27	0.38	1.08	0.92 – 1.27	0.35
Witnessed armed conflict as an adult**	1.08	0.91 – 1.28	0.39	1.06	0.89 – 1.27	0.50
"There is a special person with whom I can share joys and sorrows." ***	1.02	0.97 – 1.08	0.44	1.02	0.97 – 1.08	0.37
"I can count on my friends when things go wrong."***	1.01	0.96 – 1.07	0.63	1.02	0.96 – 1.07	0.60
Number of cattle owned	1.01	0.98 – 1.05	0.37	1.02	0.99 – 1.05	0.27
College/vocational school attendance	0.47	0.20 – 1.13	0.09	0.46	0.19 – 1.13	0.09
Total number of living children	1.27	1.22 – 1.33	**<0.001**	1.27	1.22 – 1.33	**<0.001**
Early life risk				1.04	0.92 – 1.19	0.51
Random Effects						
σ^2	0.27			0.27		
τ_{00}	0.00 $_{\text{Location}}$			0.01 $_{\text{Location}}$		
ICC	0.01			0.02		
N	2 $_{\text{Location}}$			2 $_{\text{Location}}$		
Observations	243			243		
Marginal R^2 / Conditional R^2	0.45 / 0.45			0.45 / 0.46		

*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.03 Poisson regression results (evaluating the relationship between a participant's early life risk and the number of biological children each participant has enrolled in school)

	Number of biological children enrolled in school					
Predictors	*IRR*	*CI*	*p*	*IRR*	*CI*	*p*
(Intercept)	1.23	0.25 – 6.03	0.80	1.10	0.22 – 5.51	0.91
Location[+]	1.27	1.03 – 1.58	**0.03**	1.30	1.04 – 1.61	**0.02**
Age at first marriage	0.86	0.51 – 1.43	0.56	0.88	0.52 – 1.46	0.62
Job*	1.08	0.86 – 1.36	0.50	1.07	0.86 – 1.35	0.54
Experienced a parent passing during childhood**	1.10	0.93 – 1.29	0.25	1.10	0.94 – 1.29	0.25
Witnessed armed conflict as an adult**	1.07	0.90 – 1.27	0.44	1.05	0.88 – 1.25	0.57
"There is a special person with whom I can share joys and sorrows." ***	1.01	0.96 – 1.07	0.66	1.02	0.96 – 1.07	0.52
"I can count on my friends when things go wrong."***	1.01	0.95 – 1.07	0.75	1.01	0.96 – 1.07	0.69
Number of cattle owned	1.02	0.99 – 1.05	0.11	1.02	1.00 – 1.05	0.09
College/vocational school attendance	0.49	0.08 – 1.58	0.33	0.48	0.08 – 1.53	0.30
Total number of living children	1.28	1.22 – 1.33	**<0.001**	1.27	1.22 – 1.33	**<0.001**
Early life risk				1.06	0.93 – 1.20	0.37
Observations	243			243		
AIC	801.78			802.99		

[+]Location: 0=Arbegona, 1=Boricha
*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Hypothesis 2

Households with higher educated parents will have more children enrolled in school than households with less educated parents.

One cannot reject the null hypothesis. Adding each education variable to each model does not have significant results or add any explanatory power to the model. Both the negative binomial and Poisson model failed to show any significant results for participants' or their husbands' formal education levels. Tables 7.04-7.12 display the results of the negative binomial regressions. Tables 7.13-7.21 display the results of the Poisson regressions conducted for the same models.

Table 7.04 Negative binomial regression (evaluating the relationship between participants' lack of formal education and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school					
Predictors	*IRR*	*CI*	*p*	*IRR*	*CI*	*p*
(Intercept)	1.17	0.49 – 2.81	0.72	1.22	0.62 – 2.40	0.57
Number of marriages	1.03	0.79 – 1.35	0.80	1.02	0.78 – 1.33	0.90
Age at first marriage	0.89	0.67 – 1.19	0.43	0.88	0.70 – 1.11	0.27
Job*	1.14	0.88 – 1.49	0.33	1.14	0.89 – 1.45	0.31
Number of children lost	0.94	0.47 – 1.88	0.86	0.89	0.48 – 1.67	0.72
Experienced a parent passing during childhood**	1.05	0.89 – 1.24	0.56	1.05	0.89 – 1.24	0.56
Experienced a big health problem as a child**	0.95	0.77 – 1.17	0.65	0.96	0.78 – 1.18	0.67
Someone in childhood home experienced a big health problem**	1.09	0.90 – 1.32	0.39	1.09	0.90 – 1.32	0.38
Witnessed armed conflict during childhood**	1.06	0.89 – 1.26	0.53	1.07	0.90 – 1.28	0.46
Witnessed armed conflict as an adult**	1.05	0.87 – 1.26	0.62	1.04	0.87 – 1.24	0.67
"There is a special person with whom I can share joys and sorrows."***	1.02	0.97 – 1.08	0.43	1.02	0.97 – 1.08	0.41
"I can count on my friends when things go wrong."***	1.02	0.96 – 1.08	0.48	1.02	0.96 – 1.08	0.53
Number of cattle owned	1.02	0.99 – 1.05	0.31	1.02	0.99 – 1.04	0.29
Total number of living children	1.27	1.22 – 1.33	**<0.001**	1.27	1.21 – 1.32	**<0.001**
No formal education				1.08	0.91 – 1.27	0.40
Random Effects						
σ^2	0.27			0.27		
τ_{00}	0.01 $_{\text{Location}}$			0.01 $_{\text{Location}}$		
ICC	0.02			0.03		
N	2 $_{\text{Location}}$			2 $_{\text{Location}}$		
Observations	243			243		
Marginal R^2 / Conditional R^2	0.44 / 0.46			0.45 / 0.46		

*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.05 Negative binomial regression (evaluating the relationship between participants' primary education background and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school					
Predictors	*IRR*	*CI*	*p*	*IRR*	*CI*	*p*
(Intercept)	1.17	0.49 – 2.81	0.72	1.16	0.49 – 2.75	0.74
Number of marriages	1.03	0.79 – 1.35	0.80	1.04	0.79 – 1.36	0.80
Age at first marriage	0.89	0.67 – 1.19	0.43	0.89	0.67 – 1.19	0.44
Job*	1.14	0.88 – 1.49	0.33	1.14	0.87 – 1.51	0.34
Number of children lost	0.94	0.47 – 1.88	0.86	0.95	0.41 – 2.16	0.89
Experienced a parent passing during childhood**	1.05	0.89 – 1.24	0.56	1.05	0.89 – 1.24	0.56
Experienced a big health problem as a child**	0.95	0.77 – 1.17	0.65	0.95	0.77 – 1.18	0.65
Someone in childhood home experienced a big health problem**	1.09	0.90 – 1.32	0.39	1.09	0.89 – 1.33	0.40
Witnessed armed conflict during childhood**	1.06	0.89 – 1.26	0.53	1.06	0.88 – 1.26	0.5
Witnessed armed conflict as an adult**	1.05	0.87 – 1.26	0.62	1.05	0.87 – 1.26	0.62
"There is a special person with whom I can share joys and sorrows."***	1.02	0.97 – 1.08	0.43	1.02	0.97 – 1.08	0.43
"I can count on my friends when things go wrong."***	1.02	0.96 – 1.08	0.48	1.02	0.96 – 1.08	0.47
Number of cattle owned	1.02	0.99 – 1.05	0.31	1.02	0.99 – 1.05	0.32
Total number of living children	1.27	1.22 – 1.33	**<0.001**	1.27	1.22 – 1.33	**<0.001**
Primary education				1.01	0.85 – 1.19	0.93
Random Effects						
σ^2	0.27			0.27		
τ_{00}	0.01 $_{\text{Location}}$			0.01 $_{\text{Location}}$		
ICC	0.02			0.02		
N	2 $_{\text{Location}}$			2 $_{\text{Location}}$		
Observations	243			243		
Marginal R^2 / Conditional R^2	0.44 / 0.46			0.44 / 0.45		

*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.06 Negative binomial regression (evaluating the relationship between participants' secondary education background and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school					
Predictors	*IRR*	*CI*	*p*	*IRR*	*CI*	*p*
(Intercept)	1.17	0.49 – 2.81	0.72	0.99	0.47 – 2.06	0.97
Number of marriages	1.03	0.79 – 1.35	0.80	1.00	0.76 – 1.31	1.00
Age at first marriage	0.89	0.67 – 1.19	0.43	0.96	0.75 – 1.23	0.73
Job*	1.14	0.88 – 1.49	0.33	1.24	1.03 – 1.49	**0.03**
Number of children lost	0.94	0.47 – 1.88	0.86	1.00	0.42 – 2.35	1.00
Experienced a parent passing during childhood**	1.05	0.89 – 1.24	0.56	1.04	0.88 – 1.22	0.67
Experienced a big health problem as a child**	0.95	0.77 – 1.17	0.65	0.93	0.75 – 1.15	0.49
Someone in childhood home experienced a big health problem**	1.09	0.90 – 1.32	0.39	1.09	0.90 – 1.33	0.38
Witnessed armed conflict during childhood**	1.06	0.89 – 1.26	0.53	1.05	0.88 – 1.25	0.57
Witnessed armed conflict as an adult**	1.05	0.87 – 1.26	0.62	1.07	0.89 – 1.28	0.45
"There is a special person with whom I can share joys and sorrows."***	1.02	0.97 – 1.08	0.43	1.03	0.98 – 1.08	0.27
"I can count on my friends when things go wrong."***	1.02	0.96 – 1.08	0.48	1.02	0.97 – 1.08	0.44
Number of cattle owned	1.02	0.99 – 1.05	0.31	1.01	0.99 – 1.03	0.44
Total number of living children	1.27	1.22 – 1.33	**<0.001**	1.26	1.21 – 1.32	**<0.001**
Secondary education				0.67	0.42 – 1.07	0.10
Random Effects						
σ^2	0.27			0.27		
τ_{00}	0.01 $_{\text{Location}}$			0.00 $_{\text{Location}}$		
ICC	0.02					
N	2 $_{\text{Location}}$			2 $_{\text{Location}}$		
Observations	243			243		
Marginal R^2 / Conditional R^2	0.44 / 0.46			0.46 / NA		

*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.07 Negative binomial regression (evaluating the relationship between participants' post-secondary education background and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school					
Predictors	*IRR*	*CI*	*p*	*IRR*	*CI*	*p*
(Intercept)	1.17	0.49 – 2.81	0.72	0.89	0.36 – 2.18	0.80
Number of marriages	1.03	0.79 – 1.35	0.80	1.00	0.76 – 1.30	0.99
Age at first marriage	0.89	0.67 – 1.19	0.43	0.97	0.73 – 1.31	0.87
Job*	1.14	0.88 – 1.49	0.33	1.25	1.04 – 1.50	**0.02**
Number of children lost	0.94	0.47 – 1.88	0.86	1.02	0.44 – 2.35	0.97
Experienced a parent passing during childhood**	1.05	0.89 – 1.24	0.56	1.05	0.89 – 1.24	0.56
Experienced a big health problem as a child**	0.95	0.77 – 1.17	0.65	0.93	0.75 – 1.15	0.49
Someone in childhood home experienced a big health problem**	1.09	0.90 – 1.32	0.39	1.11	0.91 – 1.35	0.32
Witnessed armed conflict during childhood**	1.06	0.89 – 1.26	0.53	1.06	0.88 – 1.26	0.54
Witnessed armed conflict as an adult**	1.05	0.87 – 1.26	0.62	1.07	0.89 – 1.28	0.46
"There is a special person with whom I can share joys and sorrows."***	1.02	0.97 – 1.08	0.43	1.03	0.98 – 1.09	0.22
"I can count on my friends when things go wrong."***	1.02	0.96 – 1.08	0.48	1.02	0.96 – 1.08	0.49
Number of cattle owned	1.02	0.99 – 1.05	0.31	1.01	0.99 – 1.04	0.42
Total number of living children	1.27	1.22 – 1.33	**<0.001**	1.27	1.22 – 1.33	**<0.001**
Attended college/vocational school				0.43	0.11 – 1.72	0.23
Random Effects						
σ^2	0.27			0.27		
τ_{00}	0.01 $_{\text{Location}}$			0.00 $_{\text{Location}}$		
ICC	0.02			0.00		
N	2 $_{\text{Location}}$			2 $_{\text{Location}}$		
Observations	243			243		
Marginal R^2 / Conditional R^2	0.44 / 0.46			0.45 / 0.45		

*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.08 Negative binomial regression (evaluating the relationship between husbands' lack of formal education and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school					
Predictors	*IRR*	*CI*	*p*	*IRR*	*CI*	*p*
(Intercept)	1.17	0.49 – 2.81	0.72	1.16	0.50 – 2.72	0.73
Number of marriages	1.03	0.79 – 1.35	0.80	1.04	0.80 – 1.36	0.75
Age at first marriage	0.89	0.67 – 1.19	0.43	0.89	0.68 – 1.18	0.42
Job*	1.14	0.88 – 1.49	0.33	1.13	0.88 – 1.45	0.33
Number of children lost	0.94	0.47 – 1.88	0.86	0.91	0.48 – 1.74	0.78
Experienced a parent passing during childhood**	1.05	0.89 – 1.24	0.56	1.05	0.89 – 1.24	0.54
Experienced a big health problem as a child**	0.95	0.77 – 1.17	0.65	0.97	0.78 – 1.19	0.74
Someone in childhood home experienced a big health problem**	1.09	0.90 – 1.32	0.39	1.09	0.90 – 1.32	0.38
Witnessed armed conflict during childhood**	1.06	0.89 – 1.26	0.53	1.07	0.89 – 1.27	0.48
Witnessed armed conflict as an adult**	1.05	0.87 – 1.26	0.62	1.03	0.86 – 1.24	0.73
"There is a special person with whom I can share joys and sorrows."***	1.02	0.97 – 1.08	0.43	1.02	0.97 – 1.08	0.46
"I can count on my friends when things go wrong."***	1.02	0.96 – 1.08	0.48	1.02	0.96 – 1.08	0.49
Number of cattle owned	1.02	0.99 – 1.05	0.31	1.02	0.99 – 1.05	0.27
Total number of living children	1.27	1.22 – 1.33	**<0.001**	1.27	1.21 – 1.33	**<0.001**
Husband has no formal education				1.07	0.91 – 1.25	0.41
Random Effects						
σ^2	0.27			0.27		
τ_{00}	0.01 $_{\text{Location}}$			0.01 $_{\text{Location}}$		
ICC	0.02			0.03		
N	2 $_{\text{Location}}$			2 $_{\text{Location}}$		
Observations	243			243		
Marginal R^2 / Conditional R^2	0.44 / 0.46			0.45 / 0.46		

*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.09 Negative binomial regression (evaluating the relationship between husbands' primary education background and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school					
Predictors	*IRR*	*CI*	*p*	*IRR*	*CI*	*p*
(Intercept)	1.17	0.49 – 2.81	0.72	1.00	0.39 – 2.54	1.00
Number of marriages	1.03	0.79 – 1.35	0.80	1.00	0.76 – 1.31	1.00
Age at first marriage	0.89	0.67 – 1.19	0.43	0.93	0.68 – 1.26	0.62
Job*	1.14	0.88 – 1.49	0.33	1.21	1.00 – 1.47	**0.05**
Number of children lost	0.94	0.47 – 1.88	0.86	1.00	0.45 – 2.24	0.99
Experienced a parent passing during childhood**	1.05	0.89 – 1.24	0.56	1.04	0.88 – 1.22	0.65
Experienced a big health problem as a child**	0.95	0.77 – 1.17	0.65	0.93	0.75 – 1.15	0.52
Someone in childhood home experienced a big health problem**	1.09	0.90 – 1.32	0.39	1.08	0.89 – 1.32	0.44
Witnessed armed conflict during childhood**	1.06	0.89 – 1.26	0.53	1.05	0.88 – 1.26	0.57
Witnessed armed conflict as an adult**	1.05	0.87 – 1.26	0.62	1.07	0.89 – 1.28	0.49
"There is a special person with whom I can share joys and sorrows."***	1.02	0.97 – 1.08	0.43	1.03	0.98 – 1.08	0.27
"I can count on my friends when things go wrong."***	1.02	0.96 – 1.08	0.48	1.02	0.97 – 1.08	0.43
Number of cattle owned	1.02	0.99 – 1.05	0.31	1.01	0.99 – 1.04	0.38
Total number of living children	1.27	1.22 – 1.33	**<0.001**	1.28	1.22 – 1.33	**<0.001**
Husband's primary education				1.06	0.90 – 1.25	0.50
Random Effects						
σ^2	0.27			0.27		
τ_{00}	0.01 $_{\text{Location}}$			0.00 $_{\text{Location}}$		
ICC	0.02					
N	2 $_{\text{Location}}$			2 $_{\text{Location}}$		
Observations	243			243		
Marginal R^2 / Conditional R^2	0.44 / 0.46			0.44 / NA		

*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.10 Negative binomial regression (evaluating the relationship between husbands' secondary education background and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school					
Predictors	*IRR*	*CI*	*p*	*IRR*	*CI*	*p*
(Intercept)	1.17	0.49 – 2.81	0.72	1.04	0.44 – 2.47	0.93
Number of marriages	1.03	0.79 – 1.35	0.80	0.99	0.76 – 1.30	0.96
Age at first marriage	0.89	0.67 – 1.19	0.43	0.93	0.70 – 1.24	0.62
Job*	1.14	0.88 – 1.49	0.33	1.22	1.02 – 1.47	**0.03**
Number of children lost	0.94	0.47 – 1.88	0.86	0.98	0.42 – 2.29	0.97
Experienced a parent passing during childhood**	1.05	0.89 – 1.24	0.56	1.03	0.88 – 1.22	0.70
Experienced a big health problem as a child**	0.95	0.77 – 1.17	0.65	0.95	0.77 – 1.17	0.60
Someone in childhood home experienced a big health problem**	1.09	0.90 – 1.32	0.39	1.08	0.88 – 1.32	0.46
Witnessed armed conflict during childhood**	1.06	0.89 – 1.26	0.53	1.06	0.89 – 1.27	0.51
Witnessed armed conflict as an adult**	1.05	0.87 – 1.26	0.62	1.05	0.88 – 1.26	0.58
"There is a special person with whom I can share joys and sorrows."***	1.02	0.97 – 1.08	0.43	1.03	0.98 – 1.08	0.27
"I can count on my friends when things go wrong."***	1.02	0.96 – 1.08	0.48	1.02	0.97 – 1.08	0.42
Number of cattle owned	1.02	0.99 – 1.05	0.31	1.01	0.99 – 1.04	0.38
Total number of living children	1.27	1.22 – 1.33	**<0.001**	1.27	1.22 – 1.33	**<0.001**
Husband's secondary education				0.87	0.68 – 1.12	0.28
Random Effects						
σ^2	0.27			0.27		
τ_{00}	0.01 $_{\text{Location}}$			0.00 $_{\text{Location}}$		
ICC	0.02			0.00		
N	2 $_{\text{Location}}$			2 $_{\text{Location}}$		
Observations	243			243		
Marginal R^2 / Conditional R^2	0.44 / 0.46			0.44 / 0.44		

*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.11 Negative binomial regression (evaluating participants' education background and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school					
Predictors	*IRR*	*CI*	*p*	*IRR*	*CI*	*p*
(Intercept)	1.17	0.49 – 2.81	0.72	1.32	0.65 – 2.66	0.44
Number of marriages	1.03	0.79 – 1.35	0.80	0.99	0.76 – 1.30	0.97
Age at first marriage	0.89	0.67 – 1.19	0.43	0.90	0.71 – 1.14	0.38
Job*	1.14	0.88 – 1.49	0.33	1.16	0.90 – 1.48	0.25
Number of children lost	0.94	0.47 – 1.88	0.86	0.88	0.49 – 1.57	0.67
Experienced a parent passing during childhood**	1.05	0.89 – 1.24	0.56	1.05	0.89 – 1.24	0.56
Experienced a big health problem as a child**	0.95	0.77 – 1.17	0.65	0.95	0.77 – 1.17	0.63
Someone in childhood home experienced a big health problem**	1.09	0.90 – 1.32	0.39	1.10	0.90 – 1.34	0.35
Witnessed armed conflict during childhood**	1.06	0.89 – 1.26	0.53	1.08	0.90 – 1.28	0.41
Witnessed armed conflict as an adult**	1.05	0.87 – 1.26	0.62	1.05	0.87 – 1.25	0.63
"There is a special person with whom I can share joys and sorrows."***	1.02	0.97 – 1.08	0.43	1.03	0.97 – 1.08	0.36
"I can count on my friends when things go wrong."***	1.02	0.96 – 1.08	0.48	1.02	0.96 – 1.08	0.60
Number of cattle owned	1.02	0.99 – 1.05	0.31	1.01	0.99 – 1.04	0.32
Total number of living children	1.27	1.22 – 1.33	**<0.001**	1.25	1.20 – 1.31	**<0.001**
Participants' education				0.89	0.77 – 1.02	0.10
Random Effects						
σ^2	0.27			0.27		
τ_{00}	0.01 $_{\text{Location}}$			0.01 $_{\text{Location}}$		
ICC	0.02			0.03		
N	2 $_{\text{Location}}$			2 $_{\text{Location}}$		
Observations	243			243		
Marginal R^2 / Conditional R^2	0.44 / 0.46			0.46 / 0.47		

*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.12 Negative binomial regression (evaluating husbands' education background and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school					
Predictors	*IRR*	*CI*	*p*	*IRR*	*CI*	*p*
(Intercept)	1.17	0.49 – 2.81	0.72	1.24	0.48 – 3.19	0.65
Number of marriages	1.03	0.79 – 1.35	0.80	1.02	0.78 – 1.34	0.86
Age at first marriage	0.89	0.67 – 1.19	0.43	0.90	0.66 – 1.23	0.52
Job*	1.14	0.88 – 1.49	0.33	1.14	0.89 – 1.48	0.30
Number of children lost	0.94	0.47 – 1.88	0.86	0.91	0.42 – 1.97	0.81
Experienced a parent passing during childhood**	1.05	0.89 – 1.24	0.56	1.05	0.89 – 1.24	0.57
Experienced a big health problem as a child**	0.95	0.77 – 1.17	0.65	0.97	0.78 – 1.20	0.76
Someone in childhood home experienced a big health problem**	1.09	0.90 – 1.32	0.39	1.09	0.89 – 1.32	0.41
Witnessed armed conflict during childhood**	1.06	0.89 – 1.26	0.53	1.08	0.90 – 1.29	0.42
Witnessed armed conflict as an adult**	1.05	0.87 – 1.26	0.62	1.03	0.86 – 1.24	0.74
"There is a special person with whom I can share joys and sorrows."***	1.02	0.97 – 1.08	0.43	1.02	0.97 – 1.08	0.44
"I can count on my friends when things go wrong."***	1.02	0.96 – 1.08	0.48	1.02	0.96 – 1.08	0.49
Number of cattle owned	1.02	0.99 – 1.05	0.31	1.02	0.99 – 1.05	0.28
Total number of living children	1.27	1.22 – 1.33	**<0.001**	1.26	1.21 – 1.32	**<0.001**
Husbands' education				0.92	0.82 – 1.03	0.13
Random Effects						
σ^2	0.27			0.27		
τ_{00}	0.01_{Location}			0.01_{Location}		
ICC	0.02			0.03		
N	2_{Location}			2_{Location}		
Observations	243			243		
Marginal R^2 / Conditional R^2	0.44 / 0.46			0.45 / 0.47		

*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.13 Poisson regression (evaluating the relationship between participants' lack of formal education and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school							
Predictors	*IRR*	*SE*	*z*	*p*	*IRR*	*SE*	*z*	*p*
(Intercept)	0.23	0.81	0.28	0.78	0.23	0.81	0.29	0.77
Number of marriages	0.07	0.14	0.47	0.64	0.04	0.14	0.30	0.77
Age at first marriage	-0.18	0.26	-0.67	0.50	-0.18	0.26	-0.70	0.48
Job*	0.04	0.12	0.37	0.71	0.05	0.12	0.42	0.67
Number of children lost	-0.14	0.47	-0.32	0.75	-0.19	0.44	-0.43	0.67
Experienced a parent passing during childhood**	0.07	0.08	0.78	0.44	0.06	0.08	0.74	0.46
Experienced a big health problem as a child**	-0.03	0.11	-0.27	0.79	-0.03	0.11	-0.25	0.80
Someone in childhood home experienced a big health problem**	0.08	0.10	0.79	0.43	0.08	0.10	0.82	0.41
Witnessed armed conflict during childhood**	0.07	0.09	0.71	0.48	0.08	0.09	0.82	0.41
Witnessed armed conflict as an adult**	0.03	0.09	0.33	0.74	0.02	0.09	0.26	0.79
"There is a special person with whom I can share joys and sorrows."***	0.01	0.03	0.49	0.62	0.01	0.03	0.55	0.58
"I can count on my friends when things go wrong."***	0.02	0.03	0.61	0.54	0.02	0.03	0.52	0.60
Number of cattle owned	0.02	0.01	1.61	0.11	0.02	0.01	1.55	0.12
Total number of living children	0.24	0.02	10.71	**<0.001**	0.24	0.02	9.76	**<0.001**
Location[+]	0.28	0.11	2.34	**0.02**	0.28	0.12	2.45	**0.01**
No formal education					0.09	0.09	0.99	0.32
Observations	243				243			
AIC	809.39				810.42			

[+]Location: 0=Arbegona, 1=Boricha
*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.14 Poisson regression (evaluating the relationship between participants' primary education background and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school							
Predictors	*IRR*	*SE*	*z*	*p*	*IRR*	*SE*	*z*	*p*
(Intercept)	0.23	0.81	0.28	0.78	0.24	0.82	0.30	0.77
Number of marriages	0.07	0.14	0.47	0.64	0.06	0.14	0.44	0.66
Age at first marriage	-0.18	0.26	-0.67	0.50	-0.18	0.26	-0.68	0.49
Job*	0.04	0.12	0.37	0.71	0.04	0.12	0.37	0.71
Number of children lost	-0.14	0.47	-0.32	0.75	-0.15	0.44	-0.33	0.74
Experienced a parent passing during childhood**	0.07	0.08	0.78	0.44	0.07	0.08	0.77	0.44
Experienced a big health problem as a child**	-0.03	0.11	-0.27	0.79	-0.03	0.11	-0.26	0.79
Someone in childhood home experienced a big health problem**	0.08	0.10	0.79	0.43	0.08	0.10	0.79	0.43
Witnessed armed conflict during childhood**	0.07	0.09	0.71	0.48	0.07	0.09	0.73	0.47
Witnessed armed conflict as an adult**	0.03	0.09	0.33	0.74	0.03	0.09	0.31	0.76
"There is a special person with whom I can share joys and sorrows."***	0.01	0.03	0.49	0.62	0.01	0.03	0.50	0.62
"I can count on my friends when things go wrong."***	0.02	0.03	0.61	0.54	0.02	0.03	0.60	0.55
Number of cattle owned	0.02	0.01	1.61	0.11	0.02	0.01	1.60	0.11
Total number of living children	0.24	0.02	10.71	**<0.001**	0.24	0.02	10.39	**<0.001**
Location[+]	0.28	0.11	2.34	**0.02**	0.27	0.12	2.33	**0.02**
Primary education					-0.01	0.08	-0.16	0.87
Observations	242				242			
AIC	809.39				811.36			

[+]Location: 0=Arbegona, 1=Boricha
*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.15 Poisson regression (evaluating the relationship between participants' secondary education background and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school							
Predictors	*IRR*	*SE*	*z*	*p*	*IRR*	*SE*	*z*	*p*
(Intercept)	0.23	0.81	0.28	0.78	0.21	0.81	0.26	0.80
Number of marriages	0.07	0.14	0.47	0.64	0.05	0.14	0.38	0.70
Age at first marriage	-0.18	0.26	-0.67	0.50	-0.15	0.26	-0.58	0.57
Job*	0.04	0.12	0.37	0.71	0.06	0.12	0.48	0.63
Number of children lost	-0.14	0.47	-0.32	0.75	-0.13	0.44	-0.30	0.76
Experienced a parent passing during childhood**	0.07	0.08	0.78	0.44	0.06	0.08	0.75	0.46
Experienced a big health problem as a child**	-0.03	0.11	-0.27	0.79	-0.04	0.11	-0.35	0.72
Someone in childhood home experienced a big health problem**	0.08	0.10	0.79	0.43	0.08	0.10	0.80	0.42
Witnessed armed conflict during childhood**	0.07	0.09	0.71	0.48	0.07	0.09	0.73	0.47
Witnessed armed conflict as an adult**	0.03	0.09	0.33	0.74	0.04	0.09	0.47	0.64
"There is a special person with whom I can share joys and sorrows."***	0.01	0.03	0.49	0.62	0.01	0.03	0.50	0.62
"I can count on my friends when things go wrong."***	0.02	0.03	0.61	0.54	0.02	0.03	0.60	0.55
Number of cattle owned	0.02	0.01	1.61	0.11	0.02	0.01	1.54	0.12
Total number of living children	0.24	0.02	10.71	**<0.001**	0.23	0.02	10.08	**<0.001**
Location[+]	0.28	0.11	2.34	**0.02**	0.25	0.11	2.18	**0.03**
Secondary education					-0.35	0.24	-1.49	0.14
Observations	242				242			
AIC	809.39				808.39			

[+]Location: 0=Arbegona, 1=Boricha
*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.16 Poisson regression (evaluating the relationship between participants' post-secondary education background [college or vocational school] and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school							
Predictors	*IRR*	*SE*	*z*	*p*	*IRR*	*SE*	*z*	*p*
(Intercept)	0.23	0.81	0.28	0.78	0.13	0.81	0.16	0.88
Number of marriages	0.07	0.14	0.47	0.64	0.05	0.14	0.38	0.70
Age at first marriage	-0.18	0.26	-0.67	0.50	-0.14	0.26	-0.53	0.60
Job*	0.04	0.12	0.37	0.71	0.06	0.12	0.51	0.61
Number of children lost	-0.14	0.47	-0.32	0.75	-0.12	0.44	-0.27	0.78
Experienced a parent passing during childhood**	0.07	0.08	0.78	0.44	0.08	0.09	0.88	0.38
Experienced a big health problem as a child**	-0.03	0.11	-0.27	0.79	-0.04	0.11	-0.35	0.72
Someone in childhood home experienced a big health problem**	0.08	0.10	0.79	0.43	0.09	0.10	0.91	0.36
Witnessed armed conflict during childhood**	0.07	0.09	0.71	0.48	0.07	0.09	0.76	0.45
Witnessed armed conflict as an adult**	0.03	0.09	0.33	0.74	0.04	0.09	0.44	0.66
"There is a special person with whom I can share joys and sorrows."***	0.01	0.03	0.49	0.62	0.02	0.03	0.61	0.55
"I can count on my friends when things go wrong."***	0.02	0.03	0.61	0.54	0.02	0.03	0.52	0.60
Number of cattle owned	0.02	0.01	1.61	0.11	0.02	0.01	1.60	0.11
Total number of living children	0.24	0.02	10.71	**<0.001**	0.24	0.02	10.60	**<0.001**
Location[+]	0.28	0.11	2.34	**0.02**	0.26	0.11	2.25	**0.02**
Attended college/vocational school					-0.76	0.72	-1.05	0.30
Observations	242				242			
AIC	809.39				810			

[+]Location: 0=Arbegona, 1=Boricha
*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.17 Poisson regression (evaluating the relationship between husbands' lack of formal education and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school							
Predictors	*IRR*	*SE*	*z*	*p*	*IRR*	*SE*	*z*	*p*
(Intercept)	0.23	0.81	0.28	0.78	0.16	0.81	0.20	0.84
Number of marriages	0.07	0.14	0.47	0.64	0.07	0.14	0.51	0.61
Age at first marriage	-0.18	0.26	-0.67	0.50	-0.16	0.26	-0.62	0.53
Job*	0.04	0.12	0.37	0.71	0.04	0.12	0.41	0.68
Number of children lost	-0.14	0.47	-0.32	0.75	-0.16	0.44	-0.37	0.71
Experienced a parent passing during childhood**	0.07	0.08	0.78	0.44	0.07	0.08	0.77	0.44
Experienced a big health problem as a child**	-0.03	0.11	-0.27	0.79	-0.01	0.11	-0.13	0.89
Someone in childhood home experienced a big health problem**	0.08	0.10	0.79	0.43	0.08	0.10	0.83	0.41
Witnessed armed conflict during childhood**	0.07	0.09	0.71	0.48	0.07	0.09	0.78	0.44
Witnessed armed conflict as an adult**	0.03	0.09	0.33	0.74	0.02	0.09	0.18	0.86
"There is a special person with whom I can share joys and sorrows."***	0.01	0.03	0.49	0.62	0.01	0.03	0.47	0.64
"I can count on my friends when things go wrong."***	0.02	0.03	0.61	0.54	0.02	0.03	0.60	0.55
Number of cattle owned	0.02	0.01	1.61	0.11	0.02	0.01	1.60	0.11
Total number of living children	0.24	0.02	10.71	**<0.001**	0.24	0.02	10.21	**<0.001**
Location[+]	0.28	0.11	2.34	**0.02**	0.29	0.12	2.50	**0.01**
Husband has no formal education					0.08	0.08	1.04	0.30
Observations	242				242			
AIC	809.39				810.32			

[+]Location: 0=Arbegona, 1=Boricha
*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.18 Poisson regression (evaluating the relationship between husbands' primary education background and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school							
Predictors	*IRR*	*SE*	*z*	*p*	*IRR*	*SE*	*z*	*p*
(Intercept)	0.23	0.81	0.28	0.78	0.23	0.81	0.28	0.78
Number of marriages	0.07	0.14	0.47	0.64	0.07	0.14	0.47	0.64
Age at first marriage	-0.18	0.26	-0.67	0.50	-0.18	0.26	-0.68	0.50
Job*	0.04	0.12	0.37	0.71	0.04	0.12	0.37	0.71
Number of children lost	-0.14	0.47	-0.32	0.75	-0.14	0.44	-0.32	0.75
Experienced a parent passing during childhood**	0.07	0.08	0.78	0.44	0.07	0.08	0.78	0.44
Experienced a big health problem as a child**	-0.03	0.11	-0.27	0.79	-0.03	0.11	-0.27	0.79
Someone in childhood home experienced a big health problem**	0.08	0.10	0.79	0.43	0.08	0.10	0.79	0.43
Witnessed armed conflict during childhood**	0.07	0.09	0.71	0.48	0.07	0.09	0.71	0.78
Witnessed armed conflict as an adult**	0.03	0.09	0.33	0.74	0.03	0.10	0.32	0.75
"There is a special person with whom I can share joys and sorrows."***	0.01	0.03	0.49	0.62	0.01	0.03	0.49	0.63
"I can count on my friends when things go wrong."***	0.02	0.03	0.61	0.54	0.02	0.03	0.61	0.54
Number of cattle owned	0.02	0.01	1.61	0.11	0.02	0.01	1.60	0.11
Total number of living children	0.24	0.02	10.71	**<0.001**	0.24	0.02	10.64	**<0.001**
Location[+]	0.28	0.11	2.34	**0.02**	0.27	0.12	2.23	**0.03**
Husband's primary education					-0.002	0.09	-0.02	0.98
Observations	242				242			
AIC	809.39				811.39			

[+]Location: 0=Arbegona, 1=Boricha
*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.19 Poisson regression (evaluating the relationship between participants' husbands' secondary education background and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school							
Predictors	*IRR*	*SE*	*z*	*p*	*IRR*	*SE*	*z*	*p*
(Intercept)	0.23	0.81	0.28	0.78	0.26	0.81	0.32	0.75
Number of marriages	0.07	0.14	0.47	0.64	0.05	0.14	0.37	0.72
Age at first marriage	-0.18	0.26	-0.67	0.50	-0.18	0.26	-0.68	0.50
Job*	0.04	0.12	0.37	0.71	0.04	0.012	0.37	0.71
Number of children lost	-0.14	0.47	-0.32	0.75	-0.15	0.44	-0.34	0.74
Experienced a parent passing during childhood**	0.07	0.08	0.78	0.44	0.06	0.08	0.72	0.47
Experienced a big health problem as a child**	-0.03	0.11	-0.27	0.79	-0.02	0.11	-0.22	0.83
Someone in childhood home experienced a big health problem**	0.08	0.10	0.79	0.43	0.07	0.10	0.69	0.50
Witnessed armed conflict during childhood**	0.07	0.09	0.71	0.48	0.07	0.09	0.78	0.43
Witnessed armed conflict as an adult**	0.03	0.09	0.33	0.74	0.03	0.09	0.30	0.77
"There is a special person with whom I can share joys and sorrows."***	0.01	0.03	0.49	0.62	0.01	0.03	0.49	0.63
"I can count on my friends when things go wrong."***	0.02	0.03	0.61	0.54	0.02	0.03	0.62	0.54
Number of cattle owned	0.02	0.01	1.61	0.11	0.02	0.01	1.64	0.10
Total number of living children	0.24	0.02	10.71	**<0.001**	0.24	0.02	10.60	**<0.001**
Location[+]	0.28	0.11	2.34	**0.02**	0.26	0.11	2.25	**0.02**
Husband's secondary education					-0.11	0.13	-0.86	0.39
Observations	242				242			
AIC	809.39				810.64			

[+]Location: 0=Arbegona, 1=Boricha
*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.20 Poisson regression (evaluating participants' education background and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school							
Predictors	*IRR*	*SE*	*z*	*p*	*IRR*	*SE*	*z*	*p*
(Intercept)	0.23	0.81	0.28	0.78	0.31	0.81	0.39	0.70
Number of marriages	0.07	0.14	0.47	0.64	0.02	0.14	0.14	0.88
Age at first marriage	-0.18	0.26	-0.67	0.50	-0.16	0.26	-0.62	0.54
Job*	0.04	0.12	0.37	0.71	0.07	0.12	0.55	0.59
Number of children lost	-0.14	0.47	-0.32	0.75	-0.20	0.44	-0.46	0.65
Experienced a parent passing during childhood**	0.07	0.08	0.78	0.44	0.06	0.08	0.75	0.45
Experienced a big health problem as a child**	-0.03	0.11	-0.27	0.79	-0.03	0.11	-0.31	0.76
Someone in childhood home experienced a big health problem**	0.08	0.10	0.79	0.43	0.09	0.10	0.89	0.37
Witnessed armed conflict during childhood**	0.07	0.09	0.71	0.48	0.08	0.09	0.89	0.37
Witnessed armed conflict as an adult**	0.03	0.09	0.33	0.74	0.03	0.09	0.34	0.74
"There is a special person with whom I can share joys and sorrows."***	0.01	0.03	0.49	0.62	0.02	0.03	0.63	0.53
"I can count on my friends when things go wrong."***	0.02	0.03	0.61	0.54	0.01	0.03	0.43	0.67
Number of cattle owned	0.02	0.01	1.61	0.11	0.02	0.01	1.50	0.13
Total number of living children	0.24	0.02	10.71	**<0.001**	0.23	0.02	9.30	**<0.001**
Location[+]	0.28	0.11	2.34	**0.02**	0.28	0.11	2.44	**0.01**
Participants' education					-0.12	0.08	-1.68	0.09
Observations	242				242			
AIC	809.39				808.54			

[+]Location: 0=Arbegona, 1=Boricha
*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.21 Poisson regression (evaluating participants' husbands' education background and the number of their biological children enrolled in school) results

	Number of biological children enrolled in school							
Predictors	*IRR*	*SE*	*z*	*p*	*IRR*	*SE*	*z*	*p*
(Intercept)	0.23	0.81	0.28	0.78	0.25	0.81	0.32	0.75
Number of marriages	0.07	0.14	0.47	0.64	0.05	0.14	0.38	0.71
Age at first marriage	-0.18	0.26	-0.67	0.50	-0.16	0.26	-0.60	0.55
Job*	0.04	0.12	0.37	0.71	0.05	0.12	0.47	0.65
Number of children lost	-0.14	0.47	-0.32	0.75	-0.16	0.44	-0.38	0.71
Experienced a parent passing during childhood**	0.07	0.08	0.78	0.44	0.06	0.08	0.74	0.46
Experienced a big health problem as a child**	-0.03	0.11	-0.27	0.79	-0.01	0.11	-0.13	0.90
Someone in childhood home experienced a big health problem**	0.08	0.10	0.79	0.43	0.08	0.10	0.78	0.44
Witnessed armed conflict during childhood**	0.07	0.09	0.71	0.48	0.08	0.09	0.89	0.38
Witnessed armed conflict as an adult**	0.03	0.09	0.33	0.74	0.02	0.09	0.19	0.85
"There is a special person with whom I can share joys and sorrows."***	0.01	0.03	0.49	0.62	0.01	0.03	0.49	0.63
"I can count on my friends when things go wrong."***	0.02	0.03	0.61	0.54	0.02	0.03	0.60	0.55
Number of cattle owned	0.02	0.01	1.61	0.11	0.02	0.01	1.61	0.11
Total number of living children	0.24	0.02	10.71	**<0.001**	0.23	0.02	10.04	**<0.001**
Location[+]	0.28	0.11	2.34	**0.02**	0.28	0.11	2.43	**0.02**
Husbands' education					-0.09	0.06	-1.58	0.12
Observations	242				242			
AIC	809.39				808.86			

[+]Location: 0=Arbegona, 1=Boricha
*Job: 0=unemployed, 1= yes
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Hypothesis 3

Women who feel they have higher levels of social support will be more likely to contracept than women who feel they have lower levels of social support.

Only the logistic regression model yielded significant results. Initially, when looking at the MSPSS variables, one has evidence to reject the null hypothesis of no effect of social support on contraceptive use. Feeling that one has a family that really tries to help or feeling that one can talk to their family about their problems displayed significant results to the model. Regarding the former variable, the more a participant feels her family really tries to help her, the less likely she is to use contraception. In the case of the latter variable, however, the more a participant feels she can discuss her problems with her family, the more likely she is to use contraception. Upon considering the *q*-value results, I concluded that this supported hypothesis is the result of a Type 1 error, and therefore, I cannot reject the null hypothesis. I will expand upon this more in Chapter 8. Table 7.22 displays the MSPSS results from both the negative binomial and logistic regressions. Table 7.23 and 7.24 break down the model, specifically for the feeling that one has a family that really tries to help and feeling that one can talk to their family about their problems, respectively.

Table 7.22 MSPSS analyses via negative binomial and logistic regression

	Perceived social support variable	Model	β	*SE*	*z*	OR	*p*	FDR*
Family	**"My family really tries to help me."**	Negative binomial regression	-0.06	0.05	-1.19	0.95	0.23	0.90
		Logistic regression	**-0.21**	**0.09**	**-2.27**	**0.81**	**0.02**	**0.40**
	"I get the emotional help and support I need from my family."	Negative binomial regression	-0.02	0.05	-0.42	0.98	0.67	0.93
		Logistic regression	-0.08	0.09	-0.87	0.93	0.38	0.90
	"I can talk about my problems with my family."	Negative binomial regression	0.04	0.05	0.75	1.04	0.45	0.90
		Logistic regression	**0.27**	**0.10**	**2.60**	**1.31**	**0.01**	**0.32**
	"My family is willing to help me make decisions."	Negative binomial regression	-0.03	0.05	-0.74	0.97	0.46	0.90
		Logistic regression	-0.16	0.09	-1.77	0.85	0.08	0.88
Significant other	"There is a special person who is around when I am in need."	Negative binomial regression	0.04	0.04	0.89	1.04	0.37	0.90
		Logistic regression	0.12	0.08	1.50	1.13	0.13	0.90
	"There is a special person with whom I can share joys and sorrows."	Negative binomial regression	0.01	0.04	0.33	1.01	0.74	0.93
		Logistic regression	0.00	0.08	-0.06	1.00	0.95	0.95
	"I have a special person who is a real source of comfort to me. "	Negative binomial regression	0.02	0.04	0.56	1.02	0.57	0.90
		Logistic regression	0.04	0.08	0.48	1.04	0.63	0.93
	"There is a special person in my life who cares about my feelings."	Negative binomial regression	0.02	0.04	0.41	1.02	0.68	0.93
		Logistic regression	0.02	0.08	0.19	1.02	0.85	0.93
Friends	"My friends really try to help me."	Negative binomial regression	0.01	0.05	0.14	1.01	0.89	0.95
		Logistic regression	-0.05	0.09	-0.59	0.95	0.55	0.90
	"I can count on my friends when things go wrong."	Negative binomial regression	0.01	0.05	0.23	1.01	0.82	0.93
		Logistic regression	-0.05	0.09	-0.55	0.95	0.58	0.90
	"I have friends with whom I can share my joys and sorrows."	Negative binomial regression	0.04	0.05	0.95	1.04	0.34	0.90
		Logistic regression	0.13	0.09	1.40	1.13	0.16	0.90
	"I can talk about my problems with my friends."	Negative binomial regression	0.02	0.05	0.55	1.02	0.59	0.90
		Logistic regression	0.06	0.09	0.65	1.06	0.51	0.90

*False discovery rate (Benjamini and Hochberg, 1995)

Table 7.22 MSPSS analyses via negative binomial and logistic regression, cont'd

	Perceived social support variable	Model	β	*SE*	*z*	OR	*p*	FDR*
Subscales	The total score for social support the participant feels she has from her family.	Negative binomial regression	-0.04	0.07	-0.61	0.96	0.54	0.90
		Logistic regression	-0.12	0.13	-0.95	0.89	0.34	0.90
	The total score for social support the participant feels she has from a significant other.	Negative binomial regression	0.03	0.05	0.66	1.04	0.51	0.90
		Logistic regression	0.06	0.10	0.63	1.06	0.53	0.90
	The total score for social support the participant feels she has from her friends.	Negative binomial regression	0.03	0.06	0.57	1.03	0.57	0.90
		Logistic regression	0.03	0.11	0.28	1.03	0.78	0.93
	The total score for social support the participant feels she has.	Negative binomial regression	0.02	0.07	0.32	1.02	0.75	0.93
		Logistic regression	0.01	0.13	0.07	1.00	0.94	0.95

*False discovery rate (Benjamini and Hochberg, 1995)

Table 7.23 Logistic regression (evaluating the relationship between a participant's feeling that her family tries to help her and her current contraception use) results

	Current contraception use					
Predictors	*Odds ratios*	*CI*	*p*	*Odds ratios*	*CI*	*p*
(Intercept)	0.07	0.00 – 0.62	**0.03**	0.16	0.01-1.59	0.15
Marital status*	19.58	3.13 – 412.84	**0.01**	17.37	2.71-372.49	**0.01**
Number of marriages	0.30	0.11 – 0.81	**0.02**	0.30	0.11-0.82	**0.02**
Number of husband's wives	0.47	0.19 – 1.15	0.10	0.39	0.15-0.97	**0.04**
Experienced a parent passing during childhood**	0.40	0.22 – 0.72	**0.003**	0.38	0.20-0.68	**0.001**
Parent abused alcohol during participant's childhood**	0.91	0.54 – 1.53	0.71	0.88	0.52-1.50	0.64
Experienced periods of food shortage during childhood**	2.56	1.34 – 5.06	**0.01**	2.25	1.17-4.50	**0.02**
Family moved to new community during childhood**	0.75	0.42 – 1.36	0.35	0.75	0.41-1.37	0.36
Member of household participated in armed conflict during participant's childhood**	0.36	0.14 – 0.94	**0.04**	0.32	0.12-0.84	**0.02**
Witnessed armed conflict as an adult**	0.67	0.34 – 1.32	0.24	0.67	0.34-1.33	0.25
Grows enset**	0.11	0.01 – 0.53	**0.04**	0.10	0.01-0.51	**0.01**
Grows maize**	2.00	1.20 – 3.34	**0.01**	2.00	1.20-3.35	**0.01**
Grows coffee**	1.26	0.87 – 2.26	0.30	1.28	0.88-2.30	0.26
Kilos of coffee grown	1.00	1.00 – 1.00	0.43	1.00	1.00-1.00	0.44
Number of cattle owned	0.94	0.85 – 1.04	0.21	0.95	0.86-1.05	0.35
Husband completed no formal education	1.44	0.77 – 2.75	0.26	1.47	0.78-2.81	0.24
Husband completed vocational school/college	0.47	0.11 – 1.81	0.28	0.51	0.11-2.04	0.35
Participant's mother completed no formal education	1.87	0.92 – 3.82	0.08	1.97	0.97-4.05	0.06

Table 7.23 Logistic regression (evaluating the relationship between a participant's feeling that her family tries to help her and her current contraception use) results, cont'd

	Current contraception use					
Predictors	*Odds ratios*	*CI*	*p*	*Odds ratios*	*CI*	*p*
Participant's mother completed vocational school/college	0.00	N/A*	0.987	0.00	N/A*	0.99
Total number of living children	1.67	1.42 – 1.98	**<0.001**	1.67	1.42-.198	**<0.001**
Location[+]	3.39	1.69 – 6.82	**0.001**	3.59	1.78-7.28	**<0.001**
"My family really tries to help me."***				0.81	0.68-0.97	**0.02**
Observations	437			437		
R^2 Tjur	0.32			0.33		

[+]Location: 0=Arbegona, 1=Boricha
*Marital status: 0=single, 1=married, 2=widow, 3=divorced
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.24 Logistic regression (evaluating the relationship between a participant's feeling that she can communicate her problems to her family and her current contraception use) results

				Current contraception use		
Predictors	*Odds ratio*	*CI*	*p*	*Odds ratio*	*CI*	*p*
(Intercept)	0.07	0.00 – 0.62	**0.03**	0.03	0.00 – 0.28	**0.01**
Marital status*	19.58	3.13 – 412.84	**0.01**	19.27	3.13 – 401.26	**0.01**
Number of marriages	0.30	0.11 – 0.81	**0.02**	0.28	0.10 – 0.77	**0.01**
Number of husband's wives	0.47	0.19 – 1.15	0.10	0.51	0.21 – 1.29	0.15
Experienced a parent passing during childhood**	0.40	0.22 – 0.72	**0.003**	0.42	0.23 – 0.77	**0.01**
Parent abused alcohol during participant's childhood**	0.91	0.54 – 1.53	0.71	0.97	0.57 – 1.66	0.92
Experienced periods of food shortage during childhood**	2.56	1.34 – 5.06	**0.01**	2.54	1.32 – 5.05	**0.01**
Family moved to new community during childhood**	0.75	0.42 – 1.36	0.35	0.74	0.41 – 1.34	0.32
Member of household participated in armed conflict during participant's childhood**	0.36	0.14 – 0.94	**0.04**	0.38	0.14 – 0.99	**0.05**
Witnessed armed conflict as an adult**	0.67	0.34 – 1.32	0.24	0.76	0.38 – 1.52	0.44
Grows enset**	0.11	0.01 – 0.53	**0.04**	0.09	0.01 – 0.43	**0.01**
Grows maize**	2.00	1.20 – 3.34	**0.01**	1.96	1.18 – 3.30	**0.01**
Grows coffee**	1.26	0.87 – 2.26	0.30	1.22	0.83 – 2.22	0.38
Kilos of coffee grown	1.00	1.00 – 1.00	0.43	1.00	1.00 – 1.00	0.44
Number of cattle owned	0.94	0.85 – 1.04	0.21	0.92	0.83 – 1.02	0.13
Husband completed no formal education	1.44	0.77 – 2.75	0.26	1.40	0.73 – 2.70	0.31
Husband completed vocational school/college	0.47	0.11 – 1.81	0.28	0.42	0.10 – 1.62	0.22
Participant's mother completed no formal education	1.87	0.92 – 3.82	0.08	1.89	0.92 – 3.88	0.08

Table 7.24 Logistic regression (evaluating the relationship between a participant's feeling that she can communicate her problems to her family and her current contraception use) results, cont'd

				Current contraception use		
Predictors	*Odds ratio*	*CI*	*p*	*Odds ratio*	*CI*	*p*
Participant's mother completed vocational school/college	0.00	N/A*	0.987	0.00	N/A*	0.99
Total number of living children	1.67	1.42 – 1.98	**<0.001**	1.69	1.44 – 2.00	**<0.001**
Location[+]	3.39	1.69 – 6.82	**0.001**	4.42	2.13 – 9.29	**<0.001**
"I can talk about my problems with my family."***				1.31	1.07 – 1.60	**0.01**
Observations	437			437		
R^2 Tjur	0.32			0.33		

[+]Location: 0=Arbegona, 1=Boricha
*Marital status: 0=single, 1=married, 2=widow, 3=divorced
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Hypothesis 4

Women who feel they have higher levels of social support will have more children enrolled in school than women who feel they have lower levels of social support.

One cannot reject the null hypothesis for any of the social support variables. Table 7.25 displays the MSPSS results from both the negative binomial and Poisson regressions.

Table 7.25 MSPSS analyses via negative binomial and Poisson regression

	Perceived social support variable	Model	β	*SE*	*z*	OR	*p*	FDR*
Family	"My family really tries to help me."	Negative binomial regression	0.00	0.02	0.15	1.00	0.88	0.93
		Poisson regression	0.00	0.02	0.15	1.00	0.88	0.93
	"I get the emotional help and support I need from my family."	Negative binomial regression	0.01	0.02	0.51	1.01	0.61	0.82
		Poisson regression	0.01	0.02	0.51	1.01	0.61	0.82
	"I can talk about my problems with my family."	Negative binomial regression	0.01	0.02	0.38	1.01	0.71	0.82
		Poisson regression	0.01	0.02	0.38	1.01	0.71	0.82
	"My family is willing to help me make decisions."	Negative binomial regression	0.01	0.02	0.48	1.01	0.63	0.82
		Poisson regression	0.01	0.02	0.48	1.01	0.63	0.82
Significant other	"There is a special person who is around when I am in need."	Negative binomial regression	0.00	0.02	0.09	1.00	0.93	0.93
		Poisson regression	0.00	0.02	0.09	1.00	0.93	0.93
	"There is a special person with whom I can share joys and sorrows."	Negative binomial regression	0.03	0.02	1.40	1.03	0.16	0.77
		Poisson regression	0.03	0.02	1.40	1.03	0.16	0.77
	"I have a special person who is a real source of comfort to me. "	Negative binomial regression	0.01	0.02	0.65	1.01	0.51	0.82
		Poisson regression	0.01	0.02	0.65	1.01	0.51	0.82
	"There is a special person in my life who cares about my feelings."	Negative binomial regression	0.02	0.02	0.92	1.02	0.36	0.77
		Poisson regression	0.02	0.02	0.92	1.02	0.36	0.77
Friends	"My friends really try to help me."	Negative binomial regression	0.01	0.02	0.35	1.01	0.72	0.82
		Poisson regression	0.01	0.02	0.35	1.01	0.72	0.82
	"I can count on my friends when things go wrong."	Negative binomial regression	0.02	0.02	1.06	1.02	0.29	0.77
		Poisson regression	0.02	0.02	1.06	1.02	0.29	0.77
	"I have friends with whom I can share my joys and sorrows."	Negative binomial regression	0.02	0.02	1.03	1.02	0.30	0.77
		Poisson regression	0.02	0.02	1.03	1.02	0.30	0.77
	"I can talk about my problems with my friends."	Negative binomial regression	0.01	0.02	0.67	1.01	0.51	0.82
		Poisson regression	0.01	0.02	0.67	1.01	0.51	0.82

*False discovery rate q-value (Benjamini and Hochberg, 1995)

Table 7.25 MSPSS analyses via negative binomial and logistic regression, cont'd

	Perceived social support variable	Model	β	*SE*	*z*	OR	*p*	FDR*
Subscales	The total score for social support the participant feels she has from her family.	Negative binomial regression	0.02	0.03	0.53	1.02	0.59	0.82
		Poisson regression	0.02	0.03	0.53	1.02	0.59	0.82
	The total score for social support the participant feels she has from a significant other.	Negative binomial regression	0.02	0.02	0.91	1.02	0.36	0.77
		Poisson regression	0.02	0.02	0.91	1.02	0.36	0.77
	The total score for social support the participant feels she has from her friends.	Negative binomial regression	0.02	0.02	0.94	1.02	0.35	0.77
		Poisson regression	0.02	0.02	0.94	1.02	0.35	0.77
	The total score for social support the participant feels she has.	Negative binomial regression	0.03	0.03	0.96	1.03	0.34	0.77
		Poisson regression	0.03	0.03	0.96	1.03	0.34	0.77

*False discovery rate (Benjamini and Hochberg, 1995)

Hypothesis 5

Women who live closer to local health clinics and who have greater interactions with health care agents will be more likely to contracept than women who live further from health clinics and have fewer interactions with health care agents.

One cannot reject the null hypothesis of no effect of health care workers on contraceptive use. Women with greater interactions with HEW are more likely to use contraception compared to women with fewer visit. The amount of time in which it takes a woman to reach her nearest health facility, however, did not show a significant relationship with contraception use. The support for the association between HEW interactions and contraception use is further strengthened by the FDR *q*-values that arose from both analyses. Though one aspect of the hypothesis showed a significant association, the overall prediction was rejected, thereby making this an unsupported hypothesis. Table 7.26 displays results from both the negative binomial and logistic regressions. Tables 7.27 and 7.28 highlights the negative binomial and logistic regressions results, respectively, specifically for the number of times in which a participant interacted with an HEW in the past year.

Table 7.26 Health-seeking behavior analyses via negative binomial and logistic regression

Healthcare variables	Model	β	*SE*	*z*	OR	*p*	FDR*
The number of times in which a participant interacted with a health extension worker in the past year	**Negative binomial regression**	**0.19**	**0.07**	**2.51**	**1.21**	**0.01**	**0.02**
	Logistic regression	**0.19**	**0.07**	**2.51**	**1.21**	**0.01**	**0.02**
The amount of time in which it takes to her travel to the nearest health facility	Negative binomial regression	0.13	0.13	1.13	1.15	0.26	0.26
	Logistic regression	0.13	0.13	1.13	1.15	0.26	0.26

*False discovery rate (Benjamini and Hochberg, 1995)

Table 7.27 Negative binomial regression (evaluating the relationship between the number of times in which a participant interacted with a HEW in the past year and her current contraception use) results

				Current contraception use		
Predictors	*IRR*	*CI*	*p*	*IRR*	*CI*	*p*
(Intercept)	0.02	0.00 – 0.24	**0.002**	0.02	0.00 – 0.25	**0.003**
Marital status*	17.65	2.26 – 137.57	**0.01**	15.45	1.97 – 121.09	**0.01**
Number of marriages	0.64	0.35 – 1.20	0.17	0.65	0.35 – 1.21	0.18
Number of people living in participant's home	2.09	0.85 – 5.13	0.11	2.11	0.86 – 5.16	0.10
Number of husband's wives	0.78	0.49 – 1.26	0.31	0.81	0.50 – 1.31	0.40
Total number of living children	0.98	0.80 – 1.19	0.81	0.97	0.80 – 1.18	0.77
Number of biological children enrolled in school	1.07	0.94 – 1.21	0.29	1.06	0.94 – 1.20	0.36
Experienced a parent passing during childhood**	0.80	0.58 – 1.10	0.16	0.82	0.59 – 1.13	0.22
Experienced periods of food shortage during childhood**	1.18	0.86 – 1.63	0.31	1.22	0.88 – 1.68	0.23
Member of household participated in armed conflict during participant's childhood**	0.79	0.47 – 1.31	0.36	0.76	0.46 – 1.27	0.29
Witnessed armed conflict as an adult**	0.89	0.63 – 1.27	0.54	0.90	0.63 – 1.28	0.55
"My family is willing to help me make decisions."***	0.97	0.89 – 1.06	0.52	0.95	0.87 – 1.05	0.32
Grows enset**	0.60	0.32 – 1.16	0.13	0.61	0.32 – 1.18	0.14
Grows maize**	1.26	0.96 – 1.66	0.10	1.28	0.97 – 1.68	0.08
Number of cattle owned	0.97	0.92 – 1.03	0.30	0.97	0.92 – 1.02	0.27
Husband completed vocational school/college	0.68	0.25 – 1.85	0.45	0.69	0.25 – 1.89	0.47
Number of times participant interacted with HEW				1.07	0.99 – 1.15	**0.01**

Random Effects		
σ^2	0.98	0.98
τ_{00}	0.01 $_{\text{Location}}$	0.01 $_{\text{Location}}$
ICC	0.01	0.01
N	2 $_{\text{Location}}$	2 $_{\text{Location}}$
Observations	437	437
Marginal R^2 / Conditional R^2	0.40 / 0.40	0.40 / 0.41

*Marital status: 0=single, 1=married, 2=widow, 3=divorced
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

Table 7.28 Logistic regression (evaluating the relationship between the number of times in which a participant interacted with a HEW in the past year and her current contraception use) results

	Current contraception use					
Predictors	*Odds Ratios*	*CI*	*p*	*Odds Ratios*	*CI*	*p*
(Intercept)	0.00	0.00 – 0.10	**0.003**	0.00	0.00 – 0.13	**0.01**
Marital status*	98.30	9.59 – 2684.94	**0.001**	72.17	6.55 – 2086.98	**0.002**
Number of marriages	0.28	0.10 – 0.76	**0.01**	0.29	0.10 – 0.79	**0.02**
Number of people living in participant's home	12.05	2.19 – 73.57	**0.01**	11.25	1.98 – 71.87	**0.01**
Number of husband's wives	0.50	0.21 – 1.19	0.11	0.55	0.23 – 1.31	0.17
Total number of living children	0.97	0.65 – 1.42	0.86	0.97	0.65 – 1.43	0.87
Number of biological children enrolled in school	1.33	1.04 – 1.70	**0.03**	1.29	1.00 – 1.66	**0.05**
Experienced a parent passing during childhood**	0.44	0.24 – 0.79	**0.01**	0.46	0.25 – 0.84	**0.01**
Experienced periods of food shortage during childhood**	2.13	1.11 – 4.23	**0.03**	2.26	1.17 – 4.51	**0.02**
Member of household participated in armed conflict during participant's childhood**	0.39	0.16 – 1.00	**0.05**	0.36	0.14 – 0.93	**0.03**
Witnessed armed conflict as an adult**	0.56	0.28 – 1.09	0.09	0.57	0.29 – 1.14	0.11
"My family is willing to help me make decisions."***	0.87	0.72 – 1.03	0.12	0.82	0.68 – 0.99	**0.04**
Grows enset**	0.09	0.01 – 0.44	**0.01**	0.10	0.01 – 0.49	**0.01**
Grows maize**	1.95	1.17 – 3.25	**0.01**	2.02	1.21 – 3.39	**0.01**
Number of cattle owned	0.95	0.86 – 1.05	0.28	0.95	0.85 – 1.05	0.29
Husband completed vocational school/college	0.48	0.11 – 1.81	0.29	0.50	0.12 – 1.91	0.32
Location+	3.47	1.98 – 6.20	**<0.001**	3.50	1.98 – 6.30	**<0.001**
Number of times participant interacted with HEW				1.21	1.05 – 1.40	**0.01**
Observations	437			437		

R^2 Tjur	0.32	0.33

[+]Location: 0=Arbegona, 1=Boricha
*Marital status: 0=single, 1=married, 2=widow, 3=divorced
**Response: 0=no, 1=yes
***Response scale: 1=strongly disagree, 2=mildly disagree, 3=neutral, 4=mildly agree, 5=strongly agree

CHAPTER 8

DISCUSSION AND CONCLUSION

Discussion

This project aims to better understand the relationship between life history events, risky environments, and perceptions of social support. More specifically, I asked, what are the relationships between environmental risk and perceptions of social support, and women's reproductive outcomes? Though reproductive life history events have been extensively studied in developing countries, there is still much we do not understand, particularly when considering the role of embodied capital in decision-making. LHT and ECT, though complementary, are typically not incorporated together in anthropological research and analyses. I argue that we should not forsake one for the other because the strength of each theory cushions the drawback of the other. LHT negates agency and individual decision-making, while heavily emphasizing the role of risk. ECT, on the other hand, downplays the role of risk (though not completely), and emphasizes agency and individual decision-making. Additionally, in considering SET and applying SEM, we can better uncover the relationship between reproductive health behaviors and social and physical stimuli. As humans are navigating their environments, they rely on a host of individuals and institutions for information and signals that inform their reproductive decision-making. By confining reproductive and parental effort research to one theoretical lens, we limit our understanding of these processes. For this reason, we must consider the influence institutional intervention has on reproductive decision-making, all while considering the environments from which these women come.

Hypothesis 1

Although early risk was not a significant predictor for either of the models, it is widely accepted that risky environments during early life impact an individual's life history strategies later on (Belsky et al., 1991; Borgerhoff Mulder, 1992; Caudell & Quinlan, 2012; Draper and

Harpending, 1982; Ellis et al., 2009; Nettle 2010; Quinlan, 2007; Roff, 2002; Stearns, 1992; Trivers, 1972) as well as parental investment (Belsky et al., 1991; Borgerhoff Mulder, 1992; Chisholm, 1999; Draper & Harpending, 1982; Fouts & Silverman, 2015; Ellis, 2004; Ellis et al., 2009; 2012; Mittal & Griskevicius, 2014; Nettle, 2010; Quinlan, 2003; 2006; 2007). As I have previously noted, the Cronbach's alpha for early risk (0.6048) was lower than the generally accepted score (≥0.70). Because this project is more exploratory in nature (Hair et al., 2014), I stand by my choice to incorporate this composite variable. Furthermore, none of the LASSO-selected variables overlapped with this variable, thereby reducing the risk of multicollinearity. I will address the limitations of this hypothesis in the "Overall Limitations" section of this chapter.

Hypothesis 2

Neither a participant's nor her husband's education level displayed significant results in any of the models. Rather than treating education as one large variable for participants and their husbands, I decided to break them down. Part of the reasoning for this is due to the lower rates of participants who have had at least some secondary (14% of the population, n=63), college/vocational school (0.005%, n=2), or university (0.007%, n=3) experience. Regarding husbands' education data (n=406), more husbands had at least some college/vocational school (2.71%, n=11) experience, but none of them were reported as having attended university. By independently testing each category, I could better understand how parents' extra-somatic capital, in the form of education experience, influences their investments in their offspring's same-categorized capital.

In Chapter 7, the results for some of the education variables (participants' university level experience, husbands' college/vocation school experience, and husbands' university level

experience) are not present. The former two variables became outliers due to their few observations, while the latter had no observations. All three were automatically removed from their respective models and omitted from Chapter 7. Additionally, participants' marital status was included in the model, though like the education variables just discussed, it was removed during the analyses. With 93.36% of the sample reported as being married, this variable was collinear with the number of biological children enrolled in school and, thus, was automatically removed from the models.

Despite this hypothesis being unsupported, we know that individuals with higher levels of education are more likely to invest in their offspring's extrasomatic embodied capital (Hill and Kaplan, 1999; Kaplan, 1996; Kaplan and Lancaster, 2000). In understanding this within the context of Ethiopia, one must consider Ethiopia's education reform history and how that could potentially influence the sample population. In 1994, the Ethiopian government unveiled its "Education and Training Policy," which established the 8-2-2 framework for its primary (grades 1-4, 5-8) and secondary (grades 9-10, 11-12) education levels (Federal Democratic Republic Government of Ethiopia, 1994). From the newly created policy emerged the Education Sector Development Program (ESDP), which was a 20-year, four-phase implementation plan that began in 1997 (Joshi and Verspoor, 2013) and ran through the 2014-2015 academic year. When thinking about these details, I must also consider the participants within this context. The average age in this sample (N=437) is 30.55 years old (30.78 years in Arbegona, 30.29 years in Boricha). Grade 1 is technically compulsory and begins when an individual is seven years old. If a participant is around 28 years or younger (thus born in the 1990s), it is likely that she was attending school, or was intended to attend school, under the new educational framework. If we

consider individuals who are over 30 years (n=242), however, it is not entirely clear if her educational trajectory aligned with the country's reform plans.

In exploring this topic, I must also highlight gender parity and education in Ethiopia. Traditionally, it was more common for boys to attend school; however, Ethiopia's educational reformation has increase girls' enrollment (Joshi and Verspoor, 2013). Again, though, when considering this detail, we must also consider the women who were born before the national education restructuring was established or implemented. Their educational experience may not necessarily be comparable to younger participants (or their children) due to societal changes. Furthermore, poor, pastoral, and rural communities (such as those found in Arbegona and Boricha) are considered to be disadvantaged to due cost (though school is technically free, there may be additional school fees, uniform expenses, etc.), and may have limited access to education, particularly secondary schools in rural regions (Joshi and Verspoor, 2013). When considering the study sample, all these women come from rural pastoral communities, and may be poor. I will address the limitations of this hypothesis in the "Overall Limitations" section of this chapter.

Hypothesis 3

Individuals within the interpersonal level of SEM have been shown to impact reproductive decision-making. Ezenkawa and colleages (2020) found that poor parental communication and poor parental perceptions of sexual education can bar their adolescent daughters from utilizing contraceptive services in Nigeria. Furthermore, research shows social networks and support influence family planning behaviors (Agha, 2010; Behrman et al., 2002; Bongaarts and Watkins, 1996; Gayen and Raeside, 2010; Godley, 2001; Kar and Cumberland, 1984; Kar and Talbot, 1980; Kohler, 1997; Lowe and Moore, 2014; Montgomery and Casterline,

1996; Valente et al., 1997). Cross-culturally, positive spousal support and involvement increases women's contraceptive use and continuation (Bawah, 2002; Hartmann et al., 2012; Olaitan, 2011; Raine et al., 2010; Samandari et al., 2010; Sharan and Valente, 2002; Sternberg and Hubley, 2004; Terefe and Larson, 1993; Tuloro et al., 2006).

Initially, only statements regarding family members, i.e. "My family really tries to help me," and "I can talk about my problems with my family," displayed significant associations with current contraception use (p=0.02 and p=0.01, respectively). Closer inspections via a false discovery rate (FDR) approach, reveal these results are the consequence of a Type I error (Benjamini and Hochberg, 1995). The statement, "My family really tries to help me," displayed an FDR q-value of 0.40, while "I can talk about my problems with my family," displayed an FDR q-value of 0.32. These figures indicate that 40% and 32% of this analysis are false positives, respectively. The possibility of a Type I error is further supported by examining the results for, "My family is willing to help me make decisions," which was trending with a p-value of 0.08 but maintained a high q-value at 0.88, as well as the fact that the family subscale did not display a significant association (p=0.34, q=0.90). I will address the limitations of this hypothesis in the "Overall Limitations" section of this chapter.

Hypothesis 4

Participants' perceptions of the social support they receive did not display a significant association with the number of their biological children who are enrolled in school. One will notice that the output in Table 7.25 is the same for both the negative binomial and Poisson regressions. These similarities are likely due to similarities in the analyses' techniques. Essentially, a negative binomial regression can be viewed as a, "generalization of Poisson regression since it has the same mean structure as Poisson regression," but with an ability to

account for overdispersion (Negative Binomial Regression, n.d.). In R, both analyses' codes contained "poisson" as the underlying distribution. I will address the limitations of this hypothesis in the "Overall Limitations" section of this chapter.

Hypothesis 5

Though this hypothesis is technically unsupported, part of its prediction garnered a significant association. Women with greater interactions with HEW were more likely to be using contraception than women with fewer interactions. Both the negative binomial model and logistic regression model yielded significant results (Tables 7.27 and 7.28, respectively), and both maintained an FDR *q*-value of 0.02 (Table 7.26), thereby indicating that a Type I error has not taken place. With the intensive amount of intervention and outreach conducted by the Ethiopian government, this association is not a surprise. Ethiopia is at the tail end of its National Reproductive Health Strategy which runs from 2016-2020. A goal of said program is to decrease unmet family planning need, increase contraception prevalence rates, and reduce the country's total fertility rate to 3 children per woman (FDRE MOH, 2016). It is too early to analyze the program's effectiveness; however, these results could be associated with the Ministry of Health's on-going efforts.

Ezenwaka and colleagues (2020) found that healthcare agents' unwelcoming/judgmental attitudes, and patients' lack of privacy and confidentiality prevented teenage girls from utilizing contraceptive services in Nigeria. Hypothesis 5 sheds light on the relationship between health agents and contraception use amongst participating Sidama women. It appears that the Health Extension Program may be having the effects the Ethiopian government intended. HEW are meant to be mobile health agents and HEP are usually situated within a reasonable distance in their respective areas, which consequently could be why the distance to a health center was not a

significant predictor of contraception use. For many rural women, the HEP is their first stop when seeking external help, and communities trust their respective HEW. As part of their duties, HEW promote hormonal contraception and can be more successful in convincing reluctant husbands to discuss and implement family planning. Furthermore, should a woman decide to use contraception without her husband's knowledge, HEW provide her with options that will best conceal her secret, and take her privacy seriously. Overall, the community level of the SEM is positively influencing health behaviors (McLeroy et al., 1988; Stokols, 1996), and HEW play an integral role in women's contracepting behaviors.

In observing Tables 7.27 and 7.28, one will notice that marital status was significantly associated with contraception use. This result is likely do to Ethiopian social norms. Though family planning is not usually stigmatized, there is a caveat to its use. Amongst the Sidama, it is socially unacceptable for single, unmarried women to use contraception. The reason behind this is that hormonal contraception is typically only viewed to be a pregnancy prevention tool, rather than a multipurpose medication. For that reason, marital status is going to be highly correlated with contraception use.

One will notice that some predictors in this analysis are significant, though they were not significant in the negative binomial regression (Table 7.27). Individuals with greater sized households, more children enrolled in school, childhood experiences of food shortage, maize crops, and/or who in Boricha were more likely to be using contraception. Meanwhile, an individual who has had at least one marriage, lost a parent as a child, had a family member participate in armed conflict during childhood, feels their family is willing to help them make decisions, and has enset crops were less likely to be using contraception. Though these results are interesting, they should not be necessarily be viewed as absolute associations. The LASSO-

selected variables were strategically incorporated to optimize my model and solely focus on the influence of HEW on contraception use. Furthermore, in Hypothesis 3, I confirmed that though "My family is willing to help me make decisions" was not associated with contraception use and, though it was trending towards significance, it maintained a high FDR value. Therefore, one must exercise caution in interpreting the results specifically for non-HEW predictors in this model. I will discuss the limitations of this hypothesis and its analyses in the "Overall Limitations" section that follows.

Overall Limitations

In discussing this research, it is imperative to talk about its limitations. Though this project is hypotheses-driven, it should be viewed as exploratory in nature, rather than a predictive assessment. This component of the project analysis was intentional due to skewness and multicollinearity. Much of the demographic data are skewed, though this is not a surprise. Sidama women generally marry earlier in life, and thus, most of the women to whom we spoke were married. These interviews were highly structured, leaving little room for open-ended responses. This was a deliberate choice to facilitate cost-effective, rapid data collection. The trade-off, however, is losing some of data, e.g. emic perspectives to contextualize behavior motivations due to incomplete responses and/or responses left blank. Additionally, participants were interviewed opportunistically, rather than being recruited via randomized sampling. Both Arbegona and Boricha are vast *woredas*, and due to time and budgetary constraints, my goal was to achieve a high sample size to help reduce sampling error. Adding to this, civil unrest was taking place in Boricha during the data collection period, thereby complicating sampling and data collection. Lastly, due to time and budgetary constraints, I did not conduct extensive participant observation in either of these *woredas*. Because of the nature of my data limitations, I

decided to treat the entire sample as one population rather than a comparative analysis between the *woredas*. By doing this, I maintained greater power in my statistical analyses.

Widespread, consistent school attendance/completion is not the norm in Ethiopia. For example, 65% of children in primary school age attend school, though this figure drops to 15% at the secondary level (CSAE, 2014). It is important to note that enrollment and consistent attendance are not synonymous, and therefore should be explored independently to gain more a well-rounded understanding. Data regarding participant's children's average school attendance per week was unusable due to missing data and incorrectly reported data, e.g. babies being reported as attending school. These data are necessary to understand parental investment towards education.

Education as a form of embodied capital may be difficult to solely evaluate in rural Ethiopia. Though Arbegona and Boricha display different degrees of risk that have clear consequences on their lives (Quinlan et al., 2015; 2016), I now argue that a question of this nature is better situated to compare rural and urban settings. When considering the study sample, participants come from rural pastoral communities, and may be poor. These categorizes put them in a structurally disadvantaged position. To understand what these populations need/want, and how they behave, we must compare them to other, potentially less disadvantaged, populations (individuals in urban communities, e.g. Hawassa). Across Ethiopia, urban populations display higher rates of education attainment than their rural counterparts. For example, 25% of urban women have no education, while the percentage of rural women with no education is over twice that rate (53%) (CSAE, 2014). In comparing these different environments, we may also be able to glean more from the impacts maternal perceptions of social support have on offspring educational outcomes.

Overall, understanding contraception use in a transitioning society is a complicated aim. Regarding the Sidama, part of this reason is because traditional Sidama culture values large families and specifically sons. Cultural beliefs drive couples' decisions when creating their families, and it is common for couples to continue having children until they reckon they have enough boys. In addition to local Sidama preferences and beliefs, however, couples must consider the advice and information conveyed by HEW and government programs. In considering the country as a whole, many Ethiopian women, not solely Sidama women, are likely to be changing their reproductive behaviors to follow program directives. This could explain how the country has reached a 41% contraception prevalence rate among married women (EPHI and ICF, 2019). Furthermore, in exploring reproductive health in rural areas, one needs to understand the sources of family planning information, as well as any potential influence/pressure under which a woman may be.

Though understanding women's perspectives about contraception and its use are essential, this research would greatly benefit by including the perspectives of husbands, mothers-in-law, and their respective health extension worker(s). Individuals in these three categories play a significant role in a Sidama woman's life, and therefore, to holistically understand her reproductive and investment decision-making process, we should incorporate them. Additionally, having their perspectives may also allow us to better contextualize and understand women' perceptions of social support. I did not target husbands two reasons: 1) Some women may be using hormonal contraception without their husband's knowledge. I decided that targeting women was the best course of action because I felt they could maintain their privacy better if only they participated. 2) Sidama gender norms make it challenging for female researchers and data collectors to discuss reproductive topics with male participants. Due to budgetary

constraints, I knew early on that I could not hire male data collectors, nor could I afford to include additional individuals, e.g. mothers-in-law, HEW. For these two reasons, I felt it best to solely focus on reproductively-aged women.

Since family planning recommendations are shared from a top-down approach, this leads one to wonder how much of contraception use is driven by personal desires and how much of it is driven by government mandates. Greater exposure to HEW increased the likelihood that a participant was using contraception at the time of the survey, so there is a connection between exposure and uptake. This, however, needs further exploration to better understand the nature of HEW's influence on reproductive decision-making. Like education, contraception use and parental investment should be investigated in a rural-versus-urban framework. This will allow for varying degrees of risk to be incorporated, while also observing/controlling for infrastructural differences and external pressure that families may be experiencing.

Conclusion

Due to the extensive amount of education and reproductive health intervention and outreach programs in Ethiopia, these topics are somewhat of a challenge to study in a conventional, single theory-driven manner. Though this project does not support my hypotheses, I argue that the combined theoretical framework (LHT, ECT, and SET) I applied to this region is novel and could have positive implications for public health initiatives. Though the development-driven research that dominates Ethiopian reproductive explorations is vital, it typically ignores multiple sources of environmental stimuli that influence women's lives. The study participants are independent agents who make their own choices and decisions; however, they are also navigating the world via the programs and systems established by the Ethiopian government to facilitate modernization and better health outcomes. The government's attempts for modernized development (which can be measured via SET/SEM) make Ethiopia is the

perfect hub to understand embodied capital investments (indicating the need for ECT) in the face of risky environments (as considered by LHT).

Future research goals aim to improve this study, in terms of its employed methodology and targeted populations (i.e. rural and urban), as well as capturing the perspectives of influential individuals in a woman's life, e.g. husbands, in-laws, and healthcare agents. Currently, this project is not equipped to make concrete cause-and-effect predictions or statements the relationship between contraception use and embodied capital investment. Regardless, more research is needed to understand how risk, embodied capital, perceptions of social support, and family planning combine to assist humans in raising children.

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