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Community Factors Influencing Birth Spacing among Married Women in Uganda and Zimbabwe

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Community Factors Influencing Birth Spacing among Married Women in Uganda and Zimbabwe

By

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Bachelor of Arts

The George Washington University

2011

Thesis Committee Chair: Rob Stephenson, PhD

An abstract of

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Abstract

Community Factors Influencing Birth Spacing among Married Women in Uganda and Zimbabwe

By Courtney McGuire

Sub-optimal birth spacing continues to be a problem in Uganda and Zimbabwe, resulting in negative infant, child, and maternal health outcomes. This study investigates community-level influences on birth spacing outcomes among women aged 15-49 in Uganda and Zimbabwe. The data used in this analysis were from nationally representative Demographic and Health Surveys conducted in 2011 (Uganda) and 2010-2011 (Zimbabwe). The analysis builds upon previous research that moves beyond individual and household variables to examine community-level influences on reproductive health outcomes. Women living in communities with higher maternal age, age at marriage, and parity were significantly more likely to have longer birth spacing. High community levels of contraceptive use and low levels of unmet need were associated with optimal birth spacing. The significance of community-level demographic and fertility norms, gender norms, economic prosperity, and family planning behaviors demonstrate the broad influence of community variables on birth spacing outcomes. This analysis highlights the importance of moving beyond individual and household-level interventions in order to harness the power of contextual influences on birth spacing.

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CHAPTER 1: INTRODUCTION

The length of time between births has wide implications for the health of both mother and child. These impacts are heightened in resource poor countries that are facing high fertility rates and under-five mortality rates. Ensuring that women are able to adequately space their births is an integral part of achieving a wide variety of development goals, including female empowerment, maternal and child health, and economic growth. Understanding the individual, household, and community-level factors that influence birth intervals will allow health organizations and governments to design and implement effective reproductive health programs that incorporate birth spacing recommendations.

Achieving the Millennium Development Goals

The Millennium Development Goals (MDGs) are 8 targets that were developed from the United Nations Millennium Declaration, which was signed by 189 countries in September 2000. The goals set out a broad and aggressive development strategy to combat poverty, illiteracy, preventable deaths, environmental degradation, and gender discrimination. MDG 4 set a target to reduce under-five mortality rates by two-thirds between 1990 and 2015. The annual rate of reduction has increased from 1.2% in 1990-1995 to 3.9% in 2005-2012[1]. If under-five mortality rates continue to decline at the same pace of 3.9%, then MDG 4 will not be achieved until 2028[1]. In the thirteen years between the original deadline and achieving MDG 4, 35 million children will die whose lives would have been saved if the deadline had been achieved in 2015[1]. In 2013, only two regions, East Asia and Pacific, and Latin American and Caribbean, were on track to achieve MDG 4 by 2015. Only eight countries in sub-Saharan Africa are on track for the deadline[1]. Recognizing that the current trajectory was insufficient, Ray Chamber, the UN Special Envoy for Financing the Health Millennium Development Goals and For

Malaria, released a roadmap for achieving MDG 4 by 2015. One of the potential accelerants for MDG 4 was scaling up family planning to prevent high-risk pregnancies, including short birth intervals[2].

The World Health Organization recommends waiting at least 24 months after a live birth before attempting the next pregnancy in order to reduce negative health impacts of short birth intervals. Inadequately spaced births have numerous health impacts, including child mortality and morbidity as well as maternal morbidity [3-8]. Understanding the influences on poor birth spacing decisions and the detrimental health impacts will allow the international health community to achieve MDG 4 and ensure maternal and child health. This thesis explores community-level impacts on birth spacing in Zimbabwe and Uganda. These two countries were chosen because they offered two very different contexts of birth spacing and will allow an examination of whether community effects on birth spacing behavior differed in settings with high or low levels of optimal birth spacing behavior.

Inadequate birth spacing is directly linked to a woman's unmet need for family planning. The WHO defines unmet need for family planning as "women who are fecund and sexually active but are not using any method of contraception[9]." Unmet need is further broken into women who have an unmet need for spacing or delaying the next child, and those that have an unmet need for limiting and do not want any more children. Unmet need for contraceptives has been consistently high on the international development political agenda, beginning in 1994 with the International Conference on Population and Development where it was acknowledged that reproductive health is necessary for personal and international development. IPCD also established control over reproductive health as a fundamental right of all women and men. Millennium Development Goal 5, to improve maternal health, has set the target of achieving

universal access to reproductive health by 2015. Satisfying the unmet need for contraceptives is an integral part to reaching MDG 5, with estimates that universal contraceptives access would reduce maternal mortality by almost a third[10].

Unmet Need and Birth Spacing Issues

In 2011, one in three (34.3%) fertile and sexually active women in Uganda had an unmet need for spacing or limiting. Prevalence of unmet need is increasing among currently married women, all sexually active women and never-married sexually active women. There is a greater unmet need for spacing (21%) among Ugandan women than limiting (14%). An analysis of three DHS surveys from 1995-2006, found that even modest declines in unmet need and increases in contraceptive use would result in substantial decreases in total fertility rate (Figure 1). If unmet need declined by 50%, total fertility rate would decline from 5.2 children per woman to 4.0. A decline of just 20% would result in a total fertility rate of 4.7 children per woman[11].

Unlike Uganda, Zimbabwe has had historically higher contraceptive use and lower unmet need. Unmet need in Zimbabwe is 12.8%, with 7.3% of women having an unmet need for spacing and 5.5% having an unmet need for limiting in 2011[12]. Low unmet need has contributed to a low total fertility rate. Zimbabwe's total fertility rate, at 4.1 children per woman, is one of the lowest in sub-Saharan Africa. It has declined from 5.3 children per woman in 1988 to 3.8 in 2006, with a slight increase to 4.1 in 2011. If half of all women with an unmet need for spacing were to start using modern contraceptives then total fertility rate would decline to 3.4 children per woman[13].

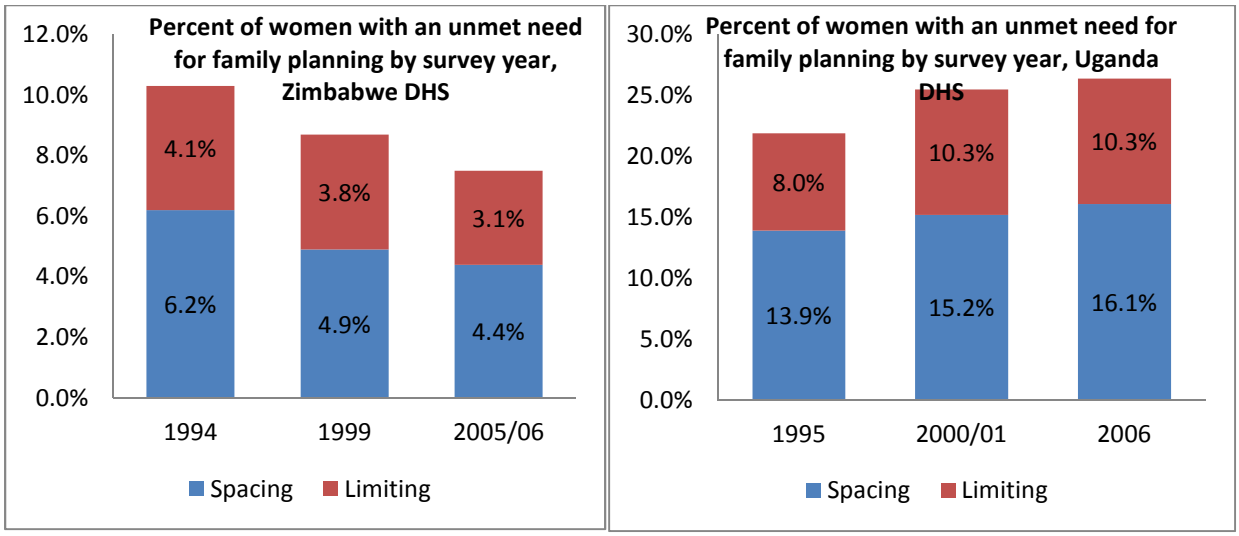

Figure 1

Women who have an unmet need for spacing and are not using contraceptives are at higher risk of having short birth intervals (<24 months). Birth intervals, the amount of time between two children's births, is an integral part of maternal and child health. There are a variety of social and biological reasons why women have short birth intervals. Women who are less educated, poorer, younger, and living in rural areas are more at risk for shorter birth intervals [14,15] [16] [17] [18]. Women who are less educated might have less reproductive health knowledge and access to family planning services. Rural locations limit access to health care services based on geographic proximity and availability. Additionally, women with less financial capabilities might not be able to access health care services and have additional pressures to have larger families to contribute to domestic chores and agricultural output.

According to a 2011 study of Demographic and Health Surveys (DHS) from 72 countries representing 371,768 birth intervals, the average birth interval is 32.1 months. An average of 31% of births occurs in the lowest risk birth interval of 36-59 months. None of the countries surveyed had more than half of births occurring in this interval. More than half (57%) of all births occur after an interval of less than 36 months with an additional 12% of births occurring

after more than 60 months. Trends have demonstrated an overall decrease in the proportion of births occurring after intervals of less than 36 months, with a decrease of about 7 percentage points per decade[19].

Ramifications of the Problem

The physical, social, and economic costs of inadequate birth spacing are widespread. Numerous studies have demonstrated the adverse health effects of short birth intervals for both babies and mothers. A systematic review of birth interval studies found that there was a substantially higher risk of dying in early childhood from intervals 36 months or less. The risk was higher for children born after intervals less than 18 months but was also elevated for birth intervals of 18-36 months compared to children born after 36 months[20]. In Uganda, the under-five mortality rate is 144 deaths per 1,000 live births for children born less than two years following the preceding birth. The infant mortality rate drops to 88 deaths per 1,000 live births for children born after two years (Figure 2). In addition to an increased risk of under-five mortality, short birth intervals are also associated with premature birth, low birth weight, and small-for-gestational age. Studies have also identified that children born after short intervals are less likely to utilize antenatal services [21] while longer birth intervals are associated with increased vaccination rates [22].

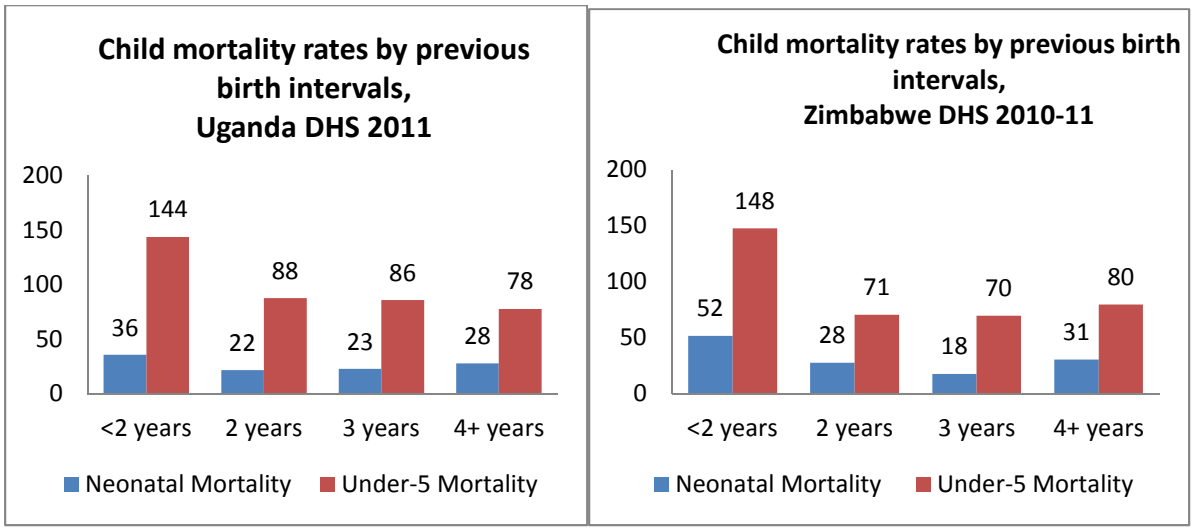

Figure 2

A systematic review of 55 studies found several adverse maternal health outcomes due to inadequate birth intervals. Long birth intervals, over five years, were associated with an increased risk of preeclampsia. Women with long birth intervals are also at increased risk for labor dystocia. Short birth intervals are associated with increased risk of uteroplacental bleeding disorders. There is also research suggesting a link between short birth intervals and maternal death and anemia [4].

Public Health Implications

Understanding the factors that contribute to inadequate birth spacing is an important step in designing effective interventions and policies to enable women to achieve optimal birth intervals. Ensuring women can achieve adequate birth spacing will have a direct impact on under-five mortality rates. In Kenya, if all women could achieve their preferred birth intervals then under-five mortality would decrease by 17%[23]. In low and middle income countries, ensuring that all women achieved birth intervals of at least two years would decrease infant mortality by 10% and under-five mortality by 21%[24].

In general, birth spacing recommendations have been considered the "invisible norm" since they have rarely been directly addressed. Few international organizations or governments have policies or programs specifically focused on birth spacing outcomes. A review by CATALYST Consortium, a USAID-funded group of reproductive health organizations focused on advancing birth spacing, found that out of over 1,000 abstracts from the health and development literature there were few programs addressing birth spacing. They found that birth spacing recommendations were commonly missing from reproductive health educational materials and provider manuals.

Figure 3

CATALYST Consortium ran from 2000-2005. CATALYST funded five meta-analyses and systematic reviews examining different factors contributing to birth spacing intervals and impacts of inadequate intervals. The outcomes of these projects spurred the technical consultation on birth spacing meeting that took place in Geneva from June 13-15, 2005. This meeting resulted in updated birth interval recommendations and renewed interest in how birth spacing contributes to maternal and child health worldwide. After the end of the CATALYST project, its goals were incorporated into the Extending Services Delivery (ESD) Project, which was funded by USAID from 2006-2011. ESD built upon CATALYST's extensive research to produce a toolkit and messaging documents to further incorporate birth spacing messaging into reproductive health activities (Figure 3).

Aims and Objectives:

Objective:

The primary aim of this study is to investigate the association between community-level factors and birth spacing intervals among married women aged 15-49 using nationally representative survey data from the Demographic and Health Surveys for Uganda (2011) and Zimbabwe (2010-2011). Birth spacing intervals are categorized according to research standards: < 24 months, 25-38 months, 39-59 months, and >60 months.

Aims:

- The analysis will investigate associations between individual and community-level variables that impact birth spacing intervals.
- The effects of four community domains will be studies: community demographics and fertility norms, community gender norms, community family planning behavior, and community economic prosperity.
- The findings of this study will contribute to the burgeoning literature on contextual influences on reproductive health outcomes. It will also contribute to the better understanding of factors that influence birth spacing outcomes.

Previous studies have focused on individual and household-level variables that influence birth spacing. This study will build upon that research by studying both individual and community-level variables. To our knowledge, no study examining contextual influences on birth spacing has been previously conducted. This study offers the opportunity to explore wider influences on birth spacing and offer insight on how causal pathways can be utilized to better support women achieving optimal birth spacing. This is vitally important in both Uganda and Zimbabwe, as these countries strike to lower under-five mortality rates to achieve MDG 4.

CHAPTER 2: MANUSCRIPT

Community Factors Influencing Birth Spacing among Married Women in Uganda and Zimbabwe

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Introduction

Millennium Development Goal 4 set a target for countries to reduce under-five mortality rates by two-thirds between 1990 and 2015[10]. The annual rate of reduction has increased from 1.2% in 1990-1995 to 3.9% in 2005-2012, but under-five mortality rates continue to decline at the same rate, then MDG 4 will not be achieved until 2028[1]. With under-five mortality rates decreasing faster in richer developing nations, sub-Saharan Africa and Southern Asia are representing an increasing proportion of deaths. In 2011, these two regions accounted for 83% of all under-five deaths globally. It is projected that, at current rates, only eight sub-Saharan African countries will achieve the MDG 4 target[25]. In order to achieve MDG 4 by 2015, under-five mortality reduction rates must quadruple in 2013-2015[1]. Increasing the proportion of women who are able to adequately space their births is an integral part of reducing under-five mortality rates to achieve MDG 4.

Numerous studies have demonstrated a close association between short birth spacing and under-five mortality [6,7,26-29]. A 2002 study of 456,889 pregnancies found that the neonatal death rate was 102% higher among children with birth intervals of 9-14 months and 27% higher among children with 15-20 months birth intervals compared to children born 27-32 months after the previous birth, as well as other health effects including low birth weight, pre-term birth, small-for-gestational age [5,6], and childhood stunting [30]. Closely spaced births are also associated with maternal morbidities, including uterine rupture and uteroplacental bleeding disorders [4]. According to a 2011 study of Demographic and Health Surveys (DHS) from 72 countries representing 371,768 birth intervals, an average of 31% of births occur in the lowest risk birth interval of 36-59 months. More than half (57%) of all births occur after an interval of less than 36 months with an additional 12% of births occurring after more than 60 months. The median birth interval is 32.1 months. Trends have demonstrated an overall decrease in the

proportion of births occurring after intervals of less than 36 months, with a decrease of about 7 percentage points per decade[19].

There is emerging evidence that birth intervals longer than 5 years are also associated with increased risks for the child, including preterm birth, low birth weight, small-for-gestational age [3,5,6,31] . An analysis of 66,759 pregnancies in Bangladesh found that birth intervals greater than 75 months had an increased risk of non-live-birth outcomes, but were still not as risky as short birth intervals less than 15 months [32]. Longer birth intervals are also associated with maternal morbidities including, preeclampsia [4], high blood pressure and edema [33].

Evidence suggests that ensuring women were able to achieve optimal birth spacing of 36-59 months would dramatically impact under-five mortality rates. Da Vanzo et al demonstrated that if all birth intervals were between 3-5 years long, then under-five mortality would drop by 8.7%[8]. Therefore there is a pressing need to better understand the factors that encourage women to achieve optimal birth spacing as a pathway to decreasing under-five mortality. Birth spacing has been shown to be driven by a wide range of individual-level biological and demographic factors. The length between births is directly influenced by a woman's contraceptive use [14,16,17,34,35]. Women who have access to modern contraceptives are able to control and plan the time between births. Lactational amenorrhea arising from exclusive breastfeeding also lengthens birth intervals [36] by preventing ovulation in the first six months after birth of the index child [37]. Previous studies have shown an association between short breastfeeding duration and shorter birth intervals[14]. This could be due to the difficulties of achieving exclusive breastfeeding necessary to stimulate lactational amenorrhea, as previous studies have shown that only 21% of women who believed they were utilizing the lactational amenorrhea method to prevent pregnancy were in fact using it correctly[38].

Numerous demographic factors have been shown to influence birth spacing. Higher maternal age is associated with longer birth intervals [14-17,39], due probably to older mothers being more likely to have achieved their desired family size or age-related reductions in fertility. Higher educational levels have been associated with shorter birth intervals in South Korea [40] but generally are associated with longer birth intervals[15-17,23,34]. This is perhaps due to women who have greater education also having greater access to health knowledge and reproductive health services. Studies have shown that women who live in rural areas have shorter birth intervals [23], perhaps due to a lack of access to reproductive health services or higher fertility norms that encourage large families with short birth spaces.

There have now been a number of studies examining the health impacts of sub-optimal birth spacing and looking at what factors impact a woman's ability to achieve optimal birth spacing. But these studies have been conducted only at the individual and household-level. There is increasing recognition of the importance of contextual influences on health outcomes. Studies have demonstrated the importance of place of residence on various sexual and reproductive health outcomes [18,41-47]. Studies have shown that communities with higher levels of education are associated with higher likelihood of premarital sex [41] but also are less likely to have risky sexual behaviors [45]. Community higher levels of education are also associated with lower pregnancy intention[18], lower birth rates [44], and greater contraceptive use [46]. This is perhaps due to increased access to reproductive health information and community educational and employment expectations that result in healthier reproductive health behaviors. Studies have demonstrated that women who live in wealthier communities use modern contraceptives [46], have decreased pregnancy intention [18], and are less likely to engage in premarital sex [41]. Wealthier communities might have social norms that place higher

emphasis on providing each child with health care and educational opportunities that encourage women to seek increased control over their reproductive intentions. Community access to health facilities has also been shown to increase contraceptive use [48] and prenatal and delivery services [49], perhaps due to greater physical access and increased exposure to health messaging.

While there are many studies on contextual influences on reproductive health choices, there are very few on community-level influences on birth intervals. Hung, et al analyzed DHS data from 11 sub-Saharan countries and found that community prevalence of intimate partner violence and sexual violence had a significant association with shorter birth intervals [50]. Women living in high IPV prevalence communities have experienced pervasive "everyday violence" that contributes to an acceptance of unequal power dynamics. This contributes to an erosion of women's self-efficacy and ability to control reproductive health outcomes. The limited number of studies on community-influences on birth intervals represents an important gap in the existing literature on birth spacing behaviors.

This paper examines the influence of community-level factors on birth spacing behavior in Uganda and Zimbabwe. By examining community demographics, economic prosperity, gender norms, and family planning behavior, this study seeks to understand how community norms impact birth intervals. Identifying community-level factors associated with birth spacing outcomes is critical to understanding how communities shape birth spacing decisions and how interventions aimed at adequate birth spacing to reduce under-five mortality rates can best target women within community environments.

Methods

Demographic and Health Surveys, Uganda and Zimbabwe

Data for this analysis was taken from the most recent Demographic and Health Survey (DHS) for Uganda (2011)[51] and Zimbabwe (2010-2011)[12]. Demographic and Health

surveys are nationally representative surveys of women aged 15-49, collecting data on recent sexual and reproductive health behaviors. In a 2011 analysis of the most recent DHS data for 70 countries, Zimbabwe was among the countries with the largest proportion of women (42.9%) reporting a birth space of 36-59 months between their most recent two births. Conversely, only 24.6% of women in Uganda reported a birth space of 36-59 months between their last two births[19]. Uganda and Zimbabwe were thus selected to represent two very different contexts of birth spacing, to allow an examination of whether community effects on birth spacing behavior differed in settings with high or low levels of optimal birth spacing behavior.

The DHS collect data from women 15-49 and men 15-54 years. The Women's Questionnaire collects data regarding demographic and socio-economic characteristics, birth and pregnancy history in the five years prior to the survey, fertility preferences, marriage and recent sexual activity, and self-reports of their husband's demographic and socioeconomic characteristics. DHS employ a two-stage sampling strategy, with households randomly selected within Primary Sampling Units (PSUs). Primary Sampling Units typically comprise 20-30 households. For Uganda, a representative sample of 404 PSU, 10,086 households and 9,247 women aged 15-49 was surveyed. For Zimbabwe, a representative sample of 406 PSU, 10,828 households and 9,831 women aged 15-49 was surveyed. The response rate was 94% for Uganda and 93% for Zimbabwe.

The DHS collects a full birth history covering the 5 years prior to the survey for all interviewed women, including the month and year of birth for each child, the survival status of each child, and the age of death (in days, months or years) for children that have died. The analysis considers two outcomes. The first is a continuous variable measuring the self-reported length of time in months between the most recent birth (index birth) and the previous birth. The

second outcome is a categorical variable measuring four types of birth spacing behavior: the number of months between the index birth and the previous birth is categorized as: <24 months, 25-38 months, 39-59 months, and >60 months). There is a plethora of studies that have demonstrated the negative health effects, for both mother and child, of extremely low birth intervals (<24 months) [5,6,29]. Birth intervals of <24 months are associated with higher neonatal and under-five mortality rates [27-29] and adverse perinatal outcomes [5,6]. In a 2005 review of DHS data, Rutstein demonstrated that the risk of neonatal mortality decreased with increasing birth intervals until 36 months [31]. Given this, the WHO updated their recommendations to suggest not attempting to conceive again until 24 months after the index birth[52].

There is recent evidence that birth intervals >60 months may also be associated with adverse maternal and infant health outcomes. Conde-Agudelo, et al showed that birth intervals >60 months were associated with an increased risk of preeclampsia [4] and increased risk of preterm birth, low birth weight, and small-for-gestational age [5]. Given this evidence, the categorical variable allows an investigation of how community effects may be associated with non-optimal birth spacing behaviors.

The original samples were 9,171 women in Zimbabwe and 8,674 women in Uganda. To identify community-level factors that influenced birth spacing, the samples were restricted to married women or women who were living with their partner. This excluded 3,593 women in Zimbabwe and 3,183 women in Uganda. A further 1,586 women in Zimbabwe and 1,076 women in Uganda were excluded because they did not have two or more children. The final sample included 3,992 women from Zimbabwe and 4,415 women from Uganda.

Measures of Community-Level Impact

The focus of this analysis is on the associations between community-level factors and

individual birth spacing behaviors. DHS do not collect community-level data, and we approximate community-level factors by aggregating individual level data to the community level. The community is represented by the PSU, a unit of approximately 30 households. For example, we approximate community levels of education by taking the mean of women with at least primary level education in the PSU. This method has been used extensively in the analysis of community effects on sexual and reproductive health outcomes and behaviors [18,41,42].

To our knowledge, no previous studies have examined how community-level factors shape individual birth spacing in resource poor settings. The choice of community variables included in the analysis is therefore guided by studies of community effects on other sexual and reproductive health outcomes (e.g. contraceptive use). We examine the following domains of community environments as potential influences on individual birth spacing behavior (Table 1).

Community Demographics and Fertility Norms

There is evidence that the demographic profile of the community in which a woman resides may influence her sexual and reproductive health[42,46,47] [43,53]. Previous studies have shown that living in communities with low mean age at marriage and low mean age at first childbirth may reduce a woman's use of contraception[47] and uptake of maternal health services[54]. It is hypothesized that young ages at marriage and first child birth are indicative of prevailing gender norms and opportunities for social capital for women. A young age at marriage or child birth may suggest that women's progress to womanhood is marked by expectations of early marriage and childbearing, and that there are fewer alternative opportunities – for example education or employment – available to women. Conversely, women residing in a community with a higher age at marriage or childbirth may be living in a community in which women have more social and economic opportunities [47]. Similarly, community demographic profiles indicative of fewer opportunities for women and social scripts that encourage early marriage and

childbearing may also lead women towards sub-optimal birth spacing by reducing their ability to seek care and their access to family planning services or by encouraging women to high fertility as a means of achieving social status or expectations. To measure demographic context we use the mean age at marriage, the mean age at first sex, the mean age at childbearing, and the mean ideal number of children.

Community Economic Prosperity

There is evidence that the socioeconomic status of the community in which a woman resides may affect her sexual and reproductive health [18,55-57]. Previous studies have demonstrated that higher socioeconomic status is associated with delayed onset of first marriage, sex, and childbirth[57] and with increased use of modern contraceptives[56]. Residing in a wealthier community may result in greater access to health knowledge, family planning and maternal health care services. To measure community economic prosperity, we use the mean wealth index factor score. This score includes information on household assets, services, and amenities.

Community Gender Norms

Previous students have shown that living in communities with higher education influence a woman's use of modern birth control[18,41,46] and have lower levels of fertility[44]. High levels of female education and employment may be indicative of greater options for social capital available to women within the community. Higher community levels of female employment and education may contribute to greater autonomy and its positive effect on reproductive health outcomes, such as utilizing pregnancy care services [58]. These may be communities in which the rights to education and employment for women are viewed as the same for men, and therefore have more progressive gender norms that more freely allow women to make reproductive health decisions. To measure community gender norms, we used ratio of

women to men with at least primary school education, rates of female employment in the previous 12 months, and violence justification. The violence justification index included questions of whether women felt a husband was justified in beating his wife in five situations, such as if she burns the food or neglects the children. Women who scored 5 on the index believed that husbands were justified in beating their wives in each scenario.

Community Family Planning Behavior

A woman's ability to access modern birth control and satisfy her need for spacing influence her reproductive health outcomes and may be indicative of the strength of the reproductive and health services available. High levels of unmet need, defined by the DHS as the percentage of women who do not want to become pregnancy but are not using contraception, might lead to lower birth intervals due to lack of access to information and contraception. Previous studies have shown that women who live in communities with family planning messaging, a marker of a successful reproductive health program, are four times as likely to be using a modern contraceptive method than those who are not exposed to family planning messages [43]. To measure community family planning behaviors, binary variables were created to reflect unmet need for spacing or limiting and use of modern birth control methods.

Individual Measures and Analysis

In addition to the community level variables, the analysis controlled for individual and household factors shown by previous studies to be associated with birth spacing behavior. For individual variables we controlled for maternal age (15-24, 25-29, 30-34, 35-39, 40-49), parity (2, 3-4, 5-6, 7+ children), age at marriage (5-14, 15-19, 20-39), and spousal age difference (20 years younger to 5 years older, 6 years older and above). We also controlled for current use of birth control (modern, no method/folkloric/traditional), women's and husband education (no education/primary, secondary/higher education). Individual variables relating to the index child

included the sex of the index child and if it was alive. At the household level we controlled for household wealth, measured by the wealth quintile. Analysis was conducted in STATA 12[59]. For the first outcome, the continuous measure of previous birth interval in months, a regression model was fitted. For the second outcome, the categorical variable of birth spaces, an ordered logistic model was fitted. Each model controlled for the sampling strategy used in the collected of the DHS data.

Results

Compared to women in Uganda, women in Zimbabwe reported higher levels of secondary or higher education (Zimbabwe 59.57%, Uganda 20.20%), and women in both countries reported that their husbands had higher levels of education, with 69.75% and 34.20% of men in Zimbabwe and Uganda achieving secondary or higher education.

Women in Zimbabwe reported a higher average age at marriage (19.0 years) compared to women in Uganda (17.5 years). Almost one-fourth of the Ugandan sample (18.4%) reported marrying between 4-14 years of age compared to only 7.2% of women in Zimbabwe (Table 2).

Fertility was higher in Uganda than in Zimbabwe, with total fertility rates of 6.2 children per woman in Uganda and 4.1 children in Zimbabwe. In Zimbabwe 22.54% of women had 5 or more children compared to 52.14% of women in Uganda. The median birth interval was 53.9 months in Zimbabwe and only 36.7 months in Uganda. Only 9.99% of the births in Zimbabwe followed a birth interval of less than 24 months compared to 27.5% of births in Uganda. One third of women in Zimbabwe (33.19%) achieved optimal birth spacing of 39-59 months compared to 19.41% of women in Uganda. In Zimbabwe, 33.9% of births were spaced greater than 60 months compared to 19.4% of births in Uganda.

The average age at first birth was higher in Zimbabwe (19.2 years) compared to women in Uganda (18.2 years). A greater proportion of women in Zimbabwe (63.2%) reported use of modern contraceptive methods than woman in Uganda (26.7%). Child mortality was also higher in Uganda, with under-five mortality of 84 deaths per 1,000 live births in Zimbabwe compared to 152 deaths per 1,000 live births in Uganda.

Table 3 shows the results of the linear regression model for the length of the preceding birth interval. Age had a significant positive association with the length of the preceding birth interval in both countries and among all ages. Relative to women who married aged 5-14, older age at marriage (20-39) was significantly negatively associated with the length of the preceding birth interval (Uganda: beta -7.55, SE 1.12, p=0.000; Zimbabwe: beta -5.35, SE 2.41, p=0.026). Parity was significantly negatively associated with the length of the preceding birth interval in both Uganda and Zimbabwe.

Women's education was significantly associated with the length of the preceding birth interval in Zimbabwe, with women reporting secondary or higher education reporting shorter birth intervals (beta -2.76, SE 1.38, p=0.046). Wealth was only significantly associated with the length of the preceding birth interval in Zimbabwe. Relative to the poorest quintile, the middle quintile had a significant positive association with the length of the preceding birth interval. Current use of a modern birth control method was significantly positively associated with the length of the previous birth interval in Zimbabwe (beta 6.63, SE 1.29, p=0.000).

Relative to a woman whose index child had survived, the mothers whose child had died reported significantly shorter preceding birth intervals (Zimbabwe: beta -5.04, SE 1.11, p=0.000; Uganda: beta -12.67, SE 2.18, p=0.000). Sex of the index child was not significantly associated with the length of the preceding birth interval in either country.

Community characteristics were only significantly associated with the length of the preceding birth interval in Uganda. In Uganda, living in a community with a higher mean age at first birth was significantly negatively associated with the length of the preceding birth interval (beta -1.26, SE 0.39, p=0.001). Living in a community with a higher mean age at first cohabitation in years was significantly positively associated with the length of the preceding birth interval (beta 1.13, SE 0.36, p=0.002). Community wealth index score was associated with birth intervals in Uganda (beta 0.00, SE 0.00, p=0.004).

Table 4 shows the results of the multinomial regression of lengths of previous birth interval. Age was significantly associated with longer birth intervals among women in Zimbabwe and Uganda. Relative to women aged 15-24, women older than 24 years in both countries were significantly more likely to report birth spacing greater than 39 months. Furthermore, relative to women aged 15-24 years, women 25 and above in Uganda were significantly less likely to report a birth less than 24 months Relative to women who married aged 5-14, women in Uganda who married aged 20-39 were significantly more likely to report a previous birth interval of less than 24 months than a birth interval of 25-38 months (RRR 1.47, 95% CI 1.11-1.93, p=0.007).

In Zimbabwe, compared to women who utilized no method, folkloric or traditional methods, women who utilized modern contraceptive methods were significantly more likely to have a birth interval greater than 60 months than a birth interval of 25-38 months (RRR2.00, 95% CI 1.50-2.66, p=0.000).

In Zimbabwe, parity was significantly associated with reporting a birth interval of 39-59 or 60+ months than a birth interval of 25-38 months. In Uganda, relative to women with two births, all women with more than two births were significantly more likely to report a birth

interval of 60+ months than a birth interval of 25-38 months. Relative to women whose first child was alive, women were more likely to have a birth interval of less than 24 months than of 25-38 months (Zimbabwe: RRR 4.39, 95% CI 2.80-6.88, p=0.000; Uganda: RRR 3.20, 95% CI 2.45-4.18, p=0.000).

In Uganda only, women residing in wealthier communities were more likely to report all birth intervals relative to birth intervals of 25-38 months. Zimbabwean women who resided in a community with greater justification for violence against women were more likely to report birth intervals of 39-59 months than 25-38 months (RRR 1.40, 95% CI 1.10-1.78, p=0.007).

Women living in communities in Uganda in which women reported wanting longer birth spaces, measured in months, were more likely to report birth intervals of 39-59 months than 25-38 months (RRR 0.99, 95% CI 0.98-1.00, p=0.016). Women living in communities in Zimbabwe in which there was a reported higher mean age at first birth in years were significantly more likely to report birth intervals of less than 24 months than 25-38 months (RRR 1.24, 95% CI 1.01-1.51, p=0.037). Ugandan women living in communities in which there was a higher reported mean age at first birth in years were significantly less likely to report a birth of greater than 60 months relative to 25-38 months (RRR 0.80, 95% CI 0.70-0.91, p=0.001).

Ugandan women in communities with lower levels of reported unmet need were significantly less likely to report birth intervals of less than 24 months than 25-38 months (RRR 0.32, 95% CI 0.18-0.55, p=0.000). Zimbabwean women residing in communities with higher levels of reported contraceptive use were significantly less likely to report birth intervals of less than 24 months than 25-38 months (RRR 0.28, 95% CI 0.08-0.94, p=0.039). Community-level

characteristics of education, age at first cohabitation and sex, women working, and ideal number of children were not significantly associated with birth intervals in Uganda or Zimbabwe.

Discussion:

The results presented here point to the different pathways through which the community environment may influence birth spacing behavior. Interestingly, the analysis found more significant community-level factors associated with birth spacing in Uganda than in Zimbabwe. Uganda overall has poorer economic, social, and reproductive health indicators than Zimbabwe, suggesting that community environments exert more of an influence on birth spacing behavior in poorer resource environments.

Several of the results found here point to the role of community-level gender norms in shaping birth spacing behavior. Women living in communities with higher age at marriage and higher age at first birth had shorter birth intervals, indicating that demographic patterns in which women marry and begin childbearing later do necessarily not result in healthy child spacing behaviors. Delayed marriage and childbirth may be indicative of more liberal community norms but subsequent short birth intervals are reflective of gender inequities that emphasize the importance of large family sizes. Elfstrom (2012) demonstrated an association between high community levels of delayed marriage and childbearing and decreased usage of modern contraceptive methods. Additionally, Upadhyay found that women in Cebu, Philippines reported that they had short birth intervals after delaying childbearing in order to "catch up" with their peers who had longer periods to plan their birth intervals. This community emphasis on achieving fertility expectations in a shorter amount of time may be the pathway to short birth intervals.

Women in Zimbabwe living in communities with higher violence justification rates were more likely to have optimal birth spacing intervals. This surprising result is consistent with Elfstrom's (2012) findings that women in Zimbabwe who reported higher levels of violence justification were more likely to use modern contraceptives. Both studies utilized cross-sectional DHS data and thus cannot draw conclusions on causality. This surprising result warrants further research: it is possible that higher levels of violence, as proxied by high levels of violence justification, may be discouraging women from childbearing.

The study's results point to the impact of living in a community with limited access to reproductive health services on achieving optimal birth intervals. Women living in communities with greater levels of unmet need for modern contraception and lower rates of contraceptive use are more likely to have shorter birth intervals, demonstrating an important synergy in reproductive health outcomes. Kaggwa et al (2008) showed that women living in Malian communities with high levels of exposure to family planning messaging were more likely to adopt modern contraceptives[43]. Similarly, Stephenson (2002) indicated that higher community-levels of health facilities resulted in increased contraceptive use and reproductive health seeking behaviors [48]. Communities without physical or financial access to reproductive health services are left without a crucial source of reproductive knowledge and care.

The significant association between the community-level variables and birth spacing outcomes in this study reflect the importance of studying communities' influence on women's birth intervals, and in sexual and reproductive health outcomes in general. There are a number of limitations to the current study, arising mainly from the community level variables used in the analysis. DHS does not collect community-level data. For this analysis, we aggregated individual data to create proxies for community-level variables. Many other studies have utilized

similar methodology[18,41-48,50,55,60,61], to establish associations between community level proxies and sexual and reproductive health outcomes. The lack of actual community level data is a limitation of the current, and highlights the need to collect data that measures community environments and can be linked to individual behavior. Since the data used were cross-sectional, it is not possible to draw conclusions regarding causality of the associations identified. Another limitation is the inability to control for the presence of reproductive health services within the community. Proxy measures were created based on community-level behaviors to approximate access to reproductive health services, but data on the actual presence and quality of health services would be more appropriate.

Conclusion:

This study is the first of its kind to investigate multiple community-level influences on birth spacing in two different resource-poor settings. The results add to a growing body of literature on the importance of moving beyond individual and household-level variables and exploring contextual influences on reproductive health. The findings highlight the community-level importance of maternal age, wealth, and contraceptive use on birth intervals. These findings support providing traditional reproductive health access but also encourage providers to be aware of community influences on birth spacing outcomes. They indicate important domains of community influence, such as gender norms and access to reproductive health care, which health organizations and governments should engage in to strengthen birth spacing outcomes.

Tables and Figures:

Table 1: Definition and Distribution of Community-Level Variables

		Zimbabwe	Uganda
Name	**Definition**	**Mean (Range)**	**Mean (Range)**
Community Unmet Need			
Unmet Need	Proportion of women in the PSU who currently report an unmet need for modern contraception for limiting or spacing.	0.14 (0-1)	0.34 (0-0.8)
Community Prosperity			
Wealth Index	Mean wealth index factor score reflects ownership of durable goods and housing characteristics, where positive and negative scores represent greater and lesser wealth, respectively.	32032.41 (-129435.7 - 298800)	-10700.04 (129435-298800)
Community Gender Norms			
Education Ratio	Ratio of women to men in the community with at least a primary school education, where 0=no and 1=yes. The proportion of women in the community with at least a primary school education was divided by the proportion of men with at least a primary school education to obtain a ratio.	0.99 (0.29-1.67)	0.89 (0-2.5)
Women Working	Proportion of women in the PSU who reporting working the previous twelve months.	0.44 (0-1)	0.82 (0.18-1)
Violence	A five-point scale of violence justification, where a higher score reflects a community's increased justification of a husband beating or hitting his wife.	0.82 (0-3.14)	1.52 (0-3.7)
Community Demographics and Fertility			
Ideal birthspacing	Mean preferred waiting time in months before the birth of another child by PSU	200.20 (107-210.5)	199.78 (107-210.5)
Ideal number of children	The mean ideal number of children	5.08 (2.8-11)	5.48 (2.8-11)
Age at first birth	The mean age at first birth of child by PSU	18.07 (15-24.4)	18.17 (15-24.4)
Age at first cohabitation	The mean age at start of first marriage or cohabitation by PSU	17.70 (13.54-25.25)	17.46 (13.53-25.25)
Age at first sex	The mean age of first sexual intercourse by PSU	16.23 (13.2-31.71)	16.27 (13.2-22.3)

Table 2: Distribution of Sample Characteristics of Women in Uganda and Zimbabwe

	Zimbabwe						**Uganda**					
			Birth Spacing						Birth Spacing			
	%	N	<24 months	25-38 months	39-59 moths	60+ months	%	N	<24 months	25-38 months	39-59 moths	60+ months
Age												
15-24	13.22	518	18.73*	40.93*	30.69*	9.65*	17.01	751	36.62*	46.60*	13.05*	3.73*
25-29	24.63	955	9.95*	25.60*	39.27*	25.18*	26.73	1,180	26.02*	47.37*	18.90*	7.71*
30-34	22.64	887	5.98*	18.26*	36.19*	39.57*	19.23	849	26.03*	41.22*	20.85*	11.90*
35-39	18.61	729	7.00*	16.60*	31.41*	44.99*	17.21	760	23.55*	40.39*	20.92*	15.13*
40-49	20.90	819	11.11*	18.80*	36.74*	43.35*	19.82	875	26.63*	33.03*	22.86*	17.49*
Women's Education												
No education/Primary	40.43	1,614	10.01	23.86	33.52	32.61	79.80	3,523	27.99*	43.68*	18.99*	9.34*
Secondary/Higher	59.57	2,378	9.84	22.30	33.27	34.59	20.20	892	25.67*	35.43*	21.08*	17.83*
Husband's Education												
No education/Primary	30.24	1,614	10.38	24.73	32.24	32.66	65.81	2,842	28.42*	43.91*	19.03*	8.65*
Secondary/Higher	69.75	2,733	9.70	22.06	33.85	34.39	34.20	1,477	25.73*	38.25*	20.18*	15.84*
Age at Marriage												
5-14	7.2	282	13.48*	19.15*	34.75*	32.62*	18.35	810	24.57*	41.85*	21.73*	11.85*
15-19	57.81	2,265	10.33*	24.15*	32.94*	32.58*	58.03	2,562	28.18*	43.36*	18.62*	9.84*
20-39	34.99	1,371	8.46*	21.52*	33.77*	36.25*	23.62	1,043	28.19*	38.83*	19.56*	13.42*
Spousal Age Difference												
20 years younger to 5 years older	51.61	2,022	10.19	22.75	32.59	34.47	52.66	2,325	27.61	43.23	18.97	10.19
6 years older and above	48.39	1,896	9.60	23.00	34.18	33.23	47.34	2,090	27.42	40.67	19.90	12.01
Parity												
2 children	35.55	1,393	9.19*	23.19*	37.04*	30.58*	17.44	770	30.00*	39.61*	17.14*	13.25*
3-4 children	41.91	1,642	8.83*	21.25*	32.22*	37.70*	30.42	1,343	26.28*	43.63*	18.76*	11.32*
5-6 children	15.85	621	11.76*	22.87*	31.08*	34.30*	23.01	1,016	25.69*	42.52*	18.90*	12.89*
7+ children	6.69	262	16.03*	31.30*	26.34*	36.34*	29.13	1,286	28.77*	41.37*	21.85*	8.01*
Current use of birth control by method type												
No method/Folkloric/Traditional	36.83	1,443	12.54*	26.33*	32.16*	28.97*	73.27	3,235	27.60*	42.81*	19.51*	10.08*
Modern Method	63.17	2,475	8.36*	20.85*	34.06*	36.73*	26.73	1,180	27.29*	39.83*	19.15*	13.73*
Sex of First Child												
Male	49.85	1,953	9.52	23.04	33.49	33.95	50.35	2,223	36.14	42.38	19.88	11.61

Female	50.15	1,965	10.28	22.70	33.23	33.79	49.65	2,192	28.92	41.65	18.93	10.49
Alive first child												
Yes	92.80	3,636	7.48*	22.94*	34.43*	35.15*	90.92	4,014	25.51*	43.72*	19.43*	11.34*
No	7.20	282	41.13*	21.99*	19.50*	17.38*	9.08	401	47.63*	24.94*	19.20*	8.23*
Wealth Quintiles												
Poorest	22.89	897	12.37*	28.54*	35.12*	23.97*	23.85	1,053	29.53*	47.58*	17.66*	5.22*
Poorer	19.73	773	10.61*	23.67*	33.12*	32.60*	19.09	843	25.74*	49.23*	16.96*	8.07*
Middle	17.71	694	9.37*	24.35*	35.45*	30.84*	17.46	771	30.35*	43.06*	17.77*	8.82*
Richer	20.75	813	7.87*	20.30*	32.72*	39.11*	17.01	751	25.97*	38.35*	21.70*	13.98*
Richest	18.91	741	8.91*	16.60*	30.23*	44.26*	22.58	997	25.88*	32.00*	22.87*	1926*

Table 3: Results of Linear Regression Regarding Birth Spacing Outcomes, Uganda and Zimbabwe, DHS

	Zimbabwe		Uganda	
Age	Beta coefficient (SE)	P value	Beta coefficient (SE)	P value
15-24 (ref)				
25-29	13.69 (2.02)*	0.000	8.21 (1.07)*	0.000
30-34	25.51 (2.20)*	0.000	16.47 (1.29)*	0.000
35-39	39.35 (2.43)*	0.000	22.42 (1.41)*	0.000
40-49	40.06 (2.51)*	0.000	26.16 (1.45)*	0.000
Women's Education				
No education/Primary (ref)				
Secondary/Higher	-2.76 (1.38)*	0.046	1.51 (0.99)	0.128
Husband's Education				
No education/Primary (ref)				
Secondary/Higher	-1.98 (1.43)	0.166	0.69 (0.64)	0.377
Age at Marriage				
5-14 (ref)				
15-19	-0.66 (2.24)	0.768	-4.32 (0.87)*	0.000
20-39	-5.35 (2.41)*	0.026	-7.55 (1.12)*	0.000
Spousal Age Difference				
20 years younger to 5 years older (ref)				
6 years older and above	-0.37 (1.17)	0.753	0.19 (0.64)	0.770
Parity				
2 children (ref)				
3-4 children	-7.11 (1.48)*	0.000	-5.23 (1.01)*	0.000
5-6 children	-20.00 (2.15)*	0.000	-10.44 (1.25)*	0.000
7+ children	-30.33 (2.89)*	0.000	-19.07 (1.40)*	0.000
Current use of birth control by method type				
No method/Folkloric/Traditional (ref)				
Modern Method	6.63 (1.29)*	0.000	-0.71 (0.80)	0.376
Sex of First Child				
Male (ref)				
Female	0.61 (1.15)	0.593	0.87 (0.63)	0.171
Alive first child				
Yes (ref)				
No	-12.67 (2.18)*	0.000	-5.04 (1.11)*	0.000
Wealth Quintiles				
Poorest (ref)				
Poorer	5.61 (1.85)*	0.003	-0.15 (1.03)	0.884
Middle	3.59 (1.93)	0.063	-1.07 (1.11)	0.336
Richer	4.75 (1.98)*	0.017	0.67 (1.19)	0.574
Richest	4.52 (2.18)*	0.039	-0.12 (1.58)	0.941
Community Level Variables				
Wealth Index	0.00 (0.00)	0.673	0.00 (0.00)*	0.004
Violence Justification Index	-0.81(1.15)	0.480	-0.87 (0.45)	0.052
Women working	-0.88 (2.65)	0.741	-1.36 (1.80)	0.450
Ideal birth spacing	-0.34 (0.04)	0.378	-0.05 (0.03)	0.073
Ideal number of children	0.22 (0.75)	0.770	-0.19 (0.38)	0.612
Age at first birth	0.44 (0.67)	0.511	-1.26 (0.39)*	0.001
Age at first sex	-0.33 (0.33)	0.314	-0.04 (0.31)	0.893

Age at first cohabitation	-0.42 (0.61)	0.485	1.13 (0.36)*	0.002
Unmet need	3.32 (6.02)	0.581	3.99 (2.29)	0.082
Birth control	3.43 (4.35)	0.431	-0.74 (2.55)	0.772
Ratio of education (women to men)	0.26 (6.55)	0.968	2.40 (1.45)	0.097

Table 4: Results of Multilinear Regression Regarding Birth Spacing Outcomes, Uganda DHS (2011) and Zimbabwe DHS (2010-2011)

	Zimbabwe						Uganda					
	<24 Months		39-59 months		>60 months		<24 Months		39-59 months		>60 months	
	RRR (95% CI)	P value	RRR (95% CI)	P value	RRR (95% CI)	P value	RRR (95% CI)	P value	RRR (95% CI)	P value	RRR (95% CI)	P value
Age												
15-24 (ref)												
25-29	0.62 (0.37-1.03)	0.066	2.59 (1.75-3.83)*	0.000	4.55 (2.79-7.43)*	0.000	0.65 (0.50-0.83)*	0.001	1.72 (1.26-2.33)*	0.001	3.18 (1.96-5.15)*	0.000
30-34	0.62 (0.33-1.14)	0.125	4.18 (2.64-6.63)*	0.000	13.53 (7.89-23.20)*	0.000	0.72 (0.53-0.99)*	0.045	2.43 (1.69-3.50)*	0.000	9.70 (5.76-16.33)*	0.000
35-39	0.60 (0.29-1.22)	0.156	5.19 (3.06-8.80)*	0.000	29.98 (14.90-48.84)*	0.000	0.65 (0.45-0.92)*	0.016	2.74 (1.84-4.08)*	0.000	19.07 (11.04-32.96)*	0.000
40-49	0.97 (0.47-2.01)	0.945	6.30 (3.59-11.06)*	0.000	37.95 (20.37-70.72)*	0.000	0.86 (0.60-1.25)	0.438	3.66 (2.42-5.53)*	0.000	35.56 (20.37-62.07)*	0.000
Women's Education												
No education/Primary (ref)												
Secondary/Higher	1.07 (0.72-1.59)	0.730	0.95 (0.711.27)	0.711	0.83 (0.61-1.12)	0.223	0.90 (0.71-1.15)	0.410	1.02 (0.78-1.34)	0.873	1.11 (0.80-1.53)	0.535
Husband's Education												
No education/Primary (ref)												
Secondary/Higher	1.23 (0.81-1.87)	0.324	1.02 (0.75-1.38)	0.920	0.97 (0.71-1.33)	0.854	0.91 (0.75-1.10)	0.319	0.95 (0.77-1.17)	0.601	1.16 (0.89-1.52)	0.260
Age at Marriage												

5-14 (ref)												
15-19	0.42 (0.23-0.79)*	0.007	0.52 (0.31-0.87)*	0.013	0.58 (0.34-0.99)*	0.046	1.20 (0.96-1.49)	0.103	0.79 (0.63-1.00)*	0.047	0.64 (0.47-0.87)*	0.004
20-39	0.40 (0.20-0.80)*	0.009	0.43 (0.25-0.74)*	0.002	0.39 (0.22-0.69)*	0.001	1.47 (1.11-1.93)*	0.007	0.73 (0.54-0.98)*	0.038	0.53 (0.36-0.77)*	0.001
Spousal Age Difference												
20 years younger to 5 years older (ref)												
6 years older and above	0.74 (0.53-1.05)	0.088	1.06 (0.83-1.36)	0.654	0.97 (0.75-1.26)	0.833	1.04 (0.89-1.21)	0.623	1.07 (0.90-1.28)	0.415	1.13 (0.90-1.41)	0.299
Parity												
2 children (ref)												
3-4 children	1.32 (0.84-2.09)	0.226	0.52 (0.38-0.72)*	0.000	0.51 (0.37-0.72)*	0.000	0.95 (0.74-1.21)	0.659	0.78 (0.59-1.04)	0.087	0.40 (0.28-0.57)*	0.000
5-6 children	1.53 (0.79-2.97)	0.211	0.30 (0.18-0.47)*	0.000	0.21 (0.13-0.33)*	0.000	1.05 (0.76-1.43)	0.775	0.63 (0.45-0.89)*	0.010	0.25 (0.17-0.38)*	0.000
7+ children	1.76 (0.78-3.98)	0.171	0.18 (0.10-0.34)*	0.000	0.08 (0.04-0.16)*	0.000	1.13 (0.79-1.61)*	0.505	0.60 (0.40-0.88)*	0.009	0.08 (0.05-0.13)*	0.000
Current use of birth control by method type												
No method/Folkloric/Traditional (ref)												
Modern Method	0.96 (0.67-1.38)	0.824	1.20 (0.92-1.58)	0.180	2.00 (1.50-2.66)*	0.000	1.05 (0.87-1.28)	0.605	0.88 (0.71-1.09)	0.241	1.01 (0.77-1.32)	0.955
Sex of First Child												
Male (ref)												
Female	0.89 (0.64-1.25)	0.501	1.08 (0.84-1.37)	0.550	1.16 (0.90-1.49)	0.240	0.91 (0.78-1.06)	0.240	1.05 (0.88-1.24)	0.590	1.08 (0.86-1.34)	0.504
Alive first child												
Yes (ref)												

No	4.39 (2.80-6.88)*	0.000	0.43 (0.26-0.73)*	0.002	0.44 (0.25-0.75)*	0.003	3.20 (2.45-4.18)*	0.000	1.69 (1.22-2.34)*	0.002	1.34 (0.86-2.08)	0.197
Wealth Quintiles												
Poorest (ref)												
Poorer	0.86 (0.51-1.46)	0.584	1.05 (0.72-1.54)	0.785	1.47 (0.98-2.20)	0.064	9.83 (0.65-1.06)	0.142	0.82 (0.62-1.08)	0.149	1.11 (0.73-1.69)	0.717
Middle	0.92 (0.53-1.60)	0.771	1.20 (0.80-1.79)	0.376	1.37 (0.90-2.10)	0.146	1.07 (0.83-1.40)	0.592	0.87 (0.64-1.17)	0.354	1.18 (0.77-1.82)	0.452
Richer	0.99 (0.56-1.74)	0.965	1.14 (0.76-1.73)	0.510	1.43 (0.93-2.20)	0.107	1.03 (0.77-1.37)	0.861	1.17 (0.85-1.59)	0.335	1.51 (0.97-2.33)	0.065
Richest	1.13 (0.60-2.10)	0.711	1.18 (0.74-1.89)	0.475	1.59 (0.98-2.58)	0.058	0.91 (0.62-1.35)	0.651	1.06 (0.70-1.60)	0.799	0.93 (0.53-1.63)	0.791
Community Level Variables												
Wealth Index	1.00 (1.00-1.00)	0.987	1.00 (1.00-1.00)	0.289	1.00 (1.00-1.00)	0.959	1.00 (1.00-1.00)*	0.007	1.00 (1.00-1.00)*	0.016	1.00 (1.00-1.00)*	0.000
Violence Justification Index	0.91 (0.65-1.28)	0.600	1.40 (1.10-1.78)*	0.007	1.07 (0.83-1.38)	0.622	0.99 (0.89-1.10)	0.865	0.95 (0.84-1.07)	0.364	0.91 (0.78-1.06)	0.232
Women working	1.29 (0.59-2.82)	0.527	0.81 (0.46-1.43)	0.471	1.00 (0.56-1.79)	0.993	0.85 (0.55-1.32)	0.468	0.73 (0.45-1.18)	0.201	0.66 (0.35-1.25)	0.203
Ideal birth spacing	0.99 (0.98-1.00)	0.213	1.01 (1.00-1.02)	0.120	1.00 (0.99-1.01)	0.688	1.00 (0.99-1.01)	0.827	0.99 (0.98-1.00)*	0.016	0.99 (0.99-1.00)	0.213
Ideal number of children	0.91 (0.73-1.14)	0.407	0.86 (0.87-1.16)	0.943	0.91 (0.77-1.07)	0.242	1.02 (0.93-1.12)	9.640	0.95 (0.86-1.05)	0.350	0.97 (0.84-1.12)	0.683
Age at first birth	1.24 (1.01-1.51)*	0.037	1.01 (0.87-1.16)	0.943	.08 (0.93-1.26)	0.301	0.94 (0.85-1.03)	0.181	0.93 (0.83-1.02)	0.160	0.80 (0.70-0.91)*	0.001
Age at first sex	0.96 (0.88-1.05)	0.402	0.98 (0.91-1.04)	0.469	0.94 (0.88-1.01)	0.119	0.97 (0.90-1.05)	0.469	1.01 (0.93-1.09)	0.837	1.02 (0.91-1.13)	0.771

Age at first cohabitation	0.88 (0.83-1.06)	0.165	1.09 (0.96-1.25)	0.174	0.96 (0.84-1.10)	0.604	1.00 (0.92-1.10)	0.969	1.02 (0.93-1.13)	0.682	1.06 (0.94-1.19)	0.381
Unmet need	0.42 (0.09-2.46)	0.368	0.87 (0.24-3.12)	0.831	0.84 (0.23-3.07)	0.787	0.32 (0.18-0.55)*	0.000	0.69 (0.37-1.28)	0.236	0.88 (0.39-2.00)	0.757
Birth control	0.28 (0.08-0.94)*	0.039	1.12 (0.44-2.84)	0.814	0.86 (0.33-2.22)	0.752	0.85 (0.45-1.58)	0.600	0.88 (0.45-1.74)	0.718	0.85 (0.36-2.03)	0.718
Ratio of education (women to men)	2.65 (0.46-15.41)	0.277	-0.65 (0.17-2.51)	0.530	0.82 (0.19-3.50)	0.794	0.78 (0.56-1.10)	0.157	0.98 (9.66-1.46)	0.936	1.65 (0.90-3.00)	0.103

CHAPTER 3: PUBLIC HEALTH IMPLICATIONS

Birth spacing recommendations have been considered the "invisible norm." There is wide agreement on the infant, child, and maternal health consequences of poor birth spacing. Yet, there has been little movement to incorporate the recommendations into interventions or government policies. The results of this analysis support a wide variety of recommendations, both at the intervention and research levels.

This study highlighted the importance of community-level variables on birth spacing outcomes. Reproductive health-focused organizations should utilize this analysis and the growing body of literature on community-level influences on reproductive health outcomes in order to support a more holistic intervention. These organizations will have a positive indirect impact on birth spacing outcomes by influencing community gender norms. Increasing women's empowerment within their households and communities through microcredit opportunities has been shown to have a positive impact on reproductive health outcomes. Buttenheim (2006) noted that microcredit program availability and participation increased a woman's ability to achieve her fertility preferences in regards to family size[62]. These programs have positive impacts by increasing the social networks and exchange of information among women within a community.

There is an inextricable connection between health problems and financial stability. Microcredit organizations are increasingly engaging in health services. A review of 89 geographically diverse microcredit organizations working in healthcare found that 80% engaged in health education[63]. Providing health education through microcredit staff members will minimize costs and yield further benefits from the already established personal relationship.

Microcredit meetings offer an established mechanism to encourage women to share birth spacing and reproductive health recommendations.

Paying bride price is a common practice in Uganda and Zimbabwe. Some husbands who have bride price believe they have absolute rights over their wives, which results a woman's diminished economic power and decision-making. The power dynamics are particularly evident in the impacts on a woman's ability to refuse sex and control her reproductive health outcomes[64]. Organizations working in Ugandan and Zimbabwean communities that traditionally value bride price should work to shift gender norms and expectations around marriage. Encouraging female empowerment from the beginning of a marriage might have positive results on reproductive health outcomes and a woman's ability to achieve optimal birth spacing.

Increasing community-level access to reproductive health services will have a direct benefit on birth spacing outcomes. Well-stocked family planning programs have a direct impact on reducing unmet need and increasing community contraceptive prevalence. Ensuring that women are able to physical and finally access reproductive health education and care will result in greater control over their reproductive health outcomes. Increasing hospital births will link women to family planning education and care and will impact birth spacing as women who have hospital births are more likely to achieve optimal birth spacing[15].

USAID's Extending Service Delivery (ESD) project is leading the efforts to operationalize the 2005 WHO birth spacing recommendations. The Healthy Timing and Spacing of Pregnancy (HTSP) intervention is working through the Champions Network to implement the CATALYST Consortium's research findings. HTSP currently advocates for governments to

implement policies to reap the benefits of positive family planning outcomes [65]. Government policies can have an indirect benefit on birth spacing outcomes by shifting community gender norms through increased female economic empowerment and education. This study's findings on the importance of shifting cultural norms and reproductive health opportunities demonstrate the immediate benefits to be reaped through expanding access through government policies. Speeding up and expanding the enactment of these policies will provide further benefits in the form of better birth spacing and subsequent maternal and child health outcomes.

This thesis utilized a proven methodology to demonstrate community-level impacts on birth spacing in Uganda and Zimbabwe. These countries were chosen to represent different experiences with birth spacing outcomes. Future research should expand on this study by applying the methodology to DHS data from different countries in sub-Saharan Africa and Southeast Asia. This will allow for a more detailed understanding and comparison of contextual influences in different settings. Additionally, analyzing multiple DHS surveys from one country would provide valuable information on the community's evolving impact on birth intervals. The open availability and consistency of the data ensures the feasibility of this future research.

This study adds to a growing literature on the importance of community-level variables for understanding health outcomes. The significant community-level variables impacting birth spacing should be further explored past the PSU methodology utilized for this study. Research should be undertaken at the community level to further investigate the causal pathways influencing birth spacing behaviors. This research will be better suited to inform evidence-based community interventions.

CHAPTER 4: REFERENCES

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