**ORIGINAL RESEARCH ARTICLE**

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

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## Abstract

Short 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, using Demographic and Health Surveys conducted in 2011 (Uganda) and 2010-2011 (Zimbabwe). Women living in communities with higher mean maternal age, mean age at marriage, and mean parity were significantly more likely to have longer birth spacing. Women living in communities with higher levels of contraceptive use and low levels of unmet contraceptive need were more likely to have short 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. *(Afr J Reprod Health 2013 (Special Edition); 19[1]: 14-24).*

**Keywords:** birth spacing, community, gender, social epidemiology

## Résumé

L'espacement des naissances court continue d'être un problème en Ouganda et au Zimbabwe, ce qui entraîne des conséquences négatives chez le nourrisson, l'enfant et la santé maternelle. Cette étude examine les influences au niveau communautaire sur les résultats d'espacement des naissances chez les femmes de 15-49 ans en Ouganda et au Zimbabwe, en utilisant les enquêtes démographiques et de santé menées en 2011 (Ouganda) et 2010-2011 (Zimbabwe). Les femmes vivant dans les communautés ayant un âge maternel moyen plus élevé, l'âge moyen au moment du mariage, la parité moyenne et étaient significativement plus susceptibles d'avoir de plus long espacement des naissances. Les femmes vivant dans les communautés avec des niveaux plus élevés d'utilisation de la contraception et de faibles niveaux de besoins non satisfaits en matière de contraception étaient plus susceptibles d'avoir des naissances rapprochées. L'importance des normes démographique et de fécondité au niveau communautaire, des normes des sexes, la prospérité économique, et les comportements de planification familiale indiquent la grande influence des variables de la communauté sur les résultats d'espacement des naissances. Cette analyse met en évidence l'importance d'aller au-delà des interventions individuelles et au niveau des ménages dans le but d'exploiter la puissance des influences contextuelles sur l'espacement des naissances. *(Afr J Reprod Health 2013 (Special Edition); 19[1]: 14-24).*

**Mots-clés**: espacement des naissances, communauté, sexe, épidémiologie sociale

## Introduction

Increasing the proportion of women who are able to adequately space their births is an integral part of reducing under-five mortality rates[1-6]. A 2002 global study of 456,889 pregnancies from low and middle income countries 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[7]. Short birth intervals (<24 months) have been linked to health effects including low birth weight, pre-term birth, small-for-gestational age[3-8], and childhood stunting[9], and maternal morbidities, including uterine rupture and utero-placental bleeding disorders[10]. A 2011 study of Demographic and Health Surveys (DHS) from 72 countries representing 371,768 birth intervals, showed that an average of only 31% of births

occur in the lowest risk birth interval of 36-59 months[11]. More than half (57%) of all births occur within an interval of less than 36 months with an additional 12% of births occurring more than 60 months[11].

There is increasing recognition of the importance of contextual influences on reproductive health outcomes[12-19]. Studies have shown residence in a community with higher levels of education is associated with higher likelihood of premarital sex[12] but a lower likelihood of risky sexual behaviors[17]. Community higher levels of education are also associated with lower demand for large families[13], lower birth rates[16], and greater contraceptive use[18]. This is perhaps due to increased access to reproductive health information in more educated communities, or the creation of alternative pathways to achieving social capital through education and employment that override the desire and expectation for large families. Studies have demonstrated that women who live in wealthier communities are more likely to use modern contraceptives[18], have lowered demand for large families[13], and are less likely to engage in premarital sex[12]. While there are many studies of contextual influences on reproductive health outcomes, there are very few that have specifically examined 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[21]. Women living in communities with high levels of intimate partner violence (IPV) have experienced pervasive "everyday violence" that contributes to acceptance of unequal power dynamics. This may contribute 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 behaviours. This paper examines the influence of community-level factors on birth spacing behaviour in Uganda and Zimbabwe, to inform the ways through which interventions aimed at improving birth spacing can best target women within community environments.

## Methods

Data for this analysis was taken from the most recent Demographic and Health Survey (DHS) for Uganda (2011) and Zimbabwe (2010-2011), available publicly from www.measuredhs.com. Data was downloaded in STATA format. 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[10]. Uganda and Zimbabwe were thus selected to represent two very different contexts of birth spacing.

The DHS collect data from women 15-49 and men 15-54 years. 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 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 reported being in a union with a man, regardless of cohabitation status (to allow the inclusion of partner characteristics). 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.

DHS do not collect community-level data, and we approximate community-level factors by aggregating individual level data to the PSU level. This method has been used extensively in the analysis of community effects on sexual and reproductive health outcomes and behaviors[12-14]. We examine the following domains of community environments as potential influences on birth spacing behaviour.

***Community Demographics and Fertility Norms***

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[18] and uptake of maternal health services[22]. 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[18]. Similarly, community demographic profiles indicative of fewer opportunities for women may also lead women towards short birth spacing by reducing their ability to seek care and access to family planning services or by encouraging women to high fertility as a means of achieving social expectations. To measure demographic context we use the community 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***

Previous studies have demonstrated that higher socioeconomic status is associated with delayed onset of first marriage, sex, and childbirth[24] and with increased use of modern contraceptives[23]. Residing in a wealthier community may result in greater access to health knowledge, family planning and maternal health care services. We measure community economic prosperity with the community mean wealth index factor score, a household level indicator of the ownership of household goods.

***Community Gender Norms***

Previous students have shown that living in communities with higher education influence a woman's use of modern birth control[12, 13, 18] and have lower levels of fertility[16]. Higher community levels of female employment and education may contribute to greater autonomy and its positive effect on reproductive health outcomes[25]. 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 in the community with at least primary school education, the percentage of women in each community who were employed in the previous 12 months, and the community mean violence justification score. 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 Behaviour***

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[15]. To measure community family planning behaviours, we use the percentage of women in the community with unmet need for spacing or limiting of births, the mean ideal birth space reported by women in the community, and the percentage of women in the community who are using modern contraceptive methods.

***Individual and Household Measures***

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 behaviour. 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 (less than 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[26]. Data were first cleaned, including checks for missing data and re-categorization of variables to create either categorical variables (transfer of continuous age at marriage into categories) or to reduce the number of categories (e.g. combining secondary and higher education into one category). 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 the number of months between the index birth and the previous birth, categorized as: <24 months, 25-38 months, 39-59 months, and >60 months). The reference category was taken as 25-38 months. The second stage of analysis involved bivariate analysis to test for significant associations between the measures of birth spacing and the individual, household and community variables. T-tests for variations in means were conducted to examine variations in birth spacing length across the variables. The third stage of analysis involved multivariate models. Two regression models were fitted. A linear regression model was fitted to the first outcome, the continuous measure of self-reported birth spacing. An ordered logistic model was fitted for the second outcome, the categorical variable measuring the length of the previous birth space. The same covariates were included in each model. Each model also controlled for the sampling strategy used in the collected of the DHS data (the survey strata, clustering and weighting). Interaction terms were tested between key covariates, but no significant interactions were found.

## Results

Community characteristics were only significantly associated with the length of the preceding birth interval in Uganda (Table 1). 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 1:** Linear Regression for Length of Preceding Birth Interval in Months

Figures shown are beta coefficients, standard error and associated P-Value.

| | **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 |

In Uganda only, women residing in wealthier communities were more likely to report all birth intervals relative to birth intervals of 25-38 months (Table 2). 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 (Relative Risk Ratio (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.

Individual and household factors found to be significantly associated with birth spacing behavior were generally in line with those identified in previous studies. 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 at less than 14, older age at marriage (20-39) was

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 associated with the length of the preceding birth interval in both Uganda and Zimbabwe. Relative to women whose first child was alive, women whose index child had died were more likely to have shorter birth spaces. There was evidence of an association between contraceptive use and birth spacing: 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). 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.

## *Discussion*

*The results point to the different pathways through which the community environment may influence birth spacing behaviour. Interestingly, the analysis found more significant community-level factors associated with birth spacing in Uganda than in Zimbabwe.*

Several of the results found here suggest 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 not necessarily 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. 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[27]. 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 (Table 2). 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[14]. 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 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 (Table 2), demonstrating an important synergy in reproductive health outcomes. Kaggwa et al. showed that women living in Malian communities with high levels of exposure to family planning messaging were more likely to adopt modern contraceptives[15]. Communities without physical or financial access to reproductive health services are left without a crucial source of reproductive knowledge and care, hence limiting options for family planning and increasing the likelihood of short birth spaces.

There are a number of limitations to the current study. 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[12-19] to establish associations between community level proxies and sexual and reproductive health outcomes. Since the data used were cross-sectional, it is not possible to draw conclusions regarding causality of the associations identified. Another limitation is the absence of data on the presence of reproductive health

services within the community. The results do not consider the availability or quality of sexual and reproductive health services in the community, although we use two proxies (mean unmet need for contraception and mean contraceptive use) as measures of likely exposure to sexual and reproductive health services.

**Table 2:** Ordinal Regression Model for Length of Preceding Birth Interval.

Outcome variable is: <24 months, 25-38 months (reference), 39-59 months, and > 60 months.
Figures presented are Relative Risk Ratio of birth interval category relative to 25-38 months, associated 95% Confidence Intervals, and P-values.

| | Zimbabwe | | | | | | Uganda | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **<24 Months RRR (95% CI)** | **P value** | **39-59 months RRR (95% CI)** | **P value** | **>60 months RRR (95% CI)** | **P value** | **<24 Months RRR (95% CI)** | **P value** | **39-59 months RRR (95% CI)** | **P value** | **>60 months 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 |

## 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 importance of the community demographic profile and related prevailing gender norms and expectations in shaping birth spacing behaviour. The results indicate the need to move beyond traditional individual and household level factors when designing interventions to improve birth spacing behaviour, and to consider the importance of the community environment as a target for intervention.

## Contribution of Authors

CM and RS conceptualized and designed the study. CM conducted the data analysis, with supervision from RS. CM and RS both contributed to the writing of the manuscript. CM and RS both approved the final content of the manuscript.

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