USING THE PROXIMATE DETERMINANTS OF FERTILITY AS A FRAMEWORK FOR EXAMINING THE RELATIONSHIP BETWEEN ARMED CONFLICT AND FERTILITY IN MYANMAR

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BACKGROUND ON CONFLICT AND FERTILITY

Conflict affects fertility through various pathways, but a clear effect has yet to be identified. Fertility has been shown to increase in Palestine during the first Intifada, possibly due to increased marriage [1]. In contrast, it has been observed that some couples consciously postpone childbearing during periods of conflict until they are in a more secure place, having either arrived in a safe environment or returned to normal life in their home area [2]. This, along with spousal separation, has been presented as a possible cause for fertility decline in Eritrea during the country's war with Ethiopia [3]. In Nepal, researchers observed different population responses to different types of conflict [4].

In this paper, we use Bongaarts' proximate determinants of fertility as a guide for exploring the means through which ongoing and prolonged armed conflict influence fertility. The proximate determinants of fertility provide tools for understanding a population's fertility behaviour [5-7], but may be influenced by outside factors, for example conflict [3]. This paper focuses on three of the four main proximate determinants of fertility, marriage, postpartum infecundity and contraceptive use, and expands on previous research into the effect of conflict on fertility by exploring how conflict and socioeconomic development interact.

Fertility may be affected by conflict and development status together or separately. For example, fertility may be higher for women in conflict areas due to the challenges they face accessing health services, like family planning. Additionally, the trauma and acute care demands in these areas limit their ability to provide preventative care [8]. Finally, governments may be less likely to invest in infrastructure development in areas with ongoing violence. For these reasons, education and wealth levels may be lower in areas of conflict, indirectly influencing fertility.

Considering how these mechanisms may interact to influence fertility, we suggest the following preliminary conceptual framework (Figure 1).

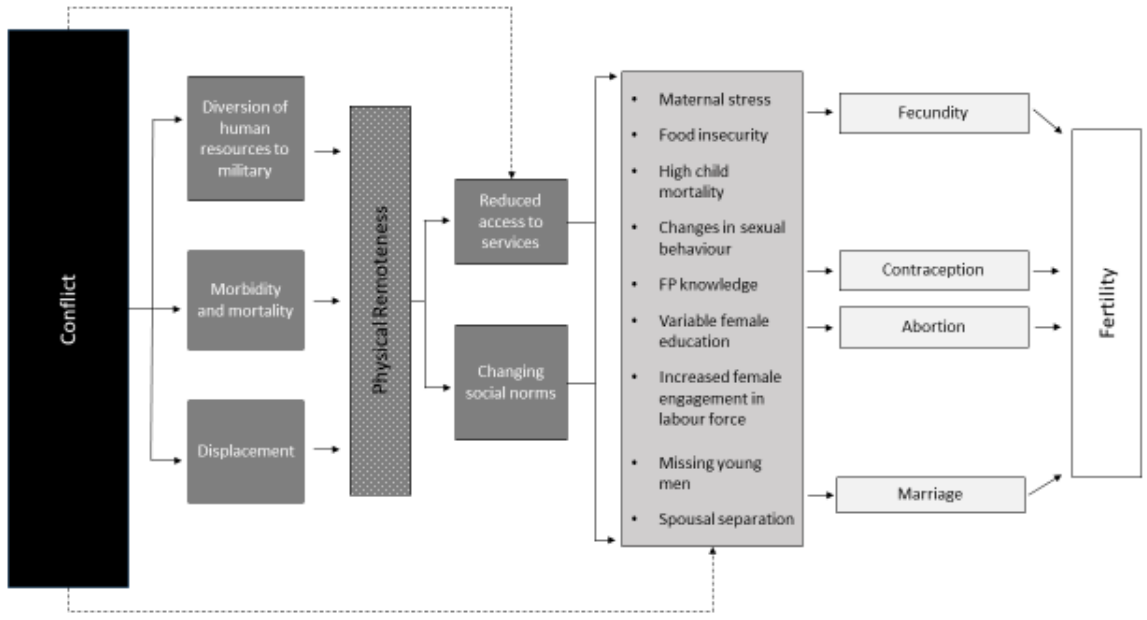

Figure 1. Preliminary conceptual framework

With this conceptual framework we suggest that areas with conflict may also be areas of lower socioeconomic development, possibly accounting for earlier ages of marriage and lower use of family planning among women living in areas with conflict. Through this, and subsequent, analysis we hope to begin to quantitatively demonstrate these relationships using data from Myanmar.

CONFLICT IN MYANMAR

Clashes between national and local leaders began almost immediately following Myanmar's independence in 1948. Ethnic Burmese, who made up the majority of the population and resided in the central, more economically stable plains, ran the government and were at odds with ethnic minority groups living in peripheral areas. The government legitimized this conflict through the *Pya Ley Pya (Four Cuts)* campaign, introduced in the 1960s, which divided the country into nine military zones in order to contest the network of insurgent groups [9]. The policy allowed insurgents, a term often applied liberally to all individuals living in a disputed zone, to be denied citizenship and subjected to state-sanctioned brutality and forced migration and labour, and live with limited access to essential supplies and medicines.

In the most contested areas, soldiers are further empowered to do harm, having the right to shoot opposition forces on site. This can lead to targeting of aid workers and medical personnel attempting to bring supplies to villages in disputed zones [8]. Armed conflict in Myanmar is further complicated by the rough terrain of the contested areas, which is most intense in areas with higher elevation [10]. The disruption caused by these actions has caused the internal displacement of up to 644,000 people in eastern Myanmar [11-12].

A 2012 ceasefire between the government and 10 of the 11 main insurgent groups in the east has led to reports of a fragile and gradual improvement in conditions in eastern Myanmar [9]. However, clashes have intensified and become the focus of international media in the west as more than 700,000 Rohingyas have fled across the border to Bangladesh since August 2017 [13].

METHODS

We use data from the Myanmar Demographic and Health Survey (DHS) [14] and the ACLED [15] to analyse relationships between residency in an area of conflict and fertility behaviour. ACLED collates conflict events from a variety of print and digital media sources into a single database for individual countries. Data are then categorized by event type, number of fatalities, participants, and other relevant characteristics.

For this analysis, we used ArcGIS to link geographic identifiers from the DHS and ACLED databases with Shapefiles from the Myanmar Information Management Unit [16]. To assess the effect of conflict on individuals, we established buffers of 10 kilometres around each DHS cluster before using ArcGIS's zonal statistics tool to count the number of conflict events and conflict-related deaths within each cluster buffer zone. From these data, we created a binary variable to indicate whether a woman included in the DHS database lived in an area (cluster buffer zone) that had experienced any instance of violence during the broad period of DHS data collection (for this analysis, January 2015-December 2016). We then merged these

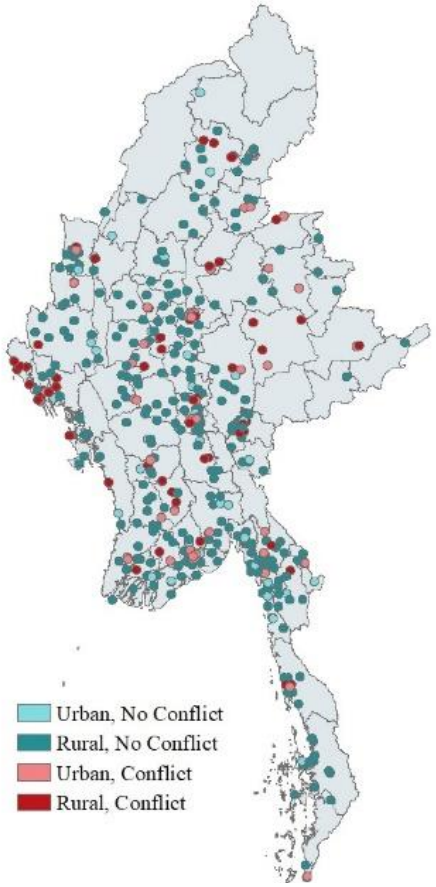

Figure 2. Distribution of conflict group clusters

measures of conflict exposure with the existing DHS database to explore differences between women living in areas with and without conflict. This expands on previously used methods, by considerer individual exposure to conflict rather than national level changes [3, 17] or differences in proxy variables [18].

Using these merged datasets, this paper presents age-specific fertility (ASFR) patterns estimated using birth history data from the DHS for four conflict exposure groups – unexposed urban women, exposed urban women, unexposed rural women, and exposed rural women (Figure 2) – based on the previously described conflict variable and the DHS "place of residence" variable. We then fit a Poisson regression to assess the effects of residency in a conflict area and urban/rural residency on fertility outcomes. We first compared the Poisson estimates for five-year age cohorts to those derived empirically using birth history data and found similar total fertility rates, confirming the appropriateness of the model for further assessment of these relationships. The final model predicted births in the last five years by conflict exposure and urban/rural residency, controlled for education status, state or region of residency, current age, and household access to a television. Finally, descriptive analysis compares the demographic characteristics of women living in areas with any conflict to those who lived without conflict during DHS implementation, with a focus on differences in the proximate determinants of fertility. We finish by highlighting areas of future study.

RESULTS

Respondent Characteristics

In all, 12,885 women were included in the analysis. Most, 64% (8,255 women), lived in areas without any conflict between 2015-2016. Women were split among the four conflict groups as follows: 7.7% (996 women) lived in urban areas without conflict, 56.3% lived in rural areas without conflict (7,259 women), 21.5% (2,772) lived in urban areas with conflict, and 14.4% (1,858) lived in rural areas with conflict. Women in conflict areas were slightly younger (32 in non-conflict areas compared to 31 in conflict areas, $p \leq 0.001$). This relationship seemed driven by age differences between rural women living in conflict (31.0 years) and conflict-free (31.9 years) clusters ($p=0. \leq 0.001$), as no age differences were found between urban women by conflict exposure ($p=0.056$).

Women living in conflict areas also had lower education (19.3% with no education in conflict areas, 10.6% non-conflict - Chi-sq. $p \leq 0.001$) and came from lower wealth quintiles (26.8% poorest quintile in conflict areas, 17.8% non-conflict - Chi-sq. $p \leq 0.001$). However, many of these differences were removed when rural and urban conflict groups were compared because women living in conflict zones were also more likely to live in rural areas (71.4% in conflict areas, 67.4% non-conflict – Chi-sq. $p \leq 0.001$). Once controlled for rural/urban differences, women living in urban areas experiencing conflict were actually better educated (25.1% with higher education) and more likely to belong to a higher wealth group (63.5%) than other urban women living in conflict-free areas (20.4% and 40.7%, respectively). Similar, though less striking, shifts were noted when comparing educational attainment across the four groups.

Fertility Trends

As Figure 3 shows, adolescent fertility was higher for women living in conflict areas for both urban and rural residents. However, overall fertility was higher for women living in areas without conflict, regardless of urban/rural residence. The difference was more pronounced in urban settings.

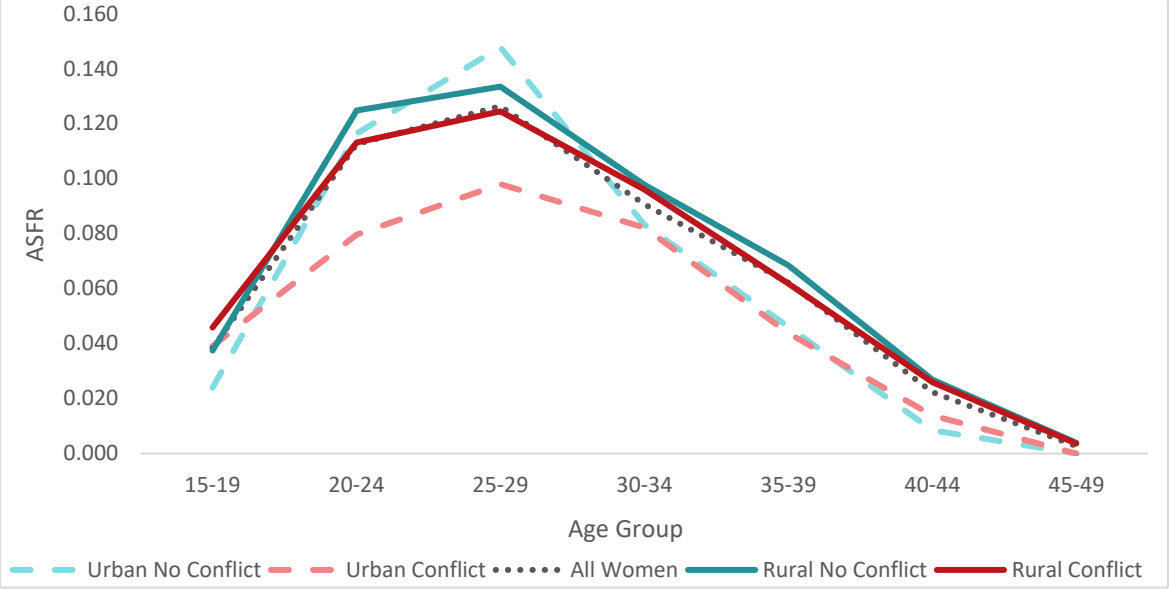

Figure 3. Age-Specific Fertility Rates by conflict group

Although ASFR estimates led to higher estimates of total fertility for women living in conflict-free areas of similar urban/rural residency, initial chi-squared tests showed that women living in conflict areas had more children on average than those living in areas with no conflict (3.0 in conflict areas, 2.6 non-conflict – t-test 95% CI: -0.559 - -0.336). Once controlled for urban-rural residency and other confounders, regression estimates found that residency in a conflict area was associated with lower recent fertility (Table 1).

*Table 1. Estimated relationships between fertility and select conflict and development indicators**

	Exp(B)	95% Wald Confidence Interval
Any conflict w/in 10km of cluster	0.907	0.841 – 0.978
Rural Residence	1.139	1.046 – 1.241
House does not have TV	1.305	1.224 – 1.392

* Model also includes respondent's state/region residency, education and current age.

Additional analysis of DHS birth history data suggest recent changes in fertility for younger women. In particular, women in the "urban, no conflict" group show increasing fertility beginning around 2005-2008 (Figure 4).

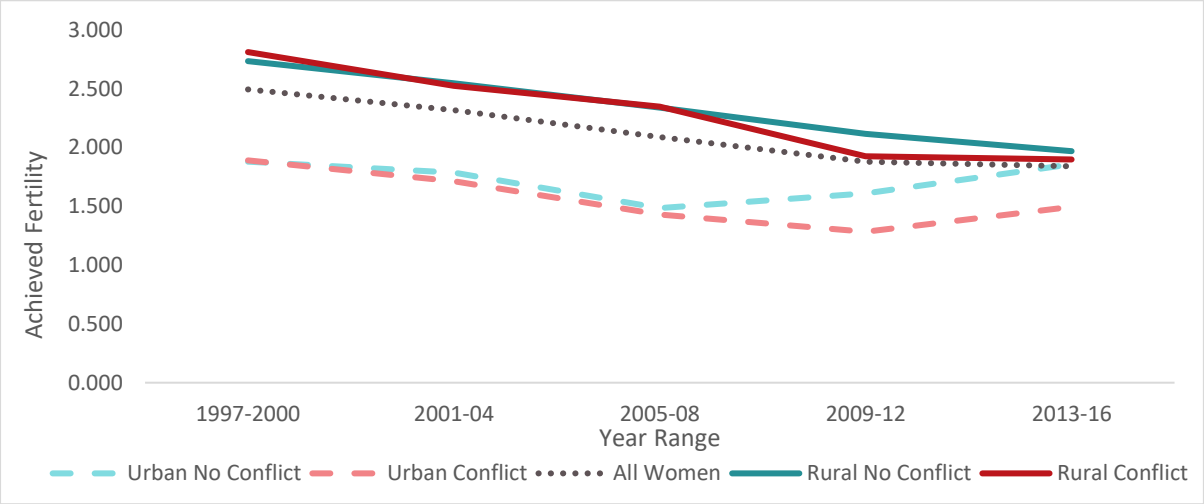

Figure 4. Trends in fertility by age 35 for conflict groups

SRH Behaviour Related to the Proximate Determinants of Fertility

We examined breastfeeding, postpartum amenorrhea and abstinence patterns among women who had given birth within the past twelve months (829 women). No differences were found in abstinence, but women in urban, conflict-free areas reported the shortest breastfeeding and postpartum amenorrhea periods (5.8 months and 2.6 months, respectively, compared to 6.1 and 3.8 months in rural, conflict-free areas).

We found a more clear difference between the percent of women using a modern method of family planning from 0-6 months postpartum (21.5% in conflict areas, 37.8% non-conflict - $p \leq 0.001$) and from 12 -23 months postpartum (44.1% in conflict areas, 60.6% non- conflict - $p \leq 0.001$). However, this relationship inverted once we controlled for urban/rural status (Figure 5), with more women in both urban and rural conflict areas using a modern method of family planning within the first year after childbirth. We did not observe differences between the groups regarding knowledge or current use of family planning among the overall sample.

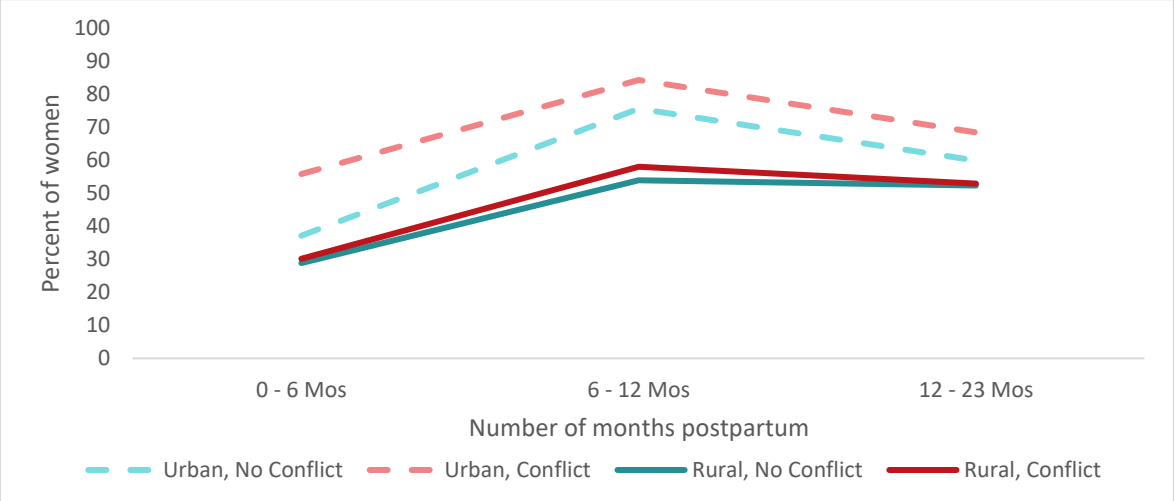

Figure 5. Percent of women using a modern method of family planning in the first year postpartum, by conflict group

Marriage patterns also appeared different for women living in areas that recently experienced conflict. Women from conflict areas were less likely to have ever married and married later (21.2 in conflict areas, 20.5 non-conflict F=47.2, p $p \leq 0.001$). This seemed driven by urban women living in conflict areas, who were least likely to marry (59.5%) compared to other groups (between 64.0% and 69.7% were married in the other three groups). Clear patterns in age at marriage were not found.

DISCUSSION AND NEXT STEPS

This paper introduces a conceptual model for considering how conflict and development collectively affect fertility using data from the Myanmar DHS and ACLED conflict event data. We first used birth history data from the Myanmar DHS to show that exposure to conflict of any type is associated with lower fertility regardless of urban/rural residency. Then, using our conceptual model as a guide, we explored the differences in the proximate determinants of fertility across four conflict groups. We found that there were few differences in the proximate determinants of fertility between groups, and that those differences were consistent with lower fertility amongst women exposed to conflict.

In our examination of the proximate determinants of fertility, we first considered the role of breastfeeding and postpartum amenorrhea. In general, we found few differences across the four conflict groups. However, women living in urban, conflict-free areas reported slightly shorter periods of both breastfeeding and amenorrhea. Additionally, compared to women living in similar types of clusters (urban/rural), women living in areas experiencing conflict were slightly more likely to be amenorrheaic. Little research exists on the effects of conflict on subfecundity, but analysis of vital statistics data and health records of Khmer refugees in Thailand found irregular menstruation and high

levels of amenorrhea amongst women entering the camps [19], and research points to a possible biological association between preconception stress and low fecundity [20].

Next we assessed differences in knowledge and use of family planning across the four groups. Surprisingly, we did not find differences in either family planning knowledge or use that could not be explained by differences in urban/rural residency. Women living in conflict areas were more likely to be using family planning than those in non-conflict areas 6-12 months postpartum, even in rural areas. This may be because of a strong non-profit presence in some areas with higher conflict. According to the "Who, What, Where" Project, which tracks donor assisted projects across Myanmar, nine international non-government organizations were providing reproductive health support across Kachin, Rakhine and northern Shan states in early 2019 [21]. In particular, Population Services International (PSI) Myanmar has been working in Myanmar since 2001, initiating and expanding a social franchising network of private sector clinics into nearly two-thirds of country's townships by 2014, which has been linked to an increased likelihood of modern family planning use among married women [22]. Projects like this one have increased access to family planning, even for women living in remote or conflict intense areas, and help explain why only small differences in family planning knowledge and use were observed.

Finally, we examined differences in marriage and partnership patterns. Previous researchers have highlighted delays in marriage, along with spousal separation, as a major cause of lower fertility during times of conflict. During the conflict between Ethiopia and Eritrea, Lindstrom and Berhanu found a negative relationship between nationwide conflict intensity and marital fertility in Ethiopia [17]. Fertility decline was also observed in Eritrea during this same conflict [3]. In both cases, delayed marriage and prolonged periods of spousal separation, either through military involvement or displacement, were identified as possible reasons for the decline. Examination of DHS data covering the period of the Rwandan Genocide found that women living in areas with greater levels of sibling deaths and under-five mortality married later and gave birth later than other women [18]. Although our analysis suggests a possible relationship between marriage and conflict, the differences appear to be driven by urban/rural residency, as women living in urban areas experiencing conflict were least likely to marry.

Although our exploration of differences in the proximate determinants of fertility found only suggestions of behavioural differences to explain lower fertility in areas of conflict, this analysis suggests that gaps may be widening. As Figure 4 shows, it appears that fertility among younger women living in urban areas which are not experiencing conflict has increased since around 2005-2008. This may be due to a possible decline in conflict events following the signing of new cease-fire agreements and the return to civilian rule in 2011. Prior to the early 2000s, when the number of conflict events began to decline across the country, it is reasonable to assume that the urban areas currently considered conflict-free were experiencing conflict as many are located outside of the major metropolitan areas of Yangon and Mandalay, serving instead as state capitals. If this is the case, then the recent increase in fertility among this group may indicate a fertility rebound, as has been noted in numerous other settings following the end of conflict exposure [23-24]. A more in-depth analysis of women living in these clusters may help to identify the factors not captured during this analysis that lower fertility during conflict in Myanmar.

However, despite the strengths of this analysis, there are limitations due to data availability. For example, although DHS sampling included areas experiencing conflict, five of the clusters are replacements for areas deemed too insecure to implement the survey [14]. Additionally, because we used a relatively small geographic buffer around clusters, some women may have been categorized incorrectly. This could have resulted due to cluster-specific geographic offsets used by the DHS to protect respondent identity, or errors in ACLED geolocation details, which may occur more frequently than errors in University of Uppsala data [25]. While these possibilities mean that some women may be misclassified, we believe that any misclassification would have small impact on the overall fit of the model. However, additional data exploration is required to confirm these assumptions.

Through our this analysis, we also begin to explore how different behaviour among women living in areas experiencing conflict may contribute to lower fertility amongst this group. However, the relatively small differences between groups suggest a need for additional research. This could include the expansion of the binary conflict variable to explore the differing effects of conflict on fertility based on the level or type of event, as has been done for national level conflict exposure in Nepal [4]. Additionally, researchers may wish to these methods to consider person period exposure to pregnancy and conflict.

Despite data concerns and the questions raised through the analysis of the proximate determinants of ferility, this analysis highlights the possibilities available for linking conflict event data to other survey data. We present an approach to linking individual level DHS data with ACLED data to adjust for cluster-level conflict exposure, and present results supporting a suppressive effect of conflict on recent fertility. Ultimately, the methods used in this analysis allow us to examine how micro-level exposure to conflict may affect fertility and supports a growing body of literature suggesting a suppressive effect of conflict on fertility.

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