Improving Maternal Health Care in a Post Conflict Setting: Evidence from Chittagong Hill Tracts of Bangladesh

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Abstract: *We evaluate a development programme with an important maternal health care component in the Chittagong Hill Tracts of Bangladesh. The region and its mostly indigenous people experienced violent conflict in the past and face a constant risk of recurring conflict. Given this fragile setting, our work differs from conventional impact evaluations by incorporating two conflict indicators: the household's actual experience of violence and fears of future violence. We find that the intervention undertaken by the United Nations Development Programme (UNDP) succeeded in boosting maternal health care utilisation: antenatal care (ANC) check-ups rose by 18 percentage points, while deliveries at health facilities increased by 23 percentage points. However, household experiences of violent conflict and perceptions of insecurity dampen maternal health care utilisation. Impacts on ANC check-ups are concentrated among households without experience of conflict (19 percentage points compared to 4 percentage points among households with such experience). And households without fears of violence see relatively larger impacts on deliveries at a health facility (37 percentage points compared to 11 percentage points). The programme is successful in raising maternal health care utilisation but its effectiveness has been constrained by the violence experienced and perceived by households. ----- 195 words*

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1   Introduction

The improvement of maternal health care facilities is of paramount importance in developing countries as stated in the sustainable development goal (SDG) 3. Each day approximately 830 women die worldwide from preventable causes related to pregnancy and childbirth, and 99% of these occurrences are in developing countries (WHO 2015, p.16).[1] The aim of this paper is to examine the effectiveness of a post conflict development programme in improving maternal health care utilisation in the Chittagong Hill Tracts (CHT), a region in Bangladesh inhabited by mostly indigenous people that experienced violent conflict during two decades starting in the late 1980s and that live in fear of recurring conflict. Our principal innovation lies in examining the psycho-social role of conflict itself in programme effectiveness.

The insurgency aimed at regional autonomy rather than independence, but the principal local grievance was against officially sponsored land grabbing by outsiders who pose a threat not only to local livelihoods, but also to a distinct way of life (Roy, 2000, p.18; Chakma, 2006; p.12). This insurgency officially ended with the signing of the CHT Peace Accord on 2 December 1997, which stipulated restitution of land and regional autonomy. But the accord has been incompletely implemented, and the United Peoples Democratic Front (UPDF) continues the struggle for full autonomy (Mohsin 2003, p.62). Land acquisition by the government for border security, and by the forest department seems to have intensified. Illegal attempts at land acquisition continue, resulting in arson, looting, ransacking, killing and violence against women (Indigenous World 2012, "pp. 336–343"; 2015, "pp. 314–320").

Although the CHT region is characterised by data paucity, as national level surveys are not carried out in the region, there is little doubt that it is relatively disadvantaged compared to the rest of Bangladesh in terms of socio-economic indicators, particularly amongst its indigenous peoples. The socio-economic baseline survey of CHT in 2008 used in this study suggests that

the large majority of the CHT population lives in poverty (86.1%) while the national poverty rate is 43.8% (Barkat et al. 2009, "pp.114-116").

Despite impressive successes in Bangladesh when it comes to reducing maternal mortality over the last two decades, there are growing inequalities between rural and urban areas, as well as between rich and poor households in health care service utilisation (Khan et al. 2011: 588; Pulok et al. 2015, "pp. 8-11"). The lack of doctors and other health personnel at the sub-district administrative levels of the CHT leads to poor service provision (GoB 2011, p.1; Tuhin 2015: "pp. 82–83", p. 98), and especially as far as the indigenous population is concerned (Islam 2010:1). According to the household survey, 18.3% of expectant mothers received ante-natal care (ANC), 12% of births were handled by a trained provider and only 4.2% of births occurred at a health facility. All these indicators at the national status are far better (Barkat et al. 2009, p. 129). Given these dire health access conditions, it is not surprising that indigenous people of CHT tend to rely on traditional healing practices (Tuhin 2015, p. 59, 63, 83).

The Chittagong Hill Tracts Development Facility (CHTDF) of the United Nations Development Programme (UNDP) operates a multi-sectoral programme aimed at improving living standards in the region. The programme works in a number of areas, including confidence building, economic opportunities, literacy and health conditions. Untill 2014, health interventions under CHTDF provided basic care services to roughly 2.5 million people cumulatively, treating 382,756 patients and ensuring safe birth deliveries across the most remote and disadvantaged communities in CHT (CHTDF 2014, "pp. 15–16"; Talukder 2014, p. 5).

We are evaluating this multi-faceted programme and we cannot claim to unpack or pinpoint the specific drivers of documented impacts. However, the programme had a strong focus on maternal health care, which as argued above was low relative to national averages. This motivated this paper and our choice of outcomes. As predicted by our theoretical framework,

the programme may increase maternal health care access through other channels including household income improvements. Indeed, related papers find that the programme increased household income by about 19.3% (Cunnington et al. 2014, p. 34). Further aims of the intervention such as improving literacy are unlikely to drive our results at least in the short term. That said, the external validity of our study is constrained by the multi-faceted approach of the programme and the special nature of the intervention area.

Our work differs from conventional impact evaluation studies in several ways. First, this study includes two types of post conflict risks – the household's prior experience of violence and subjective fears of future violence as key determinants of programme effectiveness, both of which can influence the household's psycho-social framing process about the potential benefit of the programme. Most recent studies, by contrast, when evaluating development projects in post conflict scenarios do not employ conflict as a key explanatory variable, rather treating it as a simple control variable (Bozzoli et al. 2013, p. 261). Secondly, studies examining the impact of conflict on maternal health care utilisation are characterized by their data paucity. Most of the other studies deal with the impact of conflict on various health outcomes, not health care utilisation *per se* (Camacho 2008, p. 511; Bundervoet et al. 2009, p. 536; Guerrero-Serdan 2009, p.1 for example). Thirdly, we make use of a unique dataset of two rounds of household surveys covering the most inaccessible and conflict ridden region of Bangladesh. Furthermore, we also explore equity aspects in health care utilisation from the perspective of inter-ethnic gaps, because the population of interest in this study includes a disadvantaged and marginalized ethnic minority.

We contribute to a growing literature on the impact of various types of programme interventions on maternal health care utilisation. Financial incentives in different forms (such as voucher schemes for pregnant women) are widely used to improve maternal health through increased use of health care services. Two different studies using data from a programme called

Maternal Health Voucher Scheme piloted in some districts of Bangladesh show an impressive improvement in maternal health care utilisation among the beneficiaries. The programme was also found to be equity enhancing as it bridged the gap between rich and poor households (Ahmed and Khan 2011, "pp 1706-1707"; Nguyen et al. 2012, p. 994). Ahmed and Khan (2011, p. 1705) used cross sectional data, while Nguyen et al. (2012, "pp. 990-991") used both cross sectional and panel data along with treatment and control design. Jackson and Hanson (2012, "pp. 271–272") examined the impact of a safe delivery incentive programme in Nepal, documenting positive effects on the utilisation of services. In the case of Kenya, findings suggest that there is an improvement in delivery at a facility after the implementation of the safe motherhood voucher programme (Obare et al. 2014, p. 183). Similar outcomes are found for three West African countries (Senegal, Mali, and Ghana), where community based health insurance played a significant role in increasing maternal health services (Smith and Sulzbach 2008, p. 2460). Finally, Rosas and Sabarwal (2016, "pp. 3-4") found positive impacts of a public works projects on various indicators of household welfare in post conflict Sierra Leone.

It is well documented that violence, including war, has substantial adverse effects on health as measured by mortality, malnutrition, disease and personal trauma (Altare and Guha-Sapir 2013, "pp.186–193"; Litchfield 2013, "pp. 155–158"). Micro-level studies using survey or census data mostly focus on the direct impact of violent conflict on mortality and fertility outcomes (Brück and Schindler 2009, p. 294). The long-and short-term impacts of armed conflict on infant mortality, child malnutrition, and maternal mortality are estimated and analysed in a host of studies (see Gates et al. 2012, p. 1713; Urdal and Che 2013, "pp. 492-497"; Grimard and Laszlo 2014, "pp. 139-140"). The adverse effects of armed conflict on child health in Burundi are estimated by Bundervoet et al. (2009, p. 536) combining both survey and event data. An investigation into the causal impact of conflict intensity on child health in Iraq reveals that children born in areas affected by high levels of violence are shorter than children

born in areas with low levels of conflict (Guerrero-Serdan 2009, "pp. 1–2"). A significant negative impact of stress shocks due to terrorist attacks on child birth weight in Colombia is established by Camacho (2008, p. 511). The Colombian study also looks at channels through which violence may have long-lasting and inter-generational effects on human capital accumulation.

The literature summarised above is innovative in ideas, rich in methodological rigour, quality of data, and geographical coverage. However, there are few studies dealing with the programme impact in *conjunction* with psycho-social factors engendered by the conflict, which is the subject of this paper.

The remainder of the paper is organized as follows: Section 2 briefly discusses the conflict in the CHT, as well as the nature of the CHTDF-UNDP programme. Our theoretical approach, the econometric strategy and details on the data including descriptive statistics are provided in Section 3. Our results are presented in Section 4, and Section 5 concludes.

2 Conflict in Chittagong Hill Tracts and the CHTDF programme

The CHT region of Bangladesh was mainly populated by ethnically distinct indigenous peoples prior to the mass settlement in the late 1970s of the Bengali speaking population who make up the overwhelming majority of Bangladeshis. Soon after the advent of Bangladesh in 1971, the political leadership of the CHT region demanded constitutional recognition of their ethnic identity. This was denied for the sake of greater national unity (see Barkat et al. 2009: 8; Badiuzzaman and Murshed 2015, p. 149).

Successive Bangladeshi governments adopted mixed strategies of using military force to combat rebellion and protest, while at the same time encouraging, or colluding with, a population transfer programme. In 1976 armed forces were deployed in CHT which triggered tensions in the region. A few indigenous political groups engaged in an armed struggle against

this intrusion. Under the counter-insurgency strategy, settling a large number of Bengali speaking households in CHT were seen as enhancing the size of the population loyal to the state, and these fresh settlements acted as a counterweight to indigenous peoples' demands for rights and regional autonomy. Although there are no official statistics, it is widely believed that about 400,000 people settlers entered this region, displacing indigenous households, which further intensified the armed struggle. Some 54,000 indigenous people took refuge in the neighbouring Tripura state of India, and another 50,000 indigenous people became internally displaced (Badiuzzaman and Murshed 2015, "pp.148–150").

The insurgency aimed at regional autonomy rather than independence, but the principal local grievance was against officially sponsored land grabbing by outsiders who pose a threat not only to local livelihoods, but also to a distinct way of life (Roy, 2000, p. 18; Chakma, 2006, p. 12). This insurgency officially ended with the signing of the CHT Peace Accord on 2 December 1997, which stipulated restitution of land and regional autonomy. But the accord has been incompletely implemented, and the United Peoples Democratic Front (UPDF) continues the struggle for full autonomy (Mohsin 2003, p. 62). Land acquisition by the government for border security, and by the forest department seems to have intensified. Illegal attempts at land acquisition continue, resulting in arson, looting, ransacking, killing and violence against women (Indigenous World 2012, "pp. 336–343"; 2015, "pp. 314–320").

With the signing of the peace accord in 1997, international and national development agencies along with non-governmental organizations (NGOs) commenced reconstruction and development work. The UNDP has been at the forefront of these efforts through its CHTDF since 2003. CHTDF is a multi-sectoral confidence building and overall development programme for all inhabitants in CHT, and is being executed through UNDP with a wide range of collaborating institutions. The CHTDF scaled up the programme with wider service and

regional coverage in 2005, and in the continued expansion of the programme, the whole of the CHT region was brought under implementation in 2013 (CHTDF 2013, "pp. 6-7").[2]

The CHTDF programme was rolled out in selected geographical units with universal targeting in those locations. The programme was not randomized. Instead discussions with the people involved in implementing the programme revealed that accessibility in terms of road communication facilities was the prime criterion in the selection of any particular location (upazila and village). Further, there was a top-down approach in selection of particular locations for programme intervention. For instance, in the CHT region there are three districts and a few sub-districts (upazilas) within each district. Under each upazila there are unions and each union has a number of villages (locally called *para*).

The programme components include: Policy Advocacy and Confidence Building, Capacity Development of CHT Institutions, Community Empowerment, Economic Development, Natural Resource Management, Agriculture Extension and Food Security, Education, Health, Gender and Local Peace Building, and Knowledge Management. CHTDF has engaged directly with 104,711 households out of 343,500; 3,257 Para Development Committees (PDC); as well as 1,685 Para Nari (women) Development Groups (PNDG), 300 CHTDF supported schools, 886 Community Health Service Workers (CHSW), 81 Community Skill Birth Attendants (CSBA), 80 Satellite Clinics, 1,750 Rice Banks, 690 Farmer Field Schools (FFS), 9 Market Infrastructure Facilities, and 25 Multipurpose Community Centers (Barkat et al, 2014, p. 17).

On the health side, the programme seeks to boost demand for quality health service including maternal health, safe home birth delivery, lowering the incidence of malaria, and other communicable diseases through immunisation (CHTDF 2013, "pp. 14-15"). The health project is designed in the spirit of a community based health initiative. Health interventions under the CHTDF programme have three major components: satellite/mobile clinics, referral services along with ambulance services, and community health service workers (CHSWs). The

satellite/mobile clinics visit a selected location every week on a given date. A token fee is retained which is used for the maintenance of the clinic. Awareness raising activities are organized by health educators (CHSWs), while patients are attended by doctors and other members of the clinic. In the case of more complicated health issues, there is a referral service to sub-district and district level government hospitals. There are also free or highly subsidized ambulance services (Sabina and Chakma 2015, "pp. 24-25").

The network of CHSWs and satellite clinics are the two principal health services available to the population of remote villages. The locally recruited CHSW is expected to provide improved health services to communities living in the remote villages (characterized by hilly terrain, scattered inhabitation and difficulties in communication). The CHSWs also participate in various grass-roots campaigns such as immunization, family planning, vitamin distribution, malaria prevention and so on, assisting government health workers in such activities. Additionally, health interventions provide infrastructure and logistical support to government health care facilities.

3   Methodology

3.1 Theoretical considerations in health care utilisation

This section conceptualizes the possible mechanisms through which the CHTDF programme may interact with the presence of post conflict violence and insecurity when it comes to health care utilisation. It will inform the subsequent empirical strategy in particular with regard to the impact of the programme intervention on maternal health care utilisation and its interaction with post-conflict risk.

We postulate that, on the one hand, the programme intervention is expected to improve health care utilisation, while on the other hand, violence and insecurity may reduce utilisation of

health care by households. We wish to focus on the impact of the programme from the perspective of demand-side incentives that increase utilisation of maternal health care.

According to a simple model of provider choice, individual households essentially face a trade-off between health and non-health consumption expenditures (Gertler and van der Gaag 1990, "pp. 62-65"). Subsidies by the programme clearly encourage households to avail themselves of more health care services. This improvement can be explained by a substitution effect and an income effect. A strong substitution effect may be in place, as it changes the relative price of alternative providers, while the income effect is the outcome of increased income or purchasing power, relevant in our case, as the programme also has an income support component (Jackson and Hanson 2012, "pp. 271-274"). Grossman (2000, "pp. 349-351") pioneered a model on the demand for health as part of the broader human capital stock. An individual is born with an initial stock of health capital that diminishes with age, but can be supplemented by investment in health inputs like medical care utilisation.

In what follows, we adopt a framework of expected utility, where household decision making is derived from a utility function comprising two possible states of nature: peace (p) or war (w), under which income and consumption vary. The uptake of health services and private household expenditures will depend on income and consumption (Y and C), which varies under a state of peace (greater income and consumption) or war (lesser income and consumption). It can also be postulated that health has a positive effect on the future income of households (Y_2) in both states of nature, but greater in a peaceful state. We can characterize the household utility function (V) where discounted future periods are ignored for the sake of simplicity:

$$V = \Pi(\theta)[C^p H^p(P)] + (1 - \Pi(\theta))[C^w H^w(P)] \qquad (1)$$

Where $Y^p > Y^w$; $C^p > C^w$; $H^p > H^c$; $\frac{\partial \pi}{\partial \theta} < 0$; $\frac{\partial H}{\partial P} > 0$.

Y is income, C is consumption, H is the uptake of health services and expenditures, P is the programme intervention, Π is the probability of peace and θ refers to a vector of conflict increasing factors.

Utility *(V)* in both states of nature emanates from consumption and the use of health services. The first argument inside the square brackets states that the household's utility rises with consumption; it also increases with use of health services as it both directly increases utility and indirectly helps to retain the household's stock of human capital (earning power). Note that expenditures on health cannot exceed total saving in the period: $H^{pw} \leq Y^{pw} - C^{pw}$ by the budget constraint.

Π is the probability of the good state (peace), and $1 - \Pi$ is the probability of conflict, which depends on a variety of factors, including the past individual experience of conflict (θ), which in turn influence expectations about the future prospects of violence. The information contained in θ allows households to update their prior beliefs about the probability of violence or peace through a process akin to Bayes' law.

In this manner, we endogenise choices about the uptake of available health services, in line with behavioural economics (Bowles, 1998; Fehr and Hoff, 2011). Experiences of conflict will impact on the individual and household's psychological framing process, as postulated by Kahneman and Tversky (1979). According to their prospect theory, losses are valued more highly than equivalent gains, such that the fear of future violence may negatively impact on the uptake of the CHTDF health programme. In general, framing processes are regarded to be salient to collective action behind social movements (Benson and Snow, 2000). This may apply to the struggle for autonomy by the indigenous peoples of the CHT region in Bangladesh.

Given values of Π, the household chooses C and H where the observed income Y is predetermined. The demand for health services increases with income and the probability of peace. More conflict, other things being equal, should reduce the use of health care services, because it lowers the uptake of publicly provided health services (including programme interventions) due to behavioural factors. Also, individuals have lower income and hence are more constrained in their private out-of-pocket health expenditure. Health (H) outcomes are a positive function of programme intervention (P) in the form awareness building and health care service received; the marginal impact of programme intervention is expected to be positive: $\frac{\partial H}{\partial P} > 0.$ The programme further acts as a *nudge* towards greater programme uptake (see Thaler and Sunstein, 2008). In this way, the programme may mitigate some of the adverse impacts of past conflict on healthcare utilisation.

3.2 Empirical strategy

Using two rounds of household survey data (in the form of repeated cross-sections), we examine the effect of the CHTDF programme intervention on maternal health care utilisation as measured by ante-natal care (ANC) check-ups, deliveries attended by a trained provider, and deliveries at a health facility. The empirical strategy compares changes between households living in treatment and comparison areas over time applying difference-in-difference (DiD) estimates, augmented with various sensitivity tests (such as the inclusion of a host of household co-variates, controlling for sub-district level fixed effects).

The analysis intends to estimate the overall impact of the programme and can be expressed as a weighted mean of the impact on the household that lives in the treatment area (t_i=1), and on the household not living in the treatment area (t_i=0) adjusting for baseline differences. To estimate the impact of the programme intervention on maternal health care utilisation, we employ a quasi-experimental study design. While there are data available for baseline and post-

intervention periods for both treatment and comparison groups, the data were not collected from the same households and the same villages in both the baseline and follow-up period.

With non-experimental designs, it is not possible to justify the assumption that there is no difference between treatment and comparison groups other than the treatment itself. Due to the nature of the data, we use a quasi-experimental study design as a first strategy. The regression based DiD model can be expressed as follows:

$$Y_{irt} = \beta_0 + \beta_1 X_{ir} + \beta_2 T_t + \beta_3 X_{ir}*T_t + \beta_4 Z_{irt} + \mathcal{E}_{irt} \tag{2}$$

where Y_{irt} denotes the outcome for the household i in period t=1 (treatment period) or t=0 (control period) living in area r (r=1 indicate treatment area while r=0 is for control area). The variable X_i shown in equation (2) is a dummy variable taking the value 1 if the household is in the treatment group and 0 if it is in the comparison group. T is the time dummy indicating the follow up survey if t=1 and otherwise baseline survey if t=0. The DiD estimator is represented by the coefficient β_3 on the interaction between X_{ir} and T_t estimated by using simple ordinary least squares (OLS). Since our outcomes are binary we are using a linear probability model (LPM) for simplicity, however results are robust to using logit models. <u>The validity of this estimation depends on the assumption that the underlying 'trends' in outcome (Y) is the same for both treatment and comparison groups, although it is not possible to test this assumption with two periods of data.</u> In addition, we are assuming that households and areas sampled at baseline and follow-up are comparable in the absence of proper panel data.

As we will show below, balancing tests indicate differences between treatment and comparison groups with respect to pre-determined household characteristics (table A1 in appendix), which in turn may lead to issues of selection bias, such that these two groups of households may not have experienced similar health and development trajectories over time with and without the

programme intervention. Furthermore, the composition of treated and control units may have changed due to repeated cross-sectional nature of the surveys.

To address this issue in equation (2) we include a vector of socio-economic characteristics of households Z_{irt} which include age, sex, and education level of the household head, ethnicity, access to electricity, poverty status in accordance with the national poverty line and the distance between a given village and the sub-district headquarters (measured at the village level and in terms of travel time (in hours) needed for a round trip). Travel time is a good predictor of distance, as the region is hilly and people do not have an accurate knowledge of physical distance. Distance is a strong predictor of the demand for health care services, although the CHTDF intervention aims to provide services at the doorstep, and may encourage indigenous people to use modern health care services. Indigenous communities in this region largely depend on traditional medicine and healing practices. To further alleviate estimation bias we include upazila or sub-district fixed effects, identifying on within upazila variation in a panel model.

To summarize, we assess the impact of the CHTDF programme on maternal health care utilisation by applying two different estimation designs: simple difference-in-differences and a panel model including co-variates, a time dummy as well as fixed effects at the upazila (sub-district) level. Throughout the analysis, we present two sets of standard errors in brackets below point estimates – clustered at the upazila and village level.

Finally, we are interested in identifying impact heterogeneity in terms of ethnicity of households and violence experience and perceptions. Impact heterogeneity based on ethnicity will shed light on the equity nature of the programme. Previous studies find that indigenous populations fare badly in terms of reproductive and maternal health issues (Islam 2010, p.1).

As the indigenous people are the most affected community during conflict, our model would suggest that the programme would have a higher impact on them. By contrast, the experience of violence as well as the fear of violence could have an adverse effect on programme success, which in turn would have negative effects on people's awareness of health related problems and treatments, resulting in decreased service utilisation.

Note that propensity score matching (PSM) and our chosen model (LPM with fixed effects) yield very similar results (all of which are available on request). PSM was used in earlier versions of the paper (see Badiuzzaman and Murshed, 2016, "pp. 14-17"). This is perhaps not surprising since PSM uses household characteristics for matching treatment and control. But the treatment (programme intervention) was not assigned on the basis of household level characteristics but rather community characteristics (such as accessibility). The reported fixed effect model is used to net out time invariant determinants of programme placement that may also be linked to our outcomes of interest.

3.3 Data and descriptive statistics

The empirical evidence presented in this paper is based on two household surveys in the CHT region, conducted in 2008 and 2013. Our (binary) outcome variables on maternal health care utilisation are: ANC received, deliveries attended by trained provider, and delivery at a health facility. Data on reproductive health and safe delivery were collected from women of the reproductive age cohort (15 to 49 years). Data on ANC were collected based on the experience of the women who had a delivery in the three years preceding the survey. Women in households of the reproductive age group were asked whether they received any ANC during their pregnancy. The response was coded as a dummy variable: yes (1) or no (0). In a similar fashion, data on delivery attended by a trained provider and delivery at a health facility were collected from eligible women. To define medically trained providers for delivery care we apply the definition used by NIPORT et al. (2013, p.122):[3] Delivery at a health facility refers to the union

health and family welfare centre, upazila health complex, and district hospitals. Since data on these three variables on maternal health care utilisation could be collected only from those households where eligible women could be found, the number of observations decreased. In the case of more than one eligible woman in the household, the woman who experienced delivery most recently was included in the survey.

Insert Table 1

During baseline the utilisation of ANC-check up and delivery attended by trained birth attendant was higher among the treatment households compared to that of the control households. Regarding delivery at a health facility, there is no statistically significant variation between treatment and control households at baseline. After the programme intervention, there is an improvement in utilisation of maternal health care among the treatment households and differences with control households become large and statistically significant (table 1).

Next, we briefly review the key variables used to estimate the heterogeneous impact of the treatment. Ethnicity of the household[4] could have some determining role in programme effectiveness. Since indigenous people are vulnerable and suffered more during the conflict. More than 50% of households in both treatment and control group are indigenous. When it comes to the economic situation, 75% of treated and 71% of control households lived below the poverty line at baseline, dropping to 43% and 44% in the follow-up survey.

One of our contributions is that we aim to gauge the effect of past and future violence. First, we refer to past violent conflict as the household's *previou*s experience of violence (the three years preceding the survey) and secondly, we take into account perceptions or fear of possible *future* violence. Both violence variables (experience and fear) are considered as measures of post conflict violence and/or post conflict risk of violence. We find that 17% of treated households and 23% of control households reported actual exposure to violence at baseline.

Note that this variable combines two indicators: communal riots and oppression by the military or other security forces. The variable takes the value of 0 (no experience) or 1 (experience).

Consider the household's current perception of future violence (at the time of survey) next, which reflects a distinct post conflict risk. Indeed, a majority of households voiced such fears during baseline and follow up survey; although we can document a decline over time in treated and control households. This variable is also well balanced between treatment and control.

4   Results and discussion

The results of the impact evaluation of the CHTDF programme are presented in the following order. We first discuss the main impacts on three indicators of maternal health care utilisation. Subsequently, we will shed light on the association of violence and insecurity with the effectiveness of the programme. Finally, we consider equity aspects as a function of ethnic identity of households to gauge the inclusiveness of the programme.

4.1 The impact of CHTDF on maternal health care utilisation

The main impacts of the programme based on a simple difference-in-difference (of treatment and control), as well as the preferred, full panel model with covariates and upazila (sub-districts) fixed effects are presented in table 2. Based on the unconditional difference-in-difference, we find positive and statistically significant impacts on the three interrelated maternal health care outcomes (column 1, table 2). The program increased the likelihood of an ANC check-up by 16 percentage points compared to control areas. Deliveries attended by a trained provider increased by seven percentage points, while deliveries at a facility went up by a modest two percentage points.

Insert Table 2

In columns 2-4 of table 2, we successively build up our linear panel model. Column 4 reports our preferred estimates accounting for time-invariant sub-district unobservables, a time dummy and a host of covariates. According to this model, ANC check-ups rose by 18 percentage points, while deliveries by a trained provider and at a health facility increased by 16 and 23 percentage points, respectively. All three effects are economically important. However, the effect on the deliveries by trained providers is imprecisely estimated. Compared, to the simple DiD (in column 1), the effect on ANC check-ups and delivery at health facility are the most robust to the inclusion of covariates and fixed effects.

4.2 Violence and CHTDF programme effectiveness

To investigate the role of post conflict violence for the effectiveness of the programme in relation to the utilisation of various types of maternal health care indicators we use two different variables as proxies for post conflict violence and insecurity. The first variable of interest is experience of violence in the past either as a combatant or as a victim of violence. The second violence related variable is current perception or fear of violence. Both these two variables indicate post conflict risk of violence. Such experience and perception of violence can affect programme implementation in two ways; either it deters households to travel to or access the health services or service providers could have security issues to deliver the services at the community level.

To estimate the differential impact of the programme, we split the sample in two groups; with and without experience (and fear) of violence. Then, we compare the impact of programme across samples (table 3 and 4).

Insert Table 3

According to the results presented in table 3, the role of conflict experience is mixed. The programme's impact on ANC check-up is larger and is concentrated among households *without* experience of conflict (19 percentage points vs. 4 percentage points). Conversely, the programme has increased deliveries attended by a trained provides significantly more among households *with* conflict experience.

The results regarding fear of violence are much clearer (table 4). Households without a fear of violence see relatively larger impacts on deliveries attended by trained providers and deliveries at a health facility. We can document no heterogeneities in the case of ANC check-ups. These patterns suggest that the risk of post conflict violence has a detrimental effect on the promotion of health care utilisation. In recent studies, it is argued that the indirect effects of armed conflict or civil war may be more far reaching than its direct effects. Psychological scars or trauma created by civil war violence are a serious matter for health outcomes (Camacho 2008, "pp. 511–15").

Insert Table 4

When interpreting these patterns note that both conflict exposure in the past and fear of conflict may be correlated with time-varying unobservables in our difference-in-difference setting. So the split-sample results are mere associations. Unfortunately, we cannot think of credible instruments that would generate exogenous variation in either of these variables. That said, conflict exposure and risk seem to be quantitatively important predictors associated with programme effects. Our results may inform population targeting of future interventions in the region and elsewhere.

4.3 Equity Issues

Finally, we try to gauge the equity aspect of the programme across ethnicities. We find that the programme has impacted Bengali and Indigenous people in an equitable way (table 5). If at all,

estimates show that indigenous households living in programme areas are more likely to take an ANC-check up and give birth at a health facility than the Bengali households. Our results are in line with the fact that since the CHTDF programme is being implemented as a post conflict development programme it is expected that the main victims of conflict, the indigenous population, would be well targeted.

Insert Table 5

5   Conclusion

We have attempted to carry out an impact evaluation of a large programme implemented by a UN development agency (UNDP-CHTDF) focussing on the uptake of maternal health care services. The programme intervention under study has not only a health dimension, but also other facets including education, employment, empowerment and confidence building. The region we research is a post conflict zone, and akin to other post conflict societies in the developing world, there is a clear and present danger of the recurrence of conflict.

In sum, we examine the impacts of the programme using econometric methods as motivated by our theoretical model and making use of a relatively large household dataset. However the phenomenon being investigated is to some extent sociological. We do note that further qualitative research is needed to unpack some of the more subtle impacts.

The programme has been an overall success in raising maternal health care utilisation. We find that the intervention succeeded in boosting maternal health care utilisation: ANC check-ups rose by 18 percentage points, while deliveries at health facilities increased by 23 percentage points. We find that the average effect (all in percentage points) on ANC check-ups in Ahmed and Khan (2011, "pp. 1706-1707") of 0.16 is similar in magnitude to ours (0.18). We also note that our estimates regarding delivery at a health facility (0.23) are small compared to Nguyen

et al. (2012, p. 994) (0.35) and in line with Ahmed and Khan (2011, "pp. 1706-1707") (0.23) (both studies from Bangaldesh). Our estimate is large in comparison with that of Jackson and Hanson (2012, "pp. 271-271") in a study in Nepal (0.04)[5].

We also find that violence in the two dimensions (previous experiences of violence and current apprehension about recurring violence) correlates with lower usage of health facilities as promoted by the programme. Most importantly, the effects of the programme tend to be smaller for households that currently fear conflict. Impacts on ANC check-ups are concentrated among households without experience of conflict (19 percentage points compared to 4 percentage points among households with such experience). And households without fears of violence see relatively larger impacts on deliveries at a health facility (37 percentage points compared to 11 percentage points).

When we take into account the effect of violence, our analysis suggests that the programme in a post conflict region has only been partially successful, particularly in tackling the influence of fear of violence on health service use. But when we view the programme through an affirmative action perspective, it has succeeded in targeting indigenous people, as their take up of services is as large as or greater than the relatively more advantaged Bengali speaking population. It has to be borne in mind, however, that both groups are poor in absolute terms. Even if the programme has increased the absolute uptake among the indigenous, the gap between Bengali speaking and the indigenous peoples persists, and this may have repercussions for future risks of conflict, as gaps between communities can raise the risk of conflict even when the average level of achievement for both groups has risen in absolute terms, according to the relative deprivation theories put forward by Ted Gurr (1970).

Unless gaps in achievement between the antagonists are reduced, there is every chance of conflict re-emerging. This is the major policy implication of our study, not just for the CHT region in Bangladesh but also for other post-conflict regions. The occurrence of violent

organized conflict or rebellion requires mobilization (Tilly, 1977). Resources are required to convert discontent into organized rebellion; but also the flames of conflict are fanned by a 'victim like' narrative and psychological framing in the mind of the oppressed. Enduring inequalities perpetuate victimhood perceptions. The importance of framing in social movements is critically presented in Benford and Snow (2000), including the continuous struggle between pre-existing beliefs and new stimuli.

In this context, a well administered programme intervention can nudge the population towards greater programme intake. Conflict prevention and confidence building require that the gaps between Bengalis and the indigenous people of the CHT are narrowed. Ultimately, conflict preventing affirmative action would necessitate greater outreach of development initiatives to the population of CHT to redress the structural or categorical discrimination of the indigenous peoples of this region (Tilly, 1998).

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Endnotes

[1] More information can be found on the WHO website; http://www.who.int/sdg/targets/en/ (accessed 8th October 2017).

[2] Information about the CHTDF programme and its objectives along with its implementation and management structure can be found at: http://www.chtdf.org/index.php/home (accessed 16 October 2015).

[3] According to the Bangladesh Health and Demographic Survey 2011, a medically trained provider is either a qualified doctor, nurse, midwife, paramedic, family welfare visitor (FWV), community based skill birth attendant (CSBA), medical assistant (MA), or sub-assistant community medical officer (SACMO) (NIPORT et al. 2013).

[4] Ethnicity of household more generally was carefully coded. In our dataset and setting there are no mixed ethnicity households. Households with mixed ethnicity are not a common phenomenon in this region especially in the rural areas of CHT region.

[5] Studies done by Ahmed and Khan (2011) and Nguyen et al. (2012) use data from a programme called Maternal Health Voucher Scheme piloted in some districts of Bangladesh. The programme shows an impressive improvement in maternal health care utilisation among the beneficiaries and was also found as equity enhancing as it bridged the gap between rich and poor households (Ahmed and Khan 2011: 1706-1707; Nguyen et al. 2012: 994). Ahmed and Khan (2011: 1705) used cross sectional data, while Nguyen et al. (2012: 990-991) used both cross sectional and panel data along with treatment and control design. Jackson and Hanson (2012: 271–272) examined the impact of a safe delivery incentive programme in Nepal, documenting positive effects on the utilisation of services using PSM method.

Tables

Table 1: Uptake of maternal health care utilization by survey and treatment status

Maternal health care indicator	Baseline Survey			Follow up Survey		
	Treatment	Comparison	Mean difference	Treatment	Comparison	Mean difference
ANC check-up received	0.25 (0.01)	0.11 (0.01)	0.13 (0.02) ***	0.63 (0.02)	0.45 (0.04)	0.18 (0.04) ***
N	2182	688	2870	725	188	913
Delivery attended by trained birth attendant	0.14 (0.01)	0.11 (0.01)	0.03 (0.01) **	0.34 (0.02)	0.12 (0.02)	0.22 (0.04)***
N	2192	694	2886	618	194	812
Delivery at health facility	0.05 (0.01)	0.06 (0.01)	0.01 (0.01)	0.22 (0.02)	0.10 (0.02)	0.12 (0.03)***
N	2192	694	2886	584	194	778
Note: *** significant at 1%, ** significant at 5% and * significant at 10%. Standard error is in parenthesis						

Table 2: Programme effects on maternal health care utilization

Maternal health care indicator	Difference-in-difference	Fixed effect model		
	1	2	3	4
ANC check-up received	0.16 (0.02)***	0.04 (0.10) (0.07)	0.16 (0.11) (0.10)*	0.18 (0.09)* (0.08)**
N	3783	3783	3783	3783
Delivery attended by trained provider	0.07 (0.01)***	0.18 (0.08)** (0.06)***	0.15 (0.18) (0.11)	0.16 (0.15) (0.10)
N	3698	3698	3698	3698
Delivery at health facility	0.02 (0.01)**	0.13 (0.03)*** (0.04)***	0.20 (0.08)** (0.07)***	0.23 (0.08)*** (0.07)***
N	3664	3664	3664	3664
Upazila (sub-district) level fixed effect		-	Yes	Yes
Covariates		-	-	Yes
Note: The first parenthesis under each point estimate contains the standard error clustered at the Upazila level while the subsequent parenthesis indicates the standard error clustered at village level.				
Co-variates include age, sex, and education status of household head, ethnicity and access to electricity of household, poverty status, distance between village and upazila (sub-district) and time dummy.				
All the estimations control for upazila (sub-district) level fixed effect. *** Significant at 1%, ** significant at 5% and * significant at 10%.				

Table 3: Role of violence experience in programme effects on uptake of maternal health care

Maternal health care indicator	Programme effect	Role of experience of violence	
	1	2	3
	All households	Without experience of conflict	With experience of conflict
ANC check-up received	0.18 (0.09)* (.08)**	0.19 (0.10)* (0.09)**	0.04 (0.20) (0.22)
N	3783	3079	704
Delivery attended by trained provider	0.16 (0.15) (0.10)	0.10 (0.18) (0.11)	0.44 (0.14)** (0.19)**
N	3698	3005	693
Delivery at health facility	0.23 (0.08)*** (0.07)***	0.26 (0.09)*** (0.08)***	0.23 (0.10)** (0.15)
N	3664	2979	685

Note: The first parenthesis under each point estimate contains the standard error clustered at the Upazila level while the subsequent parenthesis indicates the standard error clustered at village level.

Co-variates include age, sex, and education status of household head, ethnicity and access to electricity of household, poverty status, distance between village and upazila (sub-district) and time dummy.

All the estimations control for upazila (sub-district) level fixed effect. *** Significant at 1%, ** significant at 5% and * significant at 10%.

Table 4: Role of fear of violence in programme effects on uptake of maternal health care

Maternal health care indicator	Programme effect	Role of fear of violence	
	1	2	3
	All households	Without fear of conflict	With fear of conflict
ANC check-up received	0.18 (0.09)* (.08)**	0.16 (0.12) (0.12)	0.17 (0.10) (0.10)
N	3783	884	2899
Delivery attended by trained provider	0.16 (0.15) (0.10)	0.40 (0.19)* (0.17)**	-0.01 (0.13) (0.11)
N	3698	840	2858
Delivery at health facility	0.23 (0.08)*** (0.07)***	0.37 (0.12)*** (0.13)***	0.11 (0.06)* (0.08)
N	3664	827	2837

Note: The first parenthesis under each point estimate contains the standard error clustered at the Upazila level while the subsequent parenthesis indicates the standard error clustered at village level.

Co-variates include age, sex, and education status of household head, ethnicity and access to electricity of household, poverty status, distance between village and upazila (sub-district) and time dummy.

All the estimations control for upazila (sub-district) level fixed effect. *** Significant at 1%, ** significant at 5% and * significant at 10%.

Table 5: Role of ethnicity in programme effects on uptake of maternal health care

Maternal health care indicator	Programme effect	Role of ethnicity in programme effect	
	1	2	3
	All households	Bengali	Indigenous
ANC check-up received	0.18 (0.09)* (0.08)**	0.18 (0.12) (0.12)	0.24 (0.13)* (0.11)**
N	3783	1730	2053
Delivery attended by trained provider	0.16 (0.15) (0.10)	0.17 (0.24) (0.18)	0.15 (0.16) (0.11)
N	3698	1666	2032
Delivery at health facility	0.23 (0.08)*** (0.07)***	0.18 (0.14) (0.11)	0.24 (0.12)* (0.10)**
N	3664	1649	2015
Note: The first parenthesis under each point estimate contains the standard error clustered at the Upazila level while the subsequent parenthesis indicates the standard error clustered at village level. Co-variates include age, sex, and education status of household head, ethnicity and access to electricity of household, poverty status, distance between village and upazila (sub-district) and time dummy. All the estimations control for upazila (sub-district) level fixed effect. *** Significant at 1%, ** significant at 5% and * significant at 10%.			

Appendix: Data, and Descriptive Statistics [word count: 976]

The empirical evidence presented in this paper is based on two household surveys in the CHT region, conducted in 2008 and 2013. The first survey established a baseline status for households in terms of demographic variables, socio-economic indicators, and confidence building measures. Therefore, to establish a baseline for the programme in the future, sample villages were selected from the list of villages where no programme intervention was present in 2008.

The follow-up survey in 2013 was commissioned to track changes in the lives of people due to the CHTDF's programme in the region. In this connection, the survey was designed using an intervention (or treatment) and control approach. At the time of the survey in early 2013, the CHTDF programme had been implemented in 20 out of a total of 25 sub-districts. Treatment households were chosen from the programme implementation region (20 sub-districts), while comparison households were chosen from areas of non-implementation (5 sub-districts) by CHTDF or any other development agencies.

Both household surveys used multi-stage stratified random sampling, where the village was the primary sampling unit. Sample villages were selected randomly using probability proportionate to size on the basis of the list of villages both in treatment and comparison categories. At the final stage, households were selected from the sampled villages randomly.

The geographical coverage and dispersion of the sample villages were considered in the sample selection process. Geographical coverage under both surveys was determined in a way to make the sample representative for the whole region and ethnicity as well. Table A1 gives an overview of sample sizes across survey rounds, treatment and control units, as well as geographies.

Table A1: Sample sizes

Survey characteristics	Baseline Survey in 2008	Follow up Survey in 2013
Number of villages (Para)	199	174
Number of unions	29	24
Number of upazillas (sub-districts)	13	13
Number of districts	3	3
Number of treatment households	2440	1334
Number of comparison households	798	567
Total number of sample households	3238	1910
Number household having married woman in reproductive age	2970	1707

After careful investigation of the sampling procedures followed in both surveys, it was discovered that the five sub-districts considered as the non-implementation region in 2013 were also included in the baseline survey in 2008. Finally, the total number of sample households for the treatment group is 3,783, while for the comparison group it is 1,365 (see table A1).

These two household surveys are important in terms of development and policy formulation. First, the CHT region is not included in national surveys, such as the Demographic and Health Surveys and the Household Income and Expenditure Survey. Even when the region is included in surveys, the data are unrepresentative of the region, and no data sets at the household level are available in the public domain. Second, the majority of indigenous people of this region are seriously disadvantaged in terms of measurable socio-economic indicators. Geographically, this region is regarded as remote and hard to reach for development outreach activities. Third, this region happens to be conflict ridden, and collecting data is challenging, risky, and expensive. Finally, the two household surveys in CHT provide a wealth of information in terms of the breadth of their coverage on topics ranging from demographic factors, asset ownership, employment, crop production, income, expenditure, education, health, reproductive health, water-sanitation, access to services and post conflict confidence building.

It is important to briefly review some salient features of the household covariates in our estimation (age, sex, and household size etc.). Given the non-random placement of the programme, we find differences between the treatment and control group along several dimensions (table A2). However, these differences vary across rounds in a non-systematic way.

Table A2: Household characteristics at baseline and follow up survey

Household Characteristics	Baseline Survey			Follow up Survey		
	Treatment	Comparison	Mean Difference	Treatment	Comparison	Mean Difference
Age of household head (year)	43.27 (0.27)	44.60 (0.51)	-1.33 (0.56)**	44.76 (0.55)	44.02 (0.35)	0.74 (0.65)
Sex of household head (Male=1)	0.92 (01)	0.88 (0.01)	0.04 (01)***	0.93 (0.01)	0.93 (0.01)	0.00 (0.01)
Education of household head (primary education=1)	0.30 (0.01)	0.31 (0.02)	0.01 (0.2)	0.40 (0.1)	0.33 (0.20)	0.07 (0.02)***
Household size	5.30 (0.04)	5.08 (0.07)	0.22 (0.08)**	5.14 (0.50)	5.16 (0.08)	0.02 (0.09)
Access to electricity (access=1)	0.18 (0.01)	0.14 (0.01)	0.04 (0.01)***	0.49 (0.01)	0.35 (0.02)	0.14 (0.02)***
Per capita annual net income (in BDT)	12736 (103.81)	12098 (169.87)	638 (205.89)***	21841 (371.92)	19660 (480.23)	2181 (651.95)***
Travel time between village and upazila (in hour)	2.15 (0.05)	2.85 (0.08)	-0.69 (0.10)***	1.64 (0.03)	1.69 (0.05)	-0.05 (0.06)
Ethnicity of household (Indigenous=1)	0.56 (0.10)	0.51 (0.17)	0.05 (0.20)***	0.57 (0.13)	0.54 (0.20)	0.03 (0.02)
Poverty status of household (poor=1)	0.75 (0.01)	0.71 (0.02)	0.04 (0.02)**	0.43 (0.01)	0.44 (0.02)	-0.01 (0.02)
Experience of violence (Yes=1)	0.17 (0.01)	0.23 (0.1)	0.06 (0.01)***	0.17 (0.01)	0.15 (0.01)	0.02 (0.02)
Perception of violence (Yes=1)	0.82 (0.01)	0.84 (0.01)	-0.02 (0.01)	0.60 (0.01)	0.58 (0.02)	0.02 (0.02)
N	2440	798	3238	1343	567	1910
Note: *** significant at 1%, ** significant at 5% and * significant at 10%. Standard error is in parenthesis						

For instance, the education status of household heads between treatment and control group is the same at baseline but differs at follow-up. In relation to access to electricity of the household, there is a statistical difference between treatment and control households at both baseline and follow-up. Travel time for visiting the upazila centre from the village is relatively higher for control households at baseline survey, while it is similar in the follow-up survey. These patterns indicate that it is important to include socio-economic covariates in the impact analysis. Finally, it is interesting to examine income differences. When it comes to per capita annual net income, treatment households fare better compared to control households at baseline, and this gap further widened in the follow-up survey.