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ABSTRACT

Violent Conflict and Breastfeeding: The Case of Iraq

This study explores the relationship between armed conflict and breastfeeding practices of Iraqi mothers. Using a unique pairing of the Iraq Body Count database, in conjunction with the 2006 and 2011 Multiple Indicator Cluster Surveys for Iraq, we find that increases in conflict-related casualties are associated with a decline in breastfeeding incidence, with some mixed results on breastfeeding duration. We also explore a number of potential causal channels, including interactions with household wealth and accessibility of formula. The results are informative in the context of designing policy aimed at stabilizing the long-term health and productivity of populations in conflict areas.

JEL Classification: D74, I1, J13, J18
Keywords: conflict, breastfeeding, Middle East, Iraq

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1. Introduction

The most common measures of the costs of armed conflict are direct – civilian and combatant casualties caused by fighting. But, because the impact of war on the physical and psychological health of populations is so long-lasting and severe, the indirect costs can be large and can ultimately trump the immediate costs. Armed conflict jeopardizes access to clean water, sanitation, food and health services. Health personnel emigrate as governments shift resources away from the health sector, and insecurity can reconfigure individual health care choices (Davis and Kuritsky 2002; Devkota and Teijlingen 2010). Unfortunately, young children often bear the brunt of these costs (United Nations 2002). In this paper, we explore an important but understudied aspect of the impact of war on child health.

Breastfeeding is important for child health, and changes in breastfeeding are known to impact a whole host of child outcomes. In turn, these early health outcomes have high persistence throughout a child's life, suggesting that disruptions to breastfeeding that might result from armed conflict can create serious repercussions for the long-term health and productivity of populations in conflict states.

Theoretically, the effect of armed conflict on breastfeeding is ambiguous. On one hand, high stress and poor nutrition can lead to a decline in breastfeeding. On the other hand, disruptions to the food supply chain and the health infrastructure might spur an increase in breastfeeding out of a lack of other options, perhaps most especially for poor families as war leads to income and property losses. In this paper, we examine the relationship between intensity of armed conflict and breastfeeding practices using data from Iraq. Using a unique pairing of large-sample household survey data together with geolocational conflict data, we find that an increase in casualties from armed conflict (a proxy for war intensity) is associated with reductions in breastfeeding incidence, with some mixed results on breastfeeding duration. While data limitations prevent us from pinning down a causal impact, we do explore transmission mechanisms and identify a number of patterns in the data that warrant examination.

Our paper contributes to the literature in several important ways. First, the relationship between violent conflict and breastfeeding is surprisingly understudied, despite being a clear element of measuring the welfare effects of war on civilian populations. Second, the context in the Middle East is especially important. The region has seen the largest number of conflicts in any major region worldwide since World War II (Naufal 2011), and compounding the long-term

difficulties is the population configuration, which demographers describe as a "youth bulge" (Dhillon 2008). Thus, research on war and household behavior is critical for promoting recovery and sustainable development in this war-torn region. Third, our merging of household data with geolocational conflict data provides a new avenue for examining the impact of conflict on micro-level indicators in a region for which data availability is notoriously sparse. Fourth, the Middle East overall has one of the lowest rates of exclusive breastfeeding in the world (Hamade et al. 2014), which is a puzzle given that Islamic law explicitly counsels breastfeeding. Finally, we explore a number of causal channels to better understand the patterns that we uncover, including the availability of supplements and differential impact by wealth levels. This final point potentially has important policy implications for international organizations that work on mitigating health issues in conflict areas, and is an avenue for future researchers to understand causal links more deeply.

The paper proceeds as follows. Section 2 surveys the literature, emphasizing the impact of both breastfeeding and war on child health, while highlighting the dearth of literature connecting the two. We also offer some information on Iraq, specifically. Section 3 presents the data and some preliminary descriptive analysis. Section 4 outlines our empirical strategy and results, along with a number of robustness checks. Section 5 discusses causal channels underlying the results and section 6 concludes.

2. Literature Review

2.1 Armed Conflict and Health

There is a growing empirical literature dealing with the effects of armed conflict on health. Davis and Kuritsky (2002) find, using data from Sub-Saharan Africa, a decline in life expectancy of about one year associated with countries that experienced a conflict killing at least 1000 people. With respect to gender, Plumper and Neumayer's (2006) cross-country study argues that women suffer more from war than men do, with larger declines in life expectancy, from restricted access to food, hygiene and health services. Beyond physical health manifestations of conflict, psychological repercussions can also be serious. For example, Bell et al. (2012) show that conflict-related violence is associated with anxiety disorders in Colombia.

The effect of conflict on children specifically has been a subject of increasing attention. Al-Eissa (1995) finds that children in Kuwait displayed dysfunctional social and emotional behaviors that were influenced by their experience of aggression during the Gulf conflict in 1990. Alderman et al. (2006) investigate the preschool nutritional status of children in Zimbabwe during the civil war there, finding negative impacts. Akresh et al. (2007) find that the civil war in Rwanda was associated with a reduction in girls' height-for-age. Similarly, Bundervoet et al. (2009) find that children born in Burundi in areas with high conflict intensity are likely to experience a height-for-age deficiency compared to those in non-conflict areas. Akresh et al. (2012) further document this finding with evidence from the Eritrean-Ethiopian conflict, in which war-exposed children were found to be shorter. Mansour and Rees (2012) use Palestinian data to observe that conflict-related deaths are associated with an increase in the probability of having a child with low birthweight. They also argue that in-utero health, and the mother's health at the time of pregnancy, significantly impact the long-term health of children. Kesternich et al. (2014) argue that war experience is a predictor of both economic and health outcomes at older ages.

These studies document child outcomes, and it is generally understood that war has a variety of detrimental effects on children residing in conflict zones. On the other hand, little is known about its impact on micro-level, child-specific health indicators like breastfeeding (Davis and Kuritsky 2002).

2.2 Breastfeeding and Health

Studies of armed conflict and health tend to focus on child health in the post-infancy period. This is surprising given that breastfeeding has a whole host of short-term and long-term benefits for both the mother and the child. Immediate breastfeeding reduces the risk of post-partum hemorrhage and reduces the prevalence of Type 2 diabetes and several types of cancer among mothers (UNICEF 2014). Moreover, longer breastfeeding duration helps mothers cope with trauma and fight health threats including heart attack, stroke and cardiovascular diseases that might be associated with war (Schwarz et al. 2009).

The impact of breastfeeding on child health is substantial. Black et al. (2013) estimate that optimal breastfeeding has the potential to prevent over 800,000 deaths annually in children under the age of five. The mortality-reducing gains from exclusive breastfeeding are also large: children are on average 14 times less likely to die in the first six months after birth, and their risk of

contracting diseases like diarrhea and acute respiratory infections falls significantly (Black et al. 2008). The latter point is especially important in wartime given compromised health and sanitation infrastructure. Beyond reducing neonatal mortality, breastfeeding contributes to immunological protection and provides essential nutrients (Labbok et al. 2004; Picciano 2001). Black et al. (2013) also find that it reduces the risk of chronic conditions later in life, including obesity, high cholesterol, blood pressure and diabetes.

The disadvantages of deviating from breastfeeding go beyond health risks. Nutrient deficiencies in early years of infancy that are often caused by inadequate (and lack of) breastfeeding can inhibit a child's ability to develop new skills, and consequently lead to lower education and eventually less labor market productivity (Alderman et al. 2006). Del Bono and Rabe (2012) and Fitzsimons and Vera-Hernandez (2013), both exploiting exogenous variation in availability of breastfeeding support, find that breastfeeding is associated with a whole host of improvements in both cognitive and non-cognitive indicators later in childhood – language, numerical reasoning and pattern recognition skills, emotional development, physical strength and others. While Fitzsimons and Vera-Hernandez find reductions in incidence of negative health outcomes like asthma, obesity and infections, Del Bono and Rabe find no significant impact on health-related outcomes. Borra et al. (2012), using propensity score matching, find that breastfeeding improves both cognitive and non-cognitive function, with a stronger impact on cognitive measures. In summary, disruptions to breastfeeding have the potential to reduce human capital and productivity, and thus overall standard of living, over long time horizons.

Despite increasing awareness of the importance of breastfeeding for economic development, impediments for mothers continue to persist. Galtry (1997) argues that the labor market imposes costs on women who breastfeed, and Smith and Ingham (2005) study the inadequacy of our economic statistics for properly valuing breastfeeding. Underutilization of breastfeeding is a particular problem in the Middle East. The Middle East and North Africa (MENA) region has one of the lowest exclusive breastfeeding rates in the world (Hamade et al. 2014), and is also the only region in the world where breastfeeding rates actually *fell* in the decade leading up to 2006. In the developing world overall, 39 percent of children under six months old are exclusively breastfed; by contrast, this figure is 26 percent in the MENA region (UNICEF 2009). It is worth noting that Islamic law explicitly counsels breastfeeding. The Quran (2:233) stipulates that "Mothers shall breastfeed their children for two whole years, for those who wish to

complete the term." The apparent discrepancy between religious texts and practice leads us to question whether regional conflict may help to account for this deviation from religiously-prescribed infant feeding practices.

2.3 Breastfeeding and War

To summarize, there is a substantial body of literature on the short and long term benefits associated with breastfeeding, both health related and non-health related. There is also a growing literature that documents negative health consequences associated with war – especially for the health of children. However, there is almost nothing that analyzes the link between the two.

From our reading of the literature, Guerrero-Serdan (2009) and Zakanj et al. (2000) are the only studies that touch on the relationship between war and breastfeeding. Zakanj et al., using survey data from Croatia, find that conflict is associated with a reduction in both the prevalence and duration of breastfeeding, and argue that this is most likely due to the distribution of infant food by international organizations. The paper compares means across war-free and war-affected households and uses descriptive statistics only. Guerrero-Serdan briefly explores the effect of the 2003 Iraq war on breastfeeding incidence, only insofar as it acts as a transmission channel to poor nutritional outcomes of children as seen by their height-for-age scores, which is the focus of that paper. By contrast, we use a large, nationally representative dataset and regression analysis to control for important determinants of breastfeeding, and in doing so identify the association between conflict intensity and breastfeeding incidence and duration.

Exploring these links is especially crucial for the MENA region. The region has experienced the largest number of conflicts in any major region worldwide since World War II, with no apparent end in sight (Naufal 2011), and the conflict has dramatically harmed the health of resident populations.[1] Furthermore, given the population configuration in the region, which demographers describe as a "youth bulge" (Dhillon 2008), understanding the health consequences of armed conflict on child health – many aspects of which have high persistence into adulthood – is essential for studying the long-term productivity of future generations of the labor force. Finally, the effect of armed conflict on breastfeeding also has extensive policy implications, particularly

[1] It is important to note that Naufal (2011) is based on regional history *prior* to the Arab Spring. Ongoing conflicts in the region, most especially in Syria, Libya and Yemen, would only strengthen the point about the relative severity and persistence of conflict in the region.

with respect to medical services and the distribution of food supplements (including infant formula) to those trapped in war zones.

2.4 Background on Iraq

We turn now to a brief overview of recent conflict in Iraq and the impact of war on the health of the Iraqi population.

Armed conflict has been an unfortunate but dominant feature of Iraq's contemporary history. The Iran-Iraq war of the 1980s was followed by the Gulf War in the following decade, a period of punishing sanctions and brutal political violence in the 1990s and early 2000s (e.g. chemical gas attacks on civilian Kurds), the US invasion in 2003, and currently the Islamic State offensive in various parts of the country. The succession of three major wars, harsh sanctions and internal political strife has damaged the country's infrastructure, quite literally turning back progress. For instance, Iraq is the only country in the region in which the literacy rate in 2005 for 15-24 year olds was actually lower than for 25-34 year olds (Richards and Waterbury 2008). Each war saw the socio-political security of the country under threat, families broken and displaced, and thousands of lives lost. Southern and central regions of Iraq were most affected during the initial years of the US invasion, though today the death toll has spared no governorate or region (Allawi 2007). As of July 2017, there have been at least 177,509 documented civilian deaths due to the armed conflict beginning in 2003 (Iraq Body Count). Unfortunately, the violence has not been trending downward. 2013 was the deadliest year in the country over a five-year period ("Iraq's annual death toll", 2014), and in fact the conflict took a turn for the worse with the spillover of the Syrian conflict and the expansion of control by the Islamic State.

Conflict in Iraq has been accompanied by serious deleterious effects on the health of the population. It has reduced access to healthcare services and facilities, led to the deterioration of the quality of drinking water and sewage systems, and disrupted the provision of food and other necessities for the day-to-day existence of households (Guerrero-Serdan 2009). Conflict has also destroyed health infrastructure both directly and indirectly, compounding its negative effects on the population. In 2003 alone, 12 percent of hospitals in the country were damaged, and 7 percent were looted (Diaz and Garfield 2003). Children have tended to experience the greatest consequences of the deterioration of the health care infrastructure in Iraq. Richards and Waterbury (2008) estimate that the number of excess deaths of Iraqi children under the age of five between

1991 and 2002 is somewhere between 345,000 and 529,000, which they attribute mostly to direct and indirect consequences of the sanctions regime. Interestingly, the authors do highlight inadequate breastfeeding as a main factor underlying those deaths, along with diarrhea, respiratory illness, contaminated water, and lack of medical supplies. The war has also disrupted services relating to electricity and power generation which, coupled with rife insecurity, has further compromised the provision of healthcare in Iraq (Alwan 2004). Overall, Iraq is a prime location to study the effects of war on breastfeeding due to its unique history and recent experience with conflict, but also because of a comprehensive data set that, for the first time, includes all eighteen governorates. We turn now to our data.

3. Data

The household data are drawn from the Multiple Indicator Cluster Surveys (MICS), developed by the United Nations Children's Fund, which aim to capture information on the status of women and children in various countries around the world. In Iraq, the surveys are conducted via face-to-face interview by the Central Organization for Statistics & Information Technology and Kurdistan Regional Statistics Office, in collaboration with the Ministry of Health. The sampling is stratified over 56 geographical sample domains to ensure coverage of rural and urban areas in all governorates, along with all major metropolitan areas. Within each sample domain, primary sampling units (essentially neighborhoods) are selected at random, and a cluster of six households is selected at random from each neighborhood. The sample is designed to be roughly nationally representative, per census data.

In this study, we primarily use data from the 2006 and 2011 rounds of the survey, which comprise the data available following the 2003 US invasion. We also briefly incorporate the 2000 round, the earliest available, for descriptive comparison. The sample size for the 2006 survey is 27,186 women. In addition, 16,469 questionnaires for children under the age of 5 were completed. The 2011 sample sizes are 55,194 women and 36,307 children under the age of 5. The response rates are quite high – 98.6% for the 2006 survey and 99.6% for the 2011 survey. Nevertheless, one concern in the context of Iraq is that the random sampling of households is conducted across physical domicile structures at the time of the surveys, rather than by census registries of individuals, so by definition physically displaced persons are not recorded at their original homes.

Our dependent variables take advantage of several questions from the MICS survey instrument. The survey asks mothers who have given birth in the past two years the following questions about their last-born child:

1. Did you ever breastfeed (child)?
2. How long after birth did you first put (child) to breast?
3. Is (child) still being breastfed?
4. Did (child) drink or eat … yesterday during the day or at night?

Question (4) is actually a series of sub-questions about a variety of liquid and solid foods. This allows us to construct a variable measuring whether a child is exclusively breastfed, which for this study means specifically that the child had no solids and no liquids other than breastmilk in the previous 24 hours.

Figure 1 is a descriptive analysis of breastfeeding practices by child age, using pooled data from our 2006 and 2011 samples. Exclusive breastfeeding is quite uncommon. While just over 40% of children in their first month are exclusively breastfed, this figure drops precipitously to 6% by the fifth month, even though exclusive breastfeeding is still recommended at this age. Moreover, complementary breastfeeding is also at lower levels than advised; towards the end of two years of age, only 29% of children are breastfed at all.

[INSERT FIGURE 1 HERE]

Our independent variable of interest is a household-specific measure of armed conflict intensity. To measure conflict, we merge each individual household record with casualty numbers by governorate from the Iraq Body Count (IBC) database. IBC provides statistics and timestamps on deaths that have occurred across governorates since the onset of war in 2003. The data are mainly based on media reports, but also on primary sources, nongovernmental organizations and official figures. IBC figures are likely to understate the true extent of armed conflict due to its focus on media sources for much of its information and the inherent selection bias in this process (Weidmann 2014; Price and Ball 2014). Nevertheless, the dataset offers insight into the magnitude and geographical attributes of casualties in the Iraq conflict, and remains one of the most reliable sources on the matter (Carpenter et al. 2013; Fathollah-Nejad 2015).

We constructed two measures of conflict intensity. The average casualty rate measures casualties per 1000 population, averaged across the three years preceding the MICS survey, in the governorate in which the respondent lives. The pre-birth casualty rate measures casualties per 1000 population, averaged across the two years prior to the birth of the child, in the governorate in which the respondent lives.

While the mean casualty rate across our sample is around 0.20 casualties per 1000 population, it is important to note that conflict intensity was not homogeneously distributed across Iraq's 18 governorates, nor across years. Iraq consists of three main groups: Kurdish, Sunni and Shia. Each group is heavily present in adjacent governorates, practically dividing the country into three distinct sections. The Kurds dominate the northeast part, Sunnis constitute a majority in the center and northwest, while Shia are dominant in the south. Figure 2 shows the intensity of conflict across Iraq for 2006 and 2011, where darker colors indicate a higher rate of war-related casualties. It is clear from this figure that Kurdish and Shia areas were relatively safer than the Sunni-dominated region. For a picture of temporal variation, figure 3 displays the average casualty rate per 1000 population for each year between 2003 and 2011, as well as the rate for the district listing the highest casualty rate for that year. The highest rate of casualties was in Diala in 2007, with almost 3 war-related casualties per 1000 people. Note also that the geographical distribution of conflict intensity was not homogeneous over the years we are studying. In a period of just nine years, four different governorates featured the highest annual rate of casualties among the 18 governorates. While there was a notable decline in casualties in later years, there remains a wide range of conflict-affectedness across governorates. For example, there were 0.39 casualties per 1000 population in Sunni-majority Salahaladin in 2011, but only 1 casualty *total* in the Shia-majority Al Muthana governorate and 5 casualties in the Kurdish-dominated Dohuk governorate.

[INSERT FIGURE 2 HERE]
[INSERT FIGURE 3 HERE]

We also employ a number of additional controls for breastfeeding practices, including health-related controls (e.g. low birthweight, caesarean delivery, birth-related health care and contraception), characteristics of the mother (e.g. total number of children born, age, education level, labor market status), child characteristics (e.g. gender, age in months), household

characteristics (e.g. female-headed, whether the household is in an urban area) and dummies for whether the household is located in a Kurdish, Sunni or Shia governorate. Table 1 contains a description of all variables used for the study and table 2 contains descriptive statistics. Descriptive statistics are presented for the full sample, and also for the subsamples consisting of children less than 6 months old and children from 6-24 months.

[INSERT TABLE 1 HERE]
[INSERT TABLE 2 HERE]

For a preliminary descriptive analysis of breastfeeding and conflict in Iraq, figure 4 shows average breastfeeding rates (whether a child from 0-24 months has ever been breastfed) across the three regions of Iraq for 2000, 2006 and 2011 (the available survey years). The largest declines in breastfeeding occurred in the Sunni provinces, which saw by far the highest levels of conflict-related violence in Iraq. Breastfeeding actually *rose* from 2000 to 2006 in the Kurdish provinces (the safest region of Iraq) before falling from 2006 to 2011.

[INSERT FIGURE 4 HERE]

We should emphasize here that Iraq was not free of violence in 2000. Indeed, a combination of the sanctions regime and ongoing sectarian political violence led to hundreds of thousands of deaths in the late 1990s and early 2000s (Richards and Waterbury 2008). However, we do not have any governorate-specific data on conflict prior to 2003 that is comparable to the IBC database. Thus, we hesitate to use 2000 as a conflict-free baseline, and instead exploit extensive variation in conflict intensity across provinces around 2006 and 2011 to examine the relationship between conflict and changes to breastfeeding practices.

4. Results

4.1 Breastfeeding Incidence

As described in section 3, the survey questions allow us to construct four binary variables that reflect breastfeeding incidence:

- Was the child ever breastfed?
- Was the child breastfed within one hour after birth?[2]
- Is the child exclusively breastfed? (no solid or liquid supplements in the previous 24 hours)
- Is the child currently breastfed?

We restrict the exclusive breastfeeding outcome variable to children under 6 months of age, as the World Health Organization recommends exclusive breastfeeding for the first 6 months. Breastfeeding should optimally continue at least until the age of two, although possibly in conjunction with complementary feeding (UNICEF 2014). We also disaggregated the outcome variable reflecting current breastfeeding to one subsample including only children less than 6 months of age and to a second subsample including children aged between 6 and 24 months. We employ a probit model for these binary outcomes:

$$\Pr(Breastfeed_i = 1) = \Phi(\beta_0 + \beta_1 Conflict_i + \beta_2 H_i + \beta_3 I_i + \beta_4 R_i + u_i)$$

Here, $Conflict_i$ is the rate of conflict-related casualties in the respondent's governorate. H_i, I_i and R_i are vectors of health, individual/household and regional controls, respectively.

The empirical strategy is to exploit locational and temporal variation in conflict levels across surveyed households to identify the association between conflict intensity and breastfeeding practices. This is far from an ideal experimental design where households are placed at random in areas with different levels of conflict, and there remains a risk that families in different governorates are endowed with unobserved characteristics that are correlated both with conflict levels and with breastfeeding practices. As such, while we are not able to say that β_1 reflects the causal impact of conflict on breastfeeding practices, a whole host of control variables, along with different measures of conflict and other sensitivity checks, help us to measure the association in as robust a way as possible given the limitations of the dataset.

Table 3 presents the results of the probit regressions. We have pooled the 2006 and 2011 observations to exploit all of the available variation in conflict levels. Our measure of conflict is

[2] The World Health Organization recommends that breastfeeding be initiated within one hour after birth (UNICEF 2014).

the rate of casualties per 1000 persons in the governorate in which the household lives, averaged over the three years prior to survey administration. We consider an alternative measure of conflict intensity, and regressions separated out by year, later in the section. Robust standard errors, clustered at the level of the governorate, are given in parentheses. Marginal effects, evaluated at the mean, are given in brackets.

[INSERT TABLE 3 HERE]

For all indicators of breastfeeding, conflict intensity is negatively associated with breastfeeding incidence. Each 1-unit increase in the casualty rate (one additional casualty per 1000 persons) is associated with a 3.75% decline in the probability that a child has ever been breastfed, an 8.17% decline in the probability that a child was breastfed within one hour after birth, a 2.74% decline in the probability that a child under 6 months of age is exclusively breastfed, and a 7.3% decline in the probability that a child is currently breastfed.[3] The coefficients are significant at conventional levels for the indicators reflecting whether a child was ever breastfed, whether a child is currently breastfeeding, and whether a child is currently breastfeeding for the subsample of children less than 6 months of age (t-statistics of 2.43, 1.88 and 2.03, respectively).[4]

Again, while our results indicate the presence of an association between conflict-related fatalities and breastfeeding incidence, we cannot definitively establish a causal relationship from these results. Nevertheless, one way to check the robustness of the correlation is to exploit our two survey waves to examine the relationship between changes in breastfeeding and changes in the level of conflict-related casualties across governorates. Figure 5 displays this relationship, wherein we plot changes in mean residuals from each of our breastfeeding indicator probit regressions against changes in the average casualty rate by governorate. The scatterplots display the expected downward slope, and also show that the pattern in the data is distributed across most of the 18 governorates, and not driven by a few outliers.

[INSERT FIGURE 5 HERE]

[3] Throughout, "%" refers to a percent-point change. For example, each unit increase in the casualty rate is associated with a 0.0375 decline in the probability that a child has ever been breastfed.

[4] Note that the negative coefficient for the "Ever Breastfed" regression implies that at least part of the association is attributable to breastfeeding never being initiated, rather than to early termination.

As for economic significance, a good indicator of magnitude is to evaluate the estimated breastfeeding probabilities at the lowest and at the highest conflict levels, and to compare the two. For our sample, the lowest rate of conflict-related casualties was almost zero in both 2006 and 2011, while the most dangerous governorate saw an average of 1.13 conflict-related casualties per 1000 persons, over the three years prior to the survey. This level of increase in casualties is associated with an estimated 8.5% decline in the probability that a child is currently breastfed, and an estimated 5.04% decline in the probability that a child has ever been breastfed. This exercise allows us to compare the magnitude of our results with other results obtained in the literature, which typically involve a discrete contrast between conflict areas and non-conflict areas. In fact, our results are not far from those obtained by Guerrero-Serdan (2009), who estimated a 7% decline in breastfeeding associated with residing in a conflict area, or by Zakanj et al. (2000), who obtained an estimate of 4.2% based on comparing war-free and war-affected areas in Croatia. We can also compare these with estimates of the impact of war on other household variables in Iraq. The impact of conflict on breastfeeding is apparently large compared to the impact on female education. UNICEF (2010) finds that female primary school enrollment had dropped in all areas of Iraq by 2007 and, while the decline was sharper in conflict-affected areas, the largest decline was only 0.92%. On the other hand, Cetorelli (2013) finds that children in war-affected areas are 21.5% less likely to be vaccinated against polio than children in safer areas.

To check the sensitivity of our results, we consider an alternative measure of conflict. Rather than taking the average of conflict rates in the three years prior to survey administration, we consider the average conflict rate in the two years prior to the child's birth. This gives some variation in conflict levels even within survey years, owing to children of different ages included in the sample. We also disaggregated the results by year, estimating our models using the 2006 and 2011 survey waves separately. Table 4 presents the conflict coefficient from these models. All regressions are identical to those from table 3, employing the same control variables, but we have presented only the coefficient on the conflict variable. As in table 3, we use robust standard errors, clustered at the level of the governorate. Marginal effects, evaluated at the mean, are given in brackets. Note that the top line of the table is identical to the main results in table 3. We include it here for easy comparison.

[INSERT TABLE 4 HERE]

Results are qualitatively similar regardless of which conflict measure is used, although some estimated magnitudes are different. It is also worth noting that the 2011 results are substantially more robust than the 2006 results. First, the sample size is much larger. Second, it is possible that data collection was better in 2011. 2006 was the apex of the conflict.[5] Measuring casualties accurately was likely more challenging then, and presumably communications networks improved generally over the intervening years. A few of the estimated coefficients from the 2006 subsample are positive, although none of those are significant. All of the significant coefficients are negative, reflecting a negative correlation between conflict and breastfeeding incidence. Statistically significant results are obtained for the indicators measuring whether a child was ever breastfed and whether a child is currently breastfeeding, with the latter association particularly strong for children who are less than 6 months old (although the association is also significant for children aged between 6 and 24 months when estimated on the 2011 sample alone). We note that all of the (insignificant) positive coefficients are from the 2006 subsample and that these are not theoretically implausible; we discuss this issue further in section 5.

A conspicuously absent covariate is a direct measure of the household's socioeconomic status, which is potentially an important predictor of breastfeeding (Malhotra et al. 2008; Heck et al. 2006). While unfortunately no household wealth index was collected in the 2006 survey, the 2011 survey includes a household wealth indicator, by quintile. Thus, as a final check on robustness, we run the same set of regressions as above using the 2011 survey wave, and including controls for household wealth. The indicator for the highest wealth quintile is omitted. The results are shown in table 5. The significance levels and magnitude of the conflict coefficients are almost the same as the results from the 2011 regression without wealth controls, suggesting that omitted variables bias from the absence of wealth controls in the main regressions is not a large concern. What is most interesting here is that breastfeeding incidence is significantly higher among the poorest households – those comprising the lowest quintile of the wealth distribution. We return to this point in section 5.

[INSERT TABLE 5 HERE]

[5] 2006 marked a peak in violence, following the February bombing of the al-Askari mosque (IOM 2007).

4.2 Breastfeeding Duration

While the survey does not offer a retrospective picture of breastfeeding duration for each woman surveyed, we can study breastfeeding duration in an indirect way by using information on the child's age and whether the child is currently breastfed. To do so, we employ a Cox proportional hazards model. Here, the risk of breastfeeding termination (hazard) in month t is given by:

$$h(t) = h_0(t) \cdot \exp[\beta_1 Conflict_i + \beta_2 H_i + \beta_3 I_i + \beta_4 R_i + u_i]$$

We use the same set of controls as in the breastfeeding incidence regressions. The results are shown in table 6. For the pooled sample and for the 2011 sample, an increase in conflict-related casualties is associated with a higher hazard rate, and thus shorter breastfeeding duration. Specifically, using the pooled sample, a unit increase in the average casualty rate (similar to moving from the safest area to the most dangerous area) is associated with a 17.4% increase in the risk of breastfeeding termination. In other words, a mother living in the most dangerous area is 17.4% more likely to stop breastfeeding in any given month than a mother living in the safest area. However, it is important to note that the directional result is different across years. For the 2006 sample, taken during the peak of the conflict, higher conflict intensity is actually associated with *longer* breastfeeding duration. This result is consistent with some of the positive (though insignificant) coefficients obtained for the breastfeeding incidence regressions run on the 2006 sample alone, and is plausible theoretically, as we noted in the introduction. Violence that is too intense can disrupt food supply chains, leading to more breastfeeding and longer duration out of a lack of other options, perhaps most especially for poor families. We discuss this point extensively in the next section.

[INSERT TABLE 6 HERE]

5. Discussion

In this section, we expand on the various channels through which armed conflict might reduce prevalence and duration of breastfeeding. Stress from conflict situations could lower the production of breastmilk in mothers or reduce the nutritional content of their breastmilk, thus

reducing use of breastfeeding, the quality of breastmilk and consequently the baby's nutrient intake (Grajeda and Perez-Escamilla 2002). Even if this is not the case in reality, mothers may believe that their breastmilk is "insufficient to satisfy their infant's needs" (Obermeyer and Castle 1997). In other words, regardless of whether Insufficient Milk Syndrome (IMS) is real or imagined, many mothers may opt to not breastfeed their children, or to terminate breastfeeding earlier than recommended. In addition, conflict generates a significant number of refugees and displaced individuals who are likely to face difficulties in accessing basic healthcare and day-to-day necessities (Davis and Kuritsky 2002). This could further impair a mother's nutritional intake and the quality of her breastmilk, leading to a decline in breastfeeding.

Conflict can also reconfigure family dynamics, which impacts breastfeeding. Male war-related casualties endow women with more responsibilities inside the household and increased need for income-generating activities outside the household, which in turn reduces their time or inclination to breastfeed (FAO 1996). Mothers in this situation may also be compelled to spend significant portions of the day acquiring necessities like food and fuel. Reductions in household income for these female-headed households could be another channel through which food and nutritional intake is curtailed, leading to a decline in breastfeeding. Such situations are especially pronounced in times of conflict, where mothers are often the first in a family to sacrifice their own food intake if faced with a shortage, so as to provide for other family members (FAO 1996).

Supply-side effects in health care provision constitute another causal channel. Looting and destruction, inadequate supplies, a shortage of female medical staff and insufficiently trained personnel were common in the healthcare sector following the US invasion (Ministry of Health 2004). Even a decade subsequent to the invasion, the displacement of middle-class Iraqis has presumably reduced the supply of health-care personnel and thus the ability of mothers to access quality care. Furthermore, lack of medical support creates severe gaps in the transfer of knowledge to mothers about the importance of breastfeeding (FAO 1996). Indeed, the results in Del Bono and Rabe (2012) and Fitzsimons and Vera-Hernandez (2013) point to such support from health professionals as a key determinant of breastfeeding. Surrounded by untrained personnel and personnel in insufficient numbers generally, a rift in knowledge created by violent conflict can help to account for reduced prevalence of breastfeeding. The effect is likely to be even stronger if the mother is displaced herself. As we noted earlier, the dataset does not allow us to explore this

possibility directly, but it would tend to create an *upward* bias in the coefficient of interest since such mothers are affected by conflict, but not living in conflict zones at the time of the survey.

Maternal health presents another channel from violent conflict to breastfeeding, as mothers who are unwell are less likely to breastfeed. We do not have sufficient information on maternal health to test this hypothesis directly, but it is worth noting in Table 3 that low birthweight of the baby has a negative and significant association with subsequent breastfeeding, which is suggestive about differences in mothers' health. Many pregnant women in Iraq are anemic (WDI 2011). Moreover, the maternal mortality ratio in Iraq is significantly higher than in many regional counterparts (WHO 2014). Even if the mother does breastfeed, poor nutritional status owing to disrupted supply chains can reduce the volume, as well as the fat and vitamin content of her milk (Picciano 2001).

Finally, we explore the role of supplementary feeding as an obvious intermediary in the relationship between conflict and breastfeeding practices. Breast milk contains various antibodies, enzymes and hormones that are absent in infant formula and other supplements (Labbok et al. 2004), so substitution of formula for breastmilk is potentially harmful. Recall from the previous section that poorer households, and those with mothers who have a lower level of education, are more likely to breastfeed. This suggests the possibility that wealthier families can afford infant formula and other supplements, and can use it as a substitute for breastfeeding.

To test the relationship directly, we define a dependent variable equal to 1 if the child consumed milk or infant formula in the day preceding the survey. We restrict the sample to children under 6 months, to focus on the period for which breastfeeding supplements are not recommended. The sample is also restricted to the 2011 survey wave, for which household wealth information is available. We use a probit regression, and all other regression controls are the same as in our earlier specifications. The results in table 7 indicate that an increase in armed conflict is associated with an increase in milk and formula provision, presumably related mechanically to the corresponding decline in breastfeeding that we identified earlier. But interacting conflict levels with wealth quintiles suggests differentiation by income status.

[INSERT TABLE 7 HERE]

Increased reliance on supplements may occur if mothers doubt the quality of their breastmilk or fear that they have IMS, likely to be substantiated if there is actually an inadequate supply of breastmilk, which often occurs when mothers are stressed. Richer households have a straightforward solution available, because formula is more affordable and accessible to them. Thus, it may actually be that infants from poor households suffer *less* in this regard, since substitution to formula is less of a viable option for these families. However, these effects appear not to continue past 6 months of age. Specifications run on the older cohort find that, for children in poorer households, intense conflict is associated with both reduced incidence of breastfeeding and with reduced consumption of milk and infant formula. At the very least, these results suggest that policies to encourage breastfeeding in conflict areas should consider varying breastfeeding patterns and determinants per conflict intensity, household wealth, and the age of the child. This result may also offer some insight into the positive (though insignificant) coefficients from the 2006 sample, which was the peak of the conflict. It is theoretically plausible that conflict intensity is associated with reduced breastfeeding, for the reasons discussed here, but that the effect is strongest when substitutes are easily available. If conflict is so severe that formula and other supplements are difficult to acquire,[6] then the negative effect on breastfeeding might be dampened out of a lack of any other viable feeding options.

The signs on other coefficients in our main regressions are consistent with existing literature. Increases in education are associated with a decline in the prevalence and duration of breastfeeding, as noted earlier. While the association is the opposite in developed countries, other authors have noted the same negative correlation in poor countries (Dashti et al. 2014), and the link is typically attributed to a rejection of traditional modes of child care among educated women (Abada et al. 2001). Similarly, the results show a negative association between breastfeeding and the mother's age and her residence in an urban area. This has been attributed variously to less reliance on extended family among older and city-dwelling mothers (Abada et al. 2001) and to marketing of infant formula in urban areas (Radwan 2013). Educated and urban mothers are also more likely to work, which would increase their opportunity cost to breastfeed. Regarding parity, women who have had more children are more likely to breastfeed. Dennis (2002) previously found that prior breastfeeding success is a strong predictor of duration of future breastfeeding. Mothers who have experienced the death of a child are less likely to breastfeed, which is a logical inversion

[6] Some civilian areas were actually under blockade at the height of the conflict.

of Dennis' premise. We also note that mothers are more likely to breastfeed male children, and to breastfeed them for a longer period. This could reflect heavier investment in male children, which is well-known in Arab societies (Purnell 2013).

Finally, regarding religious and cultural determinants, our results indicate that mothers in governorates that are predominantly Kurdish or Sunni are less likely to breastfeed, and when they do the duration is shorter, than mothers in Shia areas. As context, the Shia in Iraq are known to have more traditional Islamic values than their Kurdish and Sunni counterparts. For example, Shia in Iraq are much more likely to support the merging of religion and state, whereas Kurds and Sunnis support secular government (Swanbrow 2007). In Lebanon, which also features large populations of both Muslim sects, Faour (2007) finds higher fertility and lower use of contracteption among the Shia, and Mazrui (1994) finds the same with respect to African Muslims.[7] Meyer et al. (1998) find in Kuwait that Shia religious institutions are more likely than Sunni institutions to promulgate an interpretation of Islam that is hostile to political inclusivity for women. While we were not able to find any literature that directly addresses breastfeeding practices by sect in Islam, Huffman et al. (1987) find shorter breastfeeding duration among Muslims than among Hindus in Bangladesh. In any case, if Shia are more religious than Sunnis on average, then conformity with religiously-prescribed breastfeeding practices could account for higher rates of breastfeeding in Shia-dominant areas. Although the Iraqi population is heavily sorted into geographically distinct regions by religion, regional controls do not fully account for religious differences at the household level. However, the dataset does not record any information about religion or sect.

6. Conclusion

Around seven million children under the age of 5 die each year around the world. Almost half of these are newborns, and scores of these deaths are estimated to have been preventable through the simple act of breastfeeding (UNICEF 2014). While typical determinants of breastfeeding include individual and household-level characteristics, this study goes a step further to consider exposure to war. Iraq, and the Middle East in general, have experienced high levels of violent conflict in the last several decades and this kind of tension is unfortunately becoming part of the natural landscape in the region. Using household data from Iraq, our results indicate a negative association between

[7] This result is not universal, however. Shia in Iran have a lower fertility rate (Pew 2011).

exposure to armed conflict and breastfeeding prevalence. There is no doubt that conflict creates immediate and dire devastation to human life, infrastructure and the economy. But conflict can also shape the health of future generations and lead to longer-term social and economic consequences. In this paper, we have argued that war can alter breastfeeding practices for women in conflict zones, which represents an important and almost completely unexplored dimension of these longer-term consequences.

Moreover, our paper explores causal channels to highlight differences in breastfeeding prevalence based not just on conflict intensity, but also on its interaction with household wealth and the provision of supplements. Our results suggest an increase in provision of supplements by women in wealthier quintiles concurrent to high levels of conflict. Possibly fearing a reduction in quality of their breast milk, augmented as a consequence of stress from conflict situations, women who can afford to do so might look to inferior alternatives in an effort to preserve child health outcomes. Results then imply an ameliorative effect for poorer households through a lower reliance on supplements, and consequently a higher incidence of breastfeeding.

Our study's evidence regarding the relationship between conflict and infant feeding, and consequently on the early health of children, is an important path of inquiry for policymakers and especially for international organizations that support interventions aimed at advancing maternal and child health in conflict zones. Food supplements do offer temporary relief for trapped families, but risk reducing probability and duration of breastfeeding. Consistent with what other authors have found, interventions that stress the importance and benefits of breastfeeding are critical for child health and for the future health of the population, and we emphasize here that the importance is especially profound during conflict periods. Attention to the supply of health care and to support systems for women are matters of the utmost urgency both during and after conflict periods. We also echo the calls of other researchers on the urgent need for better data from the region. For example, more localized measures of conflict intensity or repeated sampling for households could help us to pin down a causal impact with more precision.

Variable	Description
Conflict	
Average casualty rate	Average conflict-related casualty rate, per 1000 population, in three years preceding survey in governorate of household
Pre-birth casualty rate	Average conflict-related casualty rate, per 1000 population, two years prior to birth of child in governorate of household
Breastfeeding	
Child ever breastfed	Binary indicating if child has ever been breastfed
Hours to breastfeeding	Hours after birth for mother to put baby to breast
Exclusive breastfeeding	Binary indicating if the child is only breastfed (=1) or receives others supplements (=0)
Current breastfeeding	Binary indicating if child was breastfed at time of survey
Milk or infant formula	Binary indicating if child is receiving milk or infant formula
Health	
Low birthweight below 2.5kg	Binary indicating if child had low birthweight at birth, defined as being below 2.5 kilograms
Formal antenatal care	Binary indicating if mother received antenatal care by a health professional (doctor, midwife, or nurse) or licensed birth attendant
Formal delivery care	Binary indicating if mother was delivered by a health professional or licensed birth attendant
Birth by caesarean section	Binary indicating if mother had a caesarean section
Contraception	Mother or father is practicing one of the following methods of contraception: sterilization, pill, IUD, injections, implants, condom, diaphragm, foam/jelly, lactational amenorrhea method, periodic abstinence, withdrawal
Individual/household	
Male child	Binary indicating if the child is male
Children ever born	Number of children ever born to the mother
Dead children	Number of children belonging to mother who passed away
Primiparous mother	Binary indicating if the child is a firstborn
Child marriage	Binary indicating of the mother was married before 18 years
Wife older than husband	Binary indicating if the mother is older than her husband
Age of mother	Age of mother in years
Primary education of mother	Binary indicating if mother completed primary education
Secondary education of mother	Binary indicating if mother completed secondary education
Mother works	Binary indicating if the mother is employed
Female household head	Binary indicating if the household head is female
Regional	
Urban	Binary indicating if household resides in an urban (=1) or rural (=0) area
Kurd	Binary indicating if household resides in a Kurd-dominant governorate, found in north-east Iraq
Sunni	Binary indicating if household resides in a Sunni-dominant governorate, found in the middle and north-west Iraq

Table 1: Description of variables

	Entire sample		Under 6 months		6 months- 2 years	
Variable	**N**	**Mean**	**N**	**Mean**	**N**	**Mean**
Conflict						
Average casualty rate	15,142	0.20	4,497	0.21	10,318	0.20
Pre-birth casualty rate	14,815	0.17	4,497	0.19	10,318	0.17
Breastfeeding						
Child ever breastfed	15,134	0.93	4,496	0.95	10,316	0.93
Hours to breastfeeding	13,971	0.44	4,236	0.42	9,579	0.45
Exclusive breastfeeding	13,834	0.07	4,244	0.21	9,590	0.01
Current breastfeeding	13,834	0.68	4,244	0.89	9,590	0.58
Milk or infant formula	14,815	0.51	4,497	0.42	10,318	0.55
Health						
Low birthweight below 2.5kg	15,142	0.06	4,497	0.05	10,318	0.06
Formal antenatal care	15,142	0.76	4,497	0.76	10,318	0.77
Formal delivery care	15,142	0.88	4,497	0.87	10,318	0.88
Birth by caesarean section	15,134	0.21	4,497	0.21	10,315	0.21
Contraception	15,142	0.52	4,497	0.46	10,318	0.55
Individual/household						
Male child	15,142	0.52	4,497	0.51	10,318	0.52
Children ever born	15,142	3.27	4,497	3.17	10,318	3.31
Dead children	15,142	0.15	4,497	0.12	10,318	0.13
Primaparous mother	15,142	0.30	4,497	0.33	10,318	0.29
Child marriage	15,142	0.35	4,497	0.35	10,318	0.35
Wife older than husband	14,692	4.93	4,372	4.94	10,023	4.92
Age of mother	15,142	27.80	4,497	26.88	10,318	28.17
Primary education of mother	15,142	0.50	4,497	0.50	10,318	0.50
Secondary education of mother	15,142	0.25	4,497	0.23	10,318	0.26
Mother works	15,142	0.09	4,497	0.08	10,318	0.09
Female household head	15,142	0.94	4,497	0.94	10,318	0.95
Regional						
Urban	15,142	0.58	4,497	0.57	10,318	0.58
Kurd	15,142	0.22	4,497	0.21	10,318	0.22
Sunni	15,142	0.31	4,497	0.33	10,318	0.30
Year is 2011	15,142	0.86	4,497	0.84	10,318	0.87

Table 2: Summary statistics

VARIABLES	Ever breastfed	Breastfed one hour after birth	Exclusively breastfeeding (<6 months)	Currently breastfeeding (all ages)	Currently breastfeeding (<6 months)	Currently breastfeeding (6-24 months)
Average casualty rate	-0.306**	-0.209	-0.0973	-0.205*	-0.343**	-0.167
	(0.126)	(0.293)	(0.306)	(0.l09)	(0.169)	(0.127)
	[-0.0375]	[-0.0817]	[-0.0274]	[-0.0730]	[-0.0609]	[-0.0649]
Health						
Low birthweight (below 2.5kg)	-0.228***	-0.0589	-0.0687	-0.186***	-0.124	-0.193***
	(0.0605)	(0.0491)	(0.113)	(0.0468)	(0.107)	(0.0608)
	[-0.0326]	[-0.0230]	[-0.0188]	[-0.0686]	[-0.0237]	[-0.0763]
Formal antenatal care	0.163***	-0.0939	-0.128**	-0.0340	0.0212	-0.0304
	(0.0425)	(0.0660)	(0.0547)	(0.0321)	(0.0719)	(0.0267)
	[0.0214]	[-0.0369]	[-0.0370]	[-0.120]	[0.00380]	[-0.0118]
Formal delivery care	-0.0610	-0.115	0.0390	-0.0733*	-0.0153	-0.104**
	(0.0544)	(0.0798)	(0.0792)	(0.0392)	(0.109)	(0.0459)
	[-0.00722]	[-0.0454]	[0.0108]	[-0.0257]	[-0.00270]	[-0.0400]
C-section birth	-0.256***	-0.902***	-0.181***	-0.0597	-0.174**	-0.0939**
	(0.0316)	(0.104)	(0.0640)	(0.0410)	(0.0772)	(0.0386)
	[-0.0353]	[-0.315]	[-0.0487]	[-0.0214]	[-0.0329]	[-0.0368]
Contraception	-0.0475	0.00789	-0.187***	0.0351	-0.268***	0.207***
	(0.0302)	(0.0392)	(0.0528)	(0.0304)	(0.0535)	(0.0431)
	[-0.00581]	[0.00309]	[-0.0525]	[0.0125]	[-0.0482]	[0.0808]
Individual/household						
Male child	-0.0324	-0.00191	0.0981***	0.0567**	0.0695**	0.0714**
	(0.0268)	(0.0191)	(0.0361)	(0.0236)	(0.0310)	(0.0316)
	[-0.00398]	[-0.000750]	[0.0276]	[0.0202]	[0.0124]	[0.0278]
Children ever born	0.0607***	0.0124	0.0264	0.0596***	-0.00164	0.0511***
	(0.0100)	(0.00921)	(0.0180)	(0.0104)	(0.0395)	(0.0111)
	[0.00744]	[0.00487]	[0.00744]	[0.0212]	[-0.000292]	[0.0199]
Dead children	-0.447***	0.0294	0.00151	-0.114***	-0.103	-0.103***
	(0.0325)	(0.0236)	(0.0724)	(0.0319)	(0.0865)	(0.0390)
	[-0.0549]	[0.0115]	[0.000424]	[-0.0407]	[-0.0184]	[-0.0403]
Primaparous mother	-0.0969*	-0.109**	-0.0966*	0.0692	-0.0725	0.126***
	(0.0501)	(0.0447)	(0.0571)	(0.0485)	(0.115)	(0.0487)
	[-0.0122]	[-0.0426]	[-0.0268]	[0.0244]	[-0.0131]	[0.0487]
Child marriage	-0.0897	0.00241	-0.112*	-0.0336	0.00170	0.0294
	(0.0568)	(0.0287)	(0.0652)	(0.0272)	(0.0805)	(0.0335)
	[-0.0112]	[0.000945]	[-0.0311]	[-0.0120]	[0.000302]	[0.0114]

Wife older than husband	0.00647	-4.71e-05	-0.00569	-0.00180	-0.00264	-0.00102
	(0.00421)	(0.00221)	(0.00363)	(0.00263)	(0.00692)	(0.00273)
	[0.000794]	[-1.84e-05]	[-0.00160]	[-0.000640]	[-0.000469]	[-0.000398]
Age of mother	-0.0144***	-0.00117	-0.0134***	-0.00989***	0.00372	-0.000320
	(0.00352)	(0.00289)	(0.00431)	(0.00299)	(0.00861)	(0.00404)
	[-0.00176]	[-0.000457]	[-0.00377]	[-0.00352]	[0.000661]	[-0.000125]
Primary education of mother	-0.0285	-0.107**	-0.0464	-0.111***	-0.0998	-0.0903**
	(0.0404)	(0.0448)	(0.0782)	(0.0270)	(0.0714)	(0.0380)
	[-0.00350]	[-0.0420]	[-0.0131]	[-0.0393]	[-0.0177]	[-0.0352]
Secondary education of mother	-0.0682	-0.0845	-0.172***	-0.241***	-0.240***	-0.228***
	(0.0471)	(0.0661)	(0.0652)	(0.0355)	(0.0814)	(0.0427)
	[-0.00756]	[-0.0330]	[-0.0464]	[-0.0878]	[-0.0462]	[-0.0894]
Mother works	0.0291	0.0180	0.0209	4.71e-05	-0.0653	0.0148
	(0.0663)	(0.0883)	(0.0620)	(0.0489)	(0.113)	(0.0611)
	[0.00351]	[0.00707]	[0.00592]	[1.67e-05]	[-0.0120]	[0.00574]
Female household head	0.116	0.00323	0.239**	-0.128*	-0.0631	-0.139*
	(0.0702)	(0.0399)	(0.111)	(0.0669)	(0.128)	(0.0764)
	[0.0154]	[0.00127]	[0.0611]	[-0.0422]	[-0.0108]	[-0.0531]
Regional						
Urban	-0.186***	0.00626	-0.00783	-0.0945**	-0.130**	-0.112**
	(0.0433)	(0.0634)	(0.0533)	(0.0385)	(0.0545)	(0.0456)
	[-0.0224]	[0.00245]	[-0.00220]	[-0.0335]	[-0.0230]	[-0.0436]
Kurd	0.0307	-0.359*	-0.00890	-0.407***	-0.403***	-0.471***
	(0.0820)	(0.184)	(0.136)	(0.0409)	(0.0470)	(0.0445)
	[0.00372]	[-0.136]	[-0.00250]	[-0.151]	[-0.0825]	[-0.186]
Sunni	-0.126	-0.238	-0.119	-0.102	-0.0565	-0.165*
	(0.0956)	(0.212)	(0.156)	(0.0771)	(0.134)	(0.0897)
	[-0.0160]	[-0.0919]	[-0.0329]	[-0.0367]	[-0.0102]	[-0.0648]
Year is 2011	-0.309	0.264*	-0.335***	-0.257***	-0.186	-0.267***
	(0.0827)	(0.139)	(0.0927)	(0.0852)	(0.117)	(0.0810)
	[-0.0319]	[0.101]	[-0.103]	[-0.0868]	[-0.0306]	[-0.101]
Constant	2.251***	0.219	-0.138	1.312***	1.930***	0.741***
	(0.125)	(0.205)	(0.239)	(0.0998)	(0.327)	(0.136)
Observations	14,701	13,562	4,126	13,434	4,126	9,308

Robust standard errors in parentheses, clustered at level of governorate. Marginal effects in brackets, evaluated at the mean. *** p<0.01, ** p<0.05, * p<0.1

Table 3: Breastfeeding incidence

VARIABLES	Ever breastfed	Breastfed one hour after birth	Exclusively breastfeeding (<6 months)	Currently breastfeeding (all ages)	Currently breastfeeding (<6 months)	Currently breastfeeding (6-24 months)
	Average casualty rate in 3 years prior to survey in governorate of household					
2006 and 2011 merged						
Casualty rate	-0.306**	-0.209	-0.0973	-0.205*	-0.343**	-0.167
	(0.126)	(0.293)	(0.306)	(0.l09)	(0.169)	(0.127)
	[-0.0375]	[-0.0817]	[-0.0274]	[-0.0730]	[-0.0609]	[-0.0649]
2011 only						
Casualty rate	-0.430**	-0.267	-0.674	-0.416***	-0.640***	-0.446***
	(0.197)	(0.486)	(0.582)	(0.0905)	(0.234)	(0.112)
	[-0.0545]	[-0.106]	[-0.183]	[0.150]	[-0.117]	[-0.175]
2006 only						
Casualty rate	-0.201	-0.186	0.144	0.00535	-0.287**	0.139
	(0.140)	(0.274)	(0.280)	(0.0761)	(0.137)	(0.0934)
	[-0.0184]	[-0.0625]	[0.0460]	[0.00168]	[-0.0445]	[0.0508]
	Average casualty rate in 2 years prior to birth of child in governorate of household					
2006 and 2011 merged						
Casualty rate	-0.198**	-0.127	-0.223	-0.242**	-0.0892	-0.405**
	(0.0995)	(0.160)	(0.103)	(0.110)	(0.0760)	(0.171)
	[-0.0225]	[-0.0499]	[-0.00626]	[-0.0861]	[-0.0159]	[-0.158]
2011 only						
Casualty rate	-0.391	-0.558	-0.785	-1.652***	-1.039	-1.364***
	(0.325)	(0.551)	(1.232)	(0.364)	(0.648)	(0.260)
	[-0.0457]	[-0.221]	[-0.213]	[-0.595]	[-0.190]	[-0.533]
2006 only						
Casualty rate	-0.200***	-0.0534	-0.113	0.121	-0.119	0.0835
	(0.0603)	(0.199)	(0.0894)	(0.101)	(0.0810)	(0.0814)
	[-0.0173]	[-0.0180]	[-0.0361]	[0.0378]	[-0.0184]	[0.0304]

Robust standard errors in parentheses, clustered at level of governorate. Marginal effects in brackets, evaluated at the mean. *** p<0.01, ** p<0.05, * p<0.1. All regressions use the same set of controls as in table 3.

Table 4: Coefficient on conflict rate – Different measures of conflict, disaggregated by survey year

VARIABLES	Ever breastfed	Breastfed one hour after birth	Exclusively breastfeeding (<6 months)	Currently breastfeeding (all ages)	Currently breastfeeding (<6 months)	Currently breastfeeding (6-24 months)
Average casualty rate	-0.429**	-0.260	-0.663	-0.420***	-0.515**	-0.434***
	(0.206)	(0.501)	(0.495)	(0.0955)	(0.221)	(0.115)
	[-0.0544]	[-0.103]	[-0.179]	[-0.152]	[-0.0927]	[-0.170]
Wealth						
Quintile 1	-0.0480	0.190*	0.0227	0.102*	0.121	0.137**
	(0.0837)	(0.0987)	(0.140)	(0.0539)	(0.107)	(0.0594)
	[-0.00615]	[0.0752]	[0.00616]	[0.0365]	[0.0213]	[0.0533]
Quintile 2	0.0177	0.0590	0.150	0.0847	0.109	0.0738
	(0.0863)	(0.0668)	(0.118)	(0.0532)	(0.109)	(0.0503)
	[0.00223]	[0.0234]	[0.0419]	[0.0302]	[0.0189]	[0.0288]
Quintile 3	0.00291	0.0325	0.0334	0.0105	0.00765	0.0237
	(0.0885)	(0.0858)	(0.119)	(0.0396)	(0.0800)	(0.0447)
	[0.000368]	[0.0129]	[0.00912]	[0.00377]	[0.00137]	[0.00926]
Quintile 4	0.0364	-0.0434	0.0356	-0.00290	0.0272	-0.0213
	(0.0618)	(0.0426)	(0.122)	(0.0542)	(0.109)	(0.0469)
	[0.00453]	[-0.0171]	[0.00973]	[-0.00105]	[0.00483]	[-0.00835]
Other controls						
Health	Yes	Yes	Yes	Yes	Yes	Yes
Individual / Household	Yes	Yes	Yes	Yes	Yes	Yes
Regional	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.019***	0.276	-0.732***	0.999***	1.588***	0.394**
	(0.126)	(0.169)	(0.279)	(0.112)	(0.330)	(0.157)
Observations	12,653	11,646	3,437	11,525	3,437	8,093

Robust standard errors in parentheses, clustered at level of governorate. Marginal effects in brackets, evaluated at the mean. *** p<0.01, ** p<0.05, * p<0.1. All regressions use the same set of controls as in table 3. Highest wealth quintile omitted.

Table 5: Breastfeeding incidence, including controls for household wealth (2011 only)

Variables	All years Coefficient	Hazard ratio	Year 2006 Coefficient	Hazard ratio	Year 2011 Coefficient	Hazard ratio
Average casualty rate	0.119	1.1737	-0.270***	0.7633	0.463***	1.7221
	(0.175)		(0.0949)		(0.142)	
Health						
Low birthweight (below 2.5kg)	0.137**	1.1613	0.0861	1.0900	0.144**	1.1785
	(0.0557)		(0.141)		(0.0583)	
Formal antenatal care	0.0745**	1.0918	0.141	1.1509	0.0747**	1.0929
	(0.0333)		(0.228)		(0.0361)	
Formal delivery care	0.146***	1.1804	0.0859	1.0897	0.163***	1.2044
	(0.0397)		(0.210)		(0.0397)	
C-section birth	0.119**	1.1178	-0.0558	0.9457	0.140**	1.1403
	(0.0532)		(0.0930)		(0.0614)	
Contraception	-0.105***	0.9146	-0.327***	0.7214	-0.0916***	0.9166
	(0.0335)		(0.114)		(0.0334)	
Individual/household						
Male child	-0.0996***	0.9125	-0.118*	0.8888	-0.0971***	0.9160
	(0.0270)		(0.0611)		(0.0298)	
Children ever born	0.0273*	1.0312	0.644***	1.9049	0.0341***	1.0391
	(0.0145)		(0.172)		(0.0118)	
Dead children	0.0177	1.0162	-0.706**	0.4934	0.0235	1.0219
	(0.0326)		(0.294)		(0.0340)	
Primaparous mother	0.0417	1.0344	0.272	1.3132	0.0431	1.0355
	(0.0572)		(0.193)		(0.0608)	
Child marriage	-0.224***	0.7999	-0.223	0.8001	-0.219***	0.8035
	(0.0380)		(0.161)		(0.0369)	
Wife older than husband	-0.00383	0.9961	0.00264	1.0026	-0.00488*	0.9949
	(0.00239)		(0.0108)		(0.00277)	
Age of mother	-0.0371***	0.9623	-0.0151	0.9850	-0.0414***	0.9578
	(0.00483)		(0.0158)		(0.00434)	
Primary education of mother	0.0565	1.0678	-0.134	1.8746	0.0799**	1.0948
	(0.0345)		(0.102)		(0.0353)	
Secondary education of mother	0.171***	1.1876	-0.0867	0.9070	0.204***	1.2283
	(0.0480)		(0.112)		(0.0552)	
Mother works	0.0254	1.0352	-0.130	0.8780	0.0216	1.0305
	(0.0746)		(0.109)		(0.0772)	
Female household head	0.00116	1.0242	-0.149	0.8615	0.0460	1.0813
	(0.0929)		(0.151)		(0.113)	
Regional						
Urban	0.0450	1.0537	0.133	1.1420	0.0406	1.0497
	(0.0444)		(0.107)		(0.0460)	
Kurd	0.405***	1.5240	0.383***	1.4668	0.410***	1.5363
	(0.0442)		(0.128)		(0.0491)	
Sunni	0.216**	1.2249	0.173	1.1888	0.118	1.0976
	(0.108)		(0.180)		(0.113)	
Year is 2011	0.0240	1.0233				
	(0.0177)					
Observations	13,812		1,924		11,888	

Robust standard errors in parentheses, clustered at level of governorate. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Breastfeeding duration

VARIABLES	Dependent variable: Child given milk or infant formula (1)	(2)	(3)	(4)	(5)
Average casualty rate	0.394	0.288	0.294	0.156	0.245
	(0.367)	(0.298)	(0.271)	(0.280)	(0.507)
	[0.155]	[0.114]	[0.116]	[0.0616]	[0.0967]
Casualty*Quintile 1	-0.285				-0.147
	(0.355)				(0.521)
	[-0.112]				[-0.0579]
Casualty*Quintile 2		-0.0558			-0.0193
		(0.243)			(0.338)
		[-0.0220]			[-0.00760]
Casualty*Quintile 3			-0.135		-0.0830
			(0.293)		(0.425)
			[-0.0530]		[-0.0327]
Casualty*Quintile 4				0.850**	0.764
				(0.380)	(0.493)
				[0.335**]	[0.301]
Other Controls					
Health	Yes	Yes	Yes	Yes	Yes
Individual/household	Yes	Yes	Yes	Yes	Yes
Regional	Yes	Yes	Yes	Yes	Yes
Constant	-0.497**	-0.466**	-0.463**	-0.442**	-0.463*
	(0.208)	(0.206)	(0.205)	(0.204)	(0.248)
Observations	2,945	2,945	2,945	2,945	2,945

Robust standard errors in parentheses, clustered at level of governorate. Marginal effects in brackets, evaluated at the mean. *** p<0.01, ** p<0.05, * p<0.1. All regressions use the same set of controls as in table 3.

Table 7: Provision of milk or infant formula, children less than 6 months old

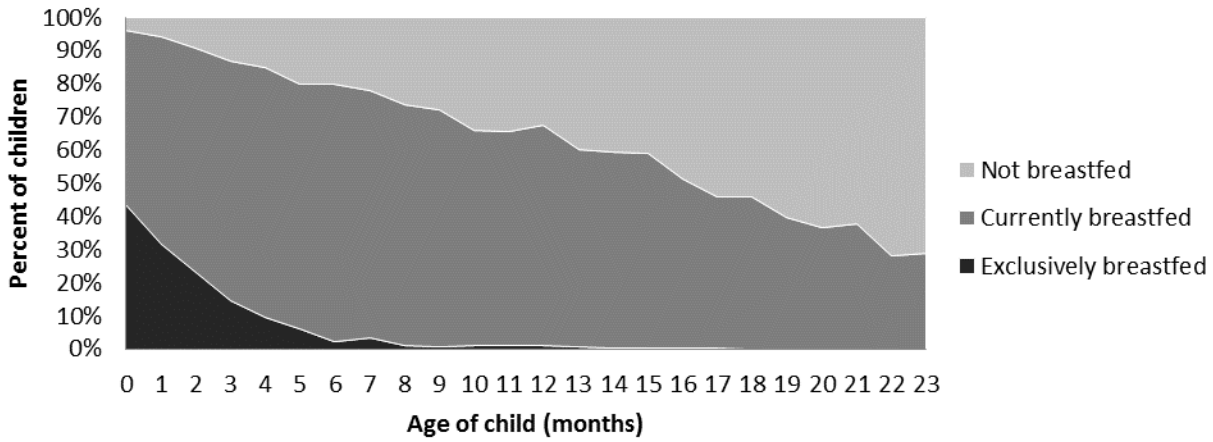

Figure 1: Breastfeeding practices by age (pooled 2006 and 2011 sample)

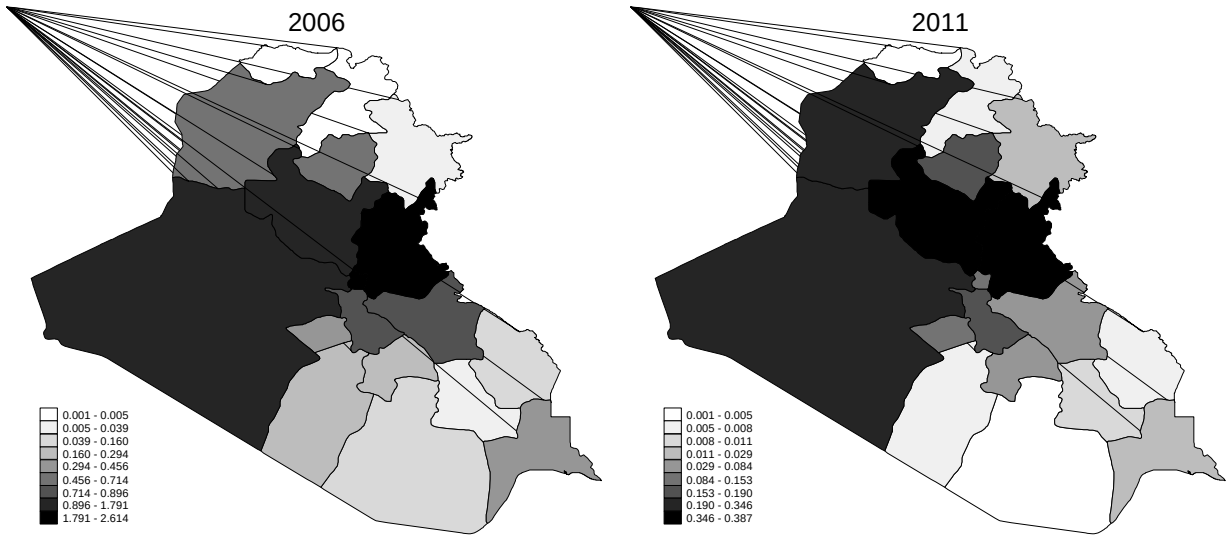

Figure 2: Armed Conflict Casualties in Iraq (per thousand population), 2006 and 2011

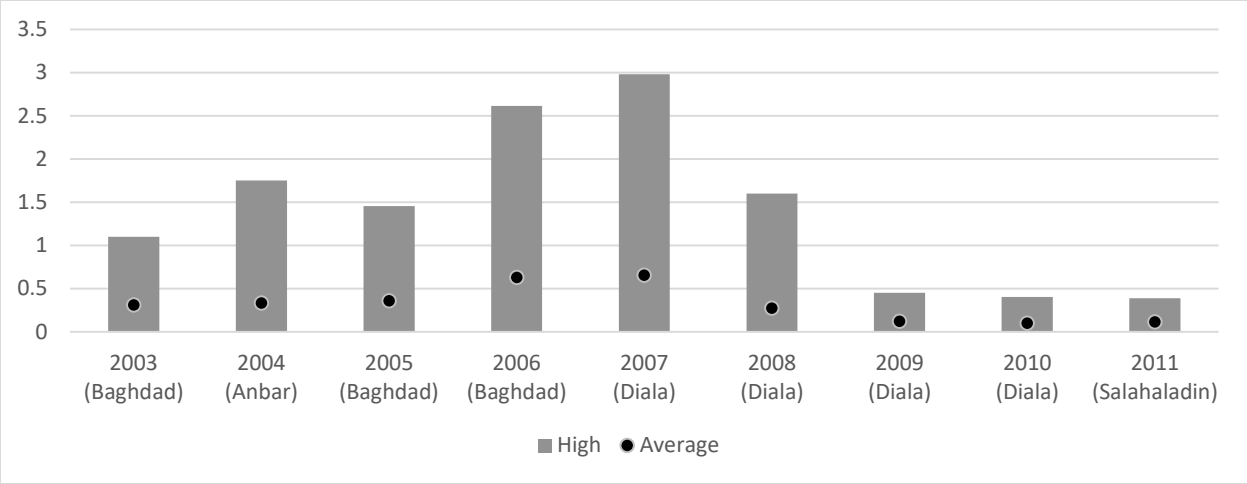

Figure 3: Casualty rate (per thousand population), average and high, 2003-2011

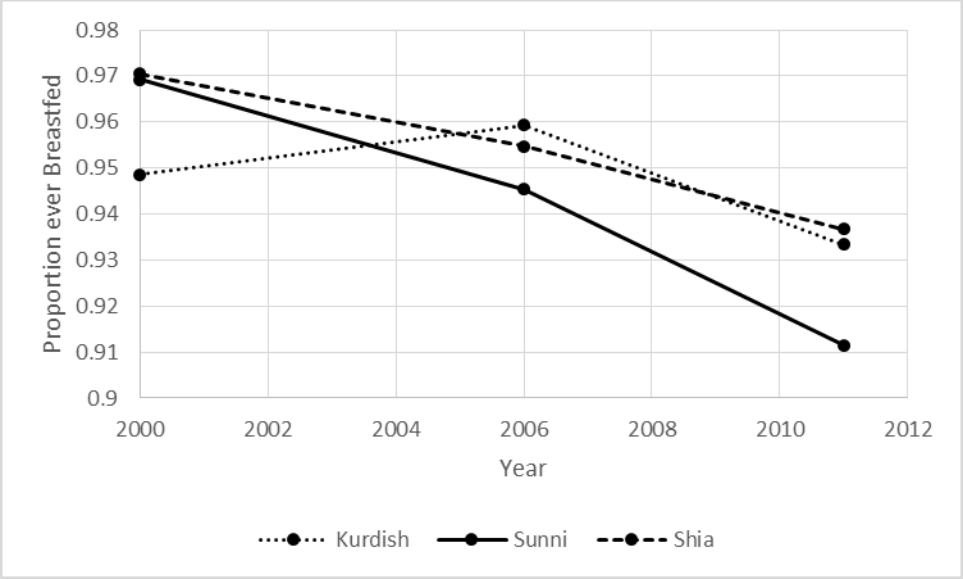

Figure 4: Average breastfeeding rates by region

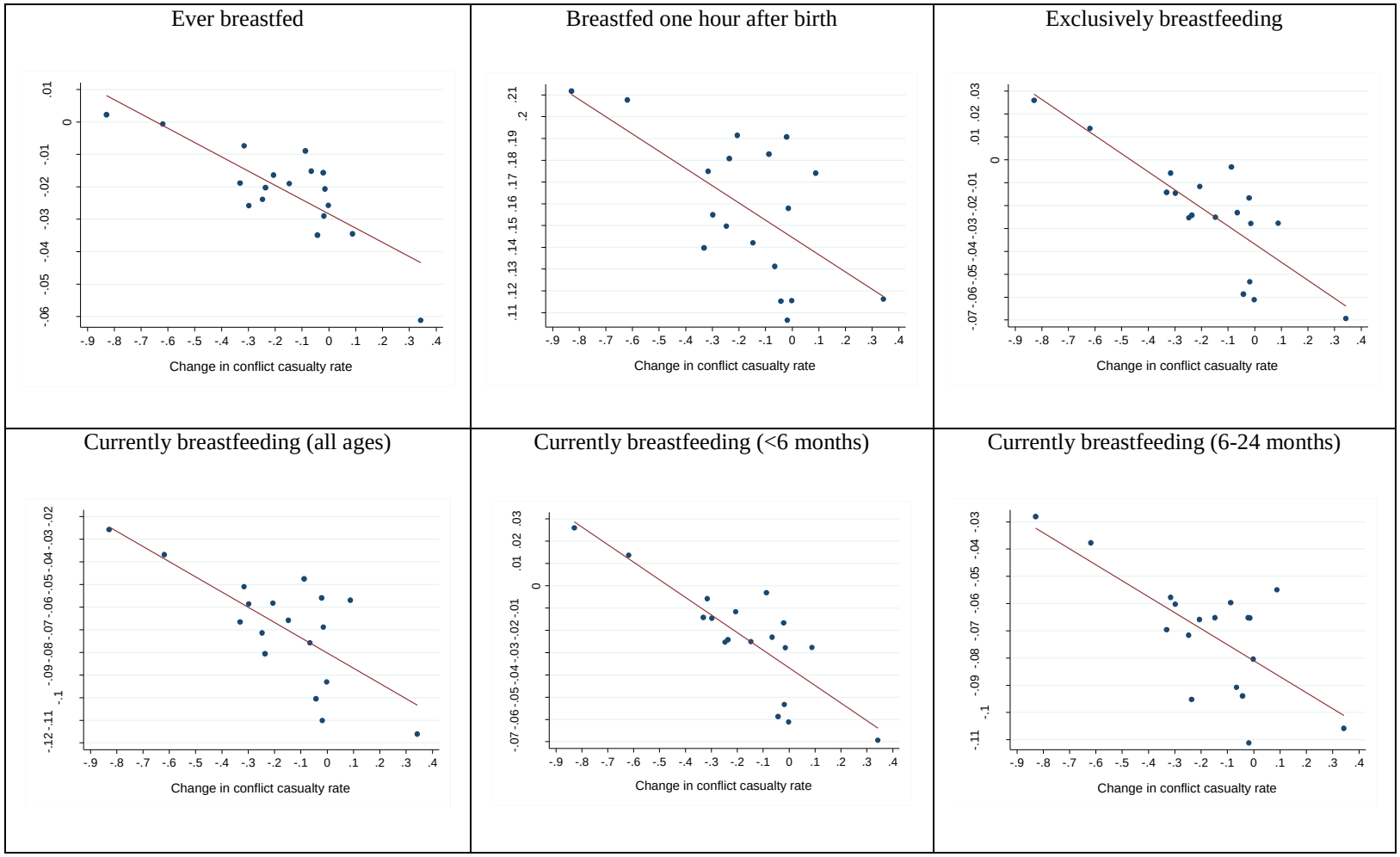

Figure 5: Regression residuals against changes in conflict, by governorate

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