The Effects of the War in Iraq on Nutrition and Health: An Analysis Using Anthropometric Outcomes of Children

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Abstract

The war in Iraq initiated in March 2003 triggered a wave of violence and turmoil in the country, exposing households to insecurity and to instability in daily life. The level of violence has varied across provinces, the south and centre areas being the most affected. Using the different intensities of the conflict across areas and the age at exposure to the war among cohorts, I analyze a possible causal effect of the war on nutritional outcomes of children. I use two empirical strategies, leading to very similar results. Estimates indicate that children born in areas affected by high levels of violence are 0.8 cm shorter than children born in low violence provinces. These results are robust to several specifications. Furthermore, the paper also addresses the channels through which the conflict has affected health and nutrition. The results have not only short-term policy implications, but also, given the empirical evidence of the impact of early child malnutrition on later education, labour and productivity outcomes, the results are of great importance for the future.

JEL: I10, J10, O15
Keywords: health; nutrition; shocks; war; children; Iraq

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1. Introduction

During the past two decades, the health of Iraqi people has substantially deteriorated. The country has been caught up in a continuous wave of wars and conflict causing spread of violence and detrimental effects on people's living standards[1]. The most recent war, initiated by the US-led invasion in 2003, has triggered a new wave of disruption in the country (Cockburn, 2007; Stewart, 2007; Steele, 2008). The conflict has led households to the exposure to violence and killings, to detrimental access to health services, unstable electricity supply, deterioration of drinking water and sewage systems, lack of adequate food and to disruptions of households' daily life (Unicef, June, 2003; UNAMI, 2006). However, the intensity of the violence has varied across provinces and districts in Iraq, the south and centre being the most affected during the first years (Allawi, 2007; Cockburn, 2007)[2]. This variation in insecurity and violence across provinces together with the difference in ages of exposure to the war provide a unique opportunity for a quasi-experimental design, where the war can be thought of as an exogenous shock to the child individual characteristics and household decision making. In this paper, I examine a possible causal effect of the war-related shock, i.e. treatment, on health outcomes of children. In particular, I analyze if the exposure to high levels of violence has had any effect on nutrition status of children. Using difference-in-difference estimators, I use two empirical strategies.

This research relates to various fields in the literature on conflict, development economics, and nutrition. I briefly mention below the key areas in the mentioned subjects that motivate this research. In economics, this paper relates to two areas of the literature that cover health outcomes, shocks and conflicts. First, there is a large body of

[1] Deterioration of living standards decreased during the Iraq-Iran War in the 1980s, but subsequently with the first Gulf War in the 1990s, and with the subsequent sanctions imposed by the UN in 1991.
[2] This paper uses data covering the first three years of the conflict, a period which was relatively less violent than the subsequent years. Violence and insecurity substantially increased in the aftermath of the bombing of the Samarra Al-Asakari Mosque in February 2006.

work studying the relationships between economic conditions and wars, and in particular civil, wars and conflict. The empirical research has extensively been focused on the –macro- causes of wars and conflicts (Collier and Hoeffler, 1998; Collier and Hoeffler, 2004; Miguel et al., 2004; Dube and Vargas, 2006) and on the meso-level implications (Stewart and Valpy, 2001; Barron et al., 2004), with many of the evidence drawn from African countries. But less has been studied at the micro-level on the impacts of conflicts and war on households and individuals. Although empirical work in this area using micro-data is growing (Akresh and Verwimp, 2006; Bundervoet et al., April 2008; Kondylis, 2007; Shemyakina, 2006), it is still very much African-focused[3]. Virtually, no empirical evidence exists for Middle East countries.

Second, within the development economics literature there is a great deal of work analyzing health and its relationship to socio-economic characteristics; its impacts on economic outcomes and linkages with consumption smoothing. Strauss and Thomas (2007) provide an excellent overview of this theoretical and empirical literature, which underlies how health and nutrition positively affect human capital accumulation, productivity as well as people's livings standards. On the one side, there is a unanimous agreement in the literature that health is an important factor for determining economic development and well-being in populations. Behrman and Deolalikar (1988) go beyond this, stating that, "health and nutrition are important as ends in themselves". On the other side, empirical studies have shown that nutrition affects schooling, income, labour force participation and fertility in later life (Alderman et al., 1996; Thomas and Strauss, 1997; Horton, 1999; Alderman et al., 2006; Maluccio et al., 2006).

In the development literature, quantitative research in conflict-affected areas has been modest, not only because of the lack of data, but also because data is not

[3] From all the empirical literature reviewed on the impacts of conflicts, only one has focused in a non-African country (Shemyakina, 2006).

rigorously collected[4], or because of divergence on priorities. This has exacerbated the distance between academic research and practitioners studies. The need for further research has increasingly been demanded (WHO, 2002; USAID, 2006; GAIN, 2008; UNHCR, 2007)[5]. This creates a need to establish closer ties between academic research and policy making in conflict-affected countries.

This paper contributes in several ways to the above mentioned research areas. Firstly, it adds to the economic literature on conflicts by studying the impacts of war and conflict using micro-level data. Secondly, it is relevant to the development economics literature by expanding the research of prenatal and early childhood shocks on nutrition and health. Finally, it contributes to the empirical research on conflict-affected countries and attempts to create linkages between academic-oriented studies and policy making.

The rest of the paper is organized as follows. Section two briefly describes the literature and highlights key results of the research on health and nutrition. Section three provides an overall background to the conflict in Iraq and reviews the main aspects of the 2003 war while exploring some of the implications for health. Section four focuses on the main outcomes used in this paper. Section five describes the data and sample. Section six covers the identification and empirical strategies followed. Section seven and sub-sections present the results for the nutrition indicator, height-for-age. Section eight shows results for the other two indicators, weight-for-height and weight-for-age.

[4] Data from media and humanitarian organizations can provide valuable information despite the fact that, in many instances, it is not collected with a scientific or rigorous methodology.

[5] For example, the WHO acknowledges that research is crucial for assessing the impact of conflicts on health (WHO, 2002). The UNHCR states that studies are important not only to conducting situational assessment but for assessing which interventions are effective and incorporating lessons learnt to programs (UNHCR, December 2007). USAID affirms that studies are needed to do a smooth transition from humanitarian work to development interventions (USAID, 2006). The World Bank took a major step by establishing a full research program on the economics of conflicts in 1999 (World Bank, 2008).

Section nine explores some of the mechanisms in which the war affected health of children. The final section provides a discussion of the results and concludes.

2. Literature

This section reviews the literature and empirical research on the impacts of shocks on health as well as the literature on nutrition and health in early childhood.

2.1 Literature on Shocks

The economics literature on shocks and health draws mainly from the modelling of natural disasters and other phenomena as exogenous shocks to household's decision making. These shocks include changes in weather conditions, such as floods, droughts, earthquakes, fires and rainfall, but also other catastrophes such as famines and hunger. These have provided unique opportunities to explore causalities. Studies of natural disasters have found negative effects on health. For example, Hoddinott and Kinsey (2001) using panel survey data of resettled villages in rural Zimbabwe, analyse the impact of the 1994 drought. They find that younger children lose 1.5-2 cm in the aftermath of the drought, while there is no impact for older cohorts. They also find that these effects are less evident in households who are able to smooth their consumption through holdings of livestock. Also for Zimbabwe, Alderman et al. (2006) use civil war and drought shocks to identify differences in pre-school nutritional status across siblings. They find that children exposed to these shocks are 3.4 cm shorter and complete 0.85 years less schooling. Jayachandran (1995) studies air quality and child mortality in Indonesia. She exploits the massive 1997 wildfires to identify an impact on child survival. She finds that exposure to pollution during the last trimester in-utero has negative effects on survival of babies. Rose (1999) examines whether rainfall shocks in early childhood increase the probability of survival of girls. She finds that a positive rainfall shock in the first two years of life significantly increases the likelihood that a girl survives relative to boys' survival. More recent work explores health events in early life, including health in-utero and its link to health in adult life and human capital accumulation. Almond (2006) finds that adults who were in-utero during the 1918 influenza pandemic in the US had lower education levels, lower wages and more disabilities than non exposed children. He finds that exposed pregnant women are more vulnerable to influenza and had more still births. On the impacts of conflict, Bundervoet et al. (2008) study the effects of the civil war in rural Burundi. They find that children born in provinces affected by the war had on average 0.5 standard deviations lower height-for-age z-scores than non-exposed children. Akresh and Verwimp (2006) study two types of shocks, crop failure and civil conflict, and find that girls had 0.72 standard deviations lower in their height-for-age z-scores. Generally, the mentioned studies stress not only the importance of health in early childhood for later adult outcomes, but also of health in-utero health and during pregnancy.

2.2 Literature on growth and nutrition

Within the nutritional and epidemiological literatures, studies on nutrition in early childhood are extensive. An important result of this research during the past two decades is that it has helped better understand nutrition patterns and has facilitated the development of international standards for assessing growth of children in developing countries (Martorell, 1996; Li et al., 2003; Stein et al., 2003; Stein et al., 2008). This literature highlights the importance of protein and nutritional intake in early life: infants and young children require considerably more proteins than their older peers

(Scrimshaw et al., 1994; Ziegler, 2006)[6]. In addition, health conditions of the mother during pregnancy are other important determinants of the child's health (Metcoff, 1986).

The initial months of life, in a developing country context, is also of greatest vulnerability and risk and could affect the cognitive development of a child. Research from Martorell and Habicht (1986) and Ruel et al. (2008) has shown that the first two years of the life of a child are crucial for growth, and suggest that it is less likely for children who present slow physical growth during the first 24 months to catch up later in life. If growth is decelerated, it can have possible irreversible and long-term physical consequences (Martorell and Khan, K.L., Schroeder, D, 1994; Martorell et al., 1995; Li et al., 2003). Subsequently, a key conclusion from these various studies is that nutrition in early childhood and during pregnancy determines the physical development of the child and her cognitive development.

3. Background[7]

This section provides some background to the main political and socio-economic factors in Iraq prior to 2003. In addition, it provides an overview of the 2003 war and highlights some of the damages of the conflict relevant for health.

3.1 Pre-2003 situation

Iraq once had some of the highest health and educational indicators in the Middle East, and was one of the most industrialised and developed countries in the region. However,

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[6] Children require energy and protein for both growth and for maintenance. For example, an infant of 0-1 month requires 1 gram of protein per kg/day for total growth, a 1-3 month-old .51 grs, while a 3-6 month-old .3 grs and a 2-5 year-old .07 grs of protein per day.

[7] This section draws from books written by ex-government officials and humanitarian personnel as weel as from reports of organizations and companies involved in the reconstruction efforts. It also relies on personal interviews conducted with staff and Iraqi personnel working with several organizations.

living standards substantially deteriorated after the Iraq-Iran war in the 1980s and continued to decline during the Gulf War in 1990-91 and with the 12 years of international sanctions[8]. The deterioration of economic and social conditions led the UN to establish the Oil-For-Food Program (OFFP) in April 1995[9]. Under the terms of the OFFP, the Government of Iraq was allowed to utilise oil revenues to purchase humanitarian goods, including food items[10]. The OFFP started delivering supplies in early 1997, and included twenty sectors, with food being the largest component in financial terms. The program ran until 2003 and was terminated a few months after the 2003 war started. Under the OFFP around 39 billion USD were spent on humanitarian supplies. The independent 2005 inquiry into the impact of the OFFP concluded that the program achieved its humanitarian purposes; mainly through the provision of food, medicines and maintenance supplies to key sectors[11]. The report stated that living conditions of the population improved, in particular the nutrition of children. Rates of malnutrition decreased 2.1 percentage points in the North and 1.9 percentage points in the South and Centre (WG-IIC, 2005).

3.2 The 2003 War[12]

Although several discussions on the invasion started to take place prior to 2003, the initial US plans considered entering the country from the North through Turkey, then moving through towards the Kurdistan region in Iraq and then south to Baghdad. These plans were hampered by Turkey's reluctance to allow US forces to pass through their

[8] With Iraq's invasion of Kuwait in 1990, the UN Security Council passed a resolution SC 661 establishing economic sanctions on Iraq, including a trade embargo. At the end of the Gulf War, sanctions were linked to the removal of weapons of mass destruction in SC 687.
[9] OFFP was created through UN resolution SC 986.
[10] The agreement established that the Government of Iraq would manage the program in the centre and southern provinces (i.e. governorates) and the UN would take the lead in the Northern Governorates.
[11] Nevertheless, there were serious problems in the implementation of the program as well as on the adequate and timely delivery of supplies. For a review on the OFFP see von Sponech (2006) .
[12] Paragraph based on Allawi (2007), Cockburn (2007) and Ricks (2007).

territory. The invasion, known as Operation Iraqi Freedom, therefore, began instead from the south of the country. On March 20 2003, three US and one British Army divisions, a total of 145,000 troops and 247 tanks, entered Iraq from the border with Kuwait and moved across the desert of An Nasiriyah. One of the US divisions moved north along the western bank of the Euphrates River towards Karbala, and other moved towards the southern oil fields and then north towards Nasiriyah, capital of Thi Qar province. The British moved towards Basra. The "shock and awe"[13] period also consisted of aerial bombardment, targeting government buildings and houses owned by the Baath regime[14]. There are reports suggesting that the air campaign also targeted many populated areas[15].

The initial warfare was virtually over within a few weeks. However, despite the fact that the Iraqi army provided little resistance, coalition forces met with several armed groups, militias, and paramilitaries. This created a state of violence and hostility in the south and centre parts of the country. For example, the British military surrounded Basra in the first week, but serious fighting limited them from establishing control. The US forces severely clashed in Nasiriya, and subsequently on their way up to Baghdad were halted by several ambushes and fighting. At the same time, cities were also affected by violence as armed groups from different sides clashed: some were still supporters of Saddam Hussein, while others were from religious militia groups. In Diyala province (i.e. governorate), Badr forces[16] seized Baquba, while other militants linked to political parties, such as the Iraqi National Accords (INA) moved to Anbar,

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[13] A military strategy, formulated by Harlan Ullman and James Wade in 1996, is based on "achieving rapid dominance over an adversary by the initial imposition of overwhelming force and firepower". It was used in Iraq in 2003 (Knowles 2006)
[14] The Baath Socialist Party came into power with a *coup d'état* in 1968. Saddam Hussein became president 1979.
[15] According to Landmine Monitor (2003) the coalition use cluster munitions in many populated areas throughout Iraq, including Baghdad, Basra, Hillah, Kirkuk, Mosul, Nasiriyah, and other cities and towns.
[16] Badr forces are a Shiite powerful militia that was formed and trained in Iran during the 1980s and link to the party of the Supreme Islamic Iraqi Council (SIIC)

and the Islamic party of the Supreme Council of the Islamic Revolution of Iraq (SCIR) to Kut in Wasit province[17]. It is said that the Iraqi national military troops did not surrender, but just basically went home. The number of Iraqi army or militia fatalities it is not known, but the coalition forces casualties mounted to 172 by the end of April 2003 (CNN, 2009). US President G.W. Bush declared "Mission Accomplished" in May 1st, after the coalition forces gained control of Baghdad. A Coalition Provisional Authority (CPA), in charge of overseeing overall administration, was set up on the same day.

In contrast with the 1991 war, coalition forces did not purposely target public infrastructure. Although numerous public buildings, private dwellings, and social infrastructure were damaged during the aerial bombings; it is far less than the damage incurred in the previous war in 1991[18]. Nonetheless, damage was done in several ways. A report to US Congress mentioned, already in early April 2003, the state of events:

"*It is widely believed that the current humanitarian situation is worsening due to the war. The war is disrupting critical infrastructure, delivery of basic services, and food distribution*"[19].

During the subsequent months, the war triggered a new wave of violence and destruction that damaged electricity, water supply, sewage networks, food availability and the administrative functioning. Reconstruction efforts were also hampered by armed group activity. The two major contractors in charge of rehabilitation, Abt and Betchel, often reported that insecurity was the major risk in hampering the completion of projects[20]. Personal accounts of Iraqi civil servants, CPA officials, journalists and

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[17] Iraqi National Accords (INA) was founded in 1991 by Iyad Allawi who was the interim Iraqi Prime Minister up to election in 2005. The Supreme Council of the Islamic Revolution of Iraq (SCIR) was founded in 1982.
[18] According to Cockburn (2007) in 2003 the US deliberately avoided bombing the Iraqi infrastructure. While in 1991 the US targeted electric power stations, oil refineries, telecommunication centres and essential bridges as a military strategy.
[19] See Margesson and Tarnoff (2003 ; pg.1)
[20] For example, Abt in charge of the reconstruction of the health system acknowledge that security was one of the major factors to delay fielding of staff (Abt, 2004). Bechtel who lead other infrastructure

humanitarian workers show that during the "shock and awe" period there was some damage to infrastructure, but they point to the fact that it was the violence, triggered during the subsequent months, that devastated Iraq infrastructure[21]. The sections below present an overview of the areas relevant to health and nutrition.

[Figure 1: Timeline about here]

3.3 Looting and Robbery

Within a few days of the invasion, the vacuum of an Iraqi authority was visible and eminent, while lack of order and a wave of looting and robbery spread throughout the country. Several public buildings, hospitals, schools, food distribution points and even museums were left unprotected, stimulating theft and burglary. Many looters acted as profiteers and thieves but others as a signal to oppose the coalition forces.

Although there has been no quantification of the damages to public infrastructure, anecdotal evidence and reports from contracting companies, in charge of reconstruction, suggest that a majority of the damage was done through vandalism. The Ministry of Health in Iraq reported that one third of Primary Health Care centres were looted, mainly in urban centres although some in rural areas as well. A Unicef report (Unicef, 2003) provided an overview of the situation in June 2003:

"*500 schools in Baghdad were damaged and equipment and materials had been looted....half of the 1410 water treatment plants in Iraq were no longer functioning and all the sewage treatment plants in Baghdad were out of action. Electricity supplies to nearly forty percent of all water and sewage treatment plants were interrupted. It was further estimated that nearly US$ 50 million worth of spare parts, equipment, water treatment chemicals and service vehicles –were- looted. Some of the hospitals had escaped damage or looting and continued functioning with minimum levels of equipment, but a majority of the primary healthcare facilities had virtually ceased operations. Staff as well as users of such services, particularly women and children, refrained from attending either school or health facilities due to the adverse security environmen*t".

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projects in water, electricity, airports and port also reported security as a major concern as early as in June 2003. It had later on several personnel abducted and killed (Sawyer, 2006).

[21] See for example Diaz and Garfield (2003), Allawi (2007), Cockburn (2007), Stewart (2007) and Unicef (2003).

3.4 Electricity, Water and Sanitation, and Health Services

One of the main challenges for the CPA, and later for the Government of Iraq, has been the restoration of the electricity network, which until December 2007 had not reached pre-war levels. Moreover, the lack of power severely damaged the water and sanitation infrastructure as well as the provision of health services. Although, public infrastructure was already in a precarious state, and the electricity system was somehow functioning miraculously, the 2003 war triggered an abrupt collapse[22]. Furthermore, the continuous violence hampered restoration efforts. The lack of spare parts combined with poor maintenance made it difficult for the electricity and water systems to be fully operational[23]. Moreover, reconstruction was continuously interrupted by insurgency groups and sabotage. This created an endless cycle of repair - sabotage- repair.

The lack of electricity deteriorated access to safe water and proper sanitation not only because electric power is needed to operate treatment plants, but also, because Iraq is a flat country, in which, except for the North, electricity is needed to pump treated or waste water. During the first years of the war, access to safe water was the major problem in several parts of the country[24]. Similarly, black water was not been properly treated due to malfunctioning treatment plants, or continued to be dumped into rivers or in the desert, which has incremented contamination of air and water born diseases.

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[22] Through looting and attacks but also the administration (CPA and subsequently PIG) was full of incompetence, lack of planning, and lack of knowledge of the real situation.

[23] A report commissioned by Unicef stated that the war resulted in almost half of all water and sewage treatment and pumping stations being out of order. The main reasons were power outages, but also looting, general insecurity, as well as collateral damage (Doyle, 2003).

[24] For example, the lack of chlorine and purification tablets exposed households in Basra to water contamination. In Najaf, fighting and bombing rendered water pumps inoperable and the lack of electricity damaged the water supply network. Many issues that could have been easy to address were rendered difficult because of the violence. Floods hit Missan and Thi Qar provinces in 2004 and the deteriorated security situation made much aid relief almost impossible to deliver (UNAMI, various). Moreover, salinity, which is common in the south, became exacerbated. The higher levels of salinity make water undrinkable and not good for use in agriculture. Consequently, many people in the south have relied on bottled water which has been inaccessible due to insecurity.

The 2003 war hit the -already deteriorated- health system[25] severely. According to Diaz and Garfield (2003) 12 percent of all hospitals were damaged and 7 percent were looted. Moreover, the persistent electricity power shortcuts, unstable water supply and sewage system, and widespread insecurity, paralyzed the delivery of services in many areas preventing efficient health provision (Alwan, 2004)[26]. The system was also affected by an institutional vacuum and a politicization of the health services. Despite the damage, many health facilities continued operating[27], and health personnel were reported to have worked under tight security and limited conditions.

3.5 Food availability

Iraq has the largest public distribution system (PDS) of food in the world[28]. The food basket is composed of essential items such as wheat, rice, sugar, oil and soap[29]. According to the World Food Program (WFP, 2005), almost 100 percent of the population in Iraq received rations prior to 2003[30]. After the war, the system was partially interrupted but the majority of the population continued to receive food rations. The food quality and quantity deteriorated as the PDS was not only affected by looting and destruction, but also few processing factories compiled with safety regulations (Alwan, 2004). A survey in 2005 estimated that 15 percent of the population was *food*

[25] The health care system in Iraq was set up during the years of prosperity in the late 1970s, which allowed the regime to set up a health model based on European standards. It was also made fairly equitable with the modern facilities of the time, with many of the doctors and nurses came from other Middle East countries. But, it deteriorated during the wars and sanction years, not only in terms of infrastructure and supplies, but also many of the foreign personnel left the country.

[26] Water and health systems are reported to be operational and functioning as of 2006.

[27] Around 76 percent of hospitals had backup generators as power cuts were also common before 2003.

[28] The PDS is a universal in-kind transfer program which gives every Iraqi the right to a monthly entitlement, each individual receiving the same amount. Infants sometimes receive infant formula and weaning cereals.

[29] A ration consists of 2,215 kilocalories per person per day and provided the necessary calories, but it was still low in vitamins, protein and minerals: The PDS individual monthly ration is the following: wheat (9 kilos), rice (3 kilos), sugar (2 kilos), tea (200 grams), vegetable oil (1.25 kilo), detergent (500 grams), pulses (250 grams), adult milk (250 grams), soap (250 grams), infant formula (1.8 kilo), salt (100 grams) and weaning cereals (800 grams). Salt, Adult Milk, I. Formula and W. Cereal are infrequently distributed in some sporadic areas during last year.

[30] The PDS started just after the first Gulf War in 1991 and was later reinforced by the OFFP.

insecure and 47 percent depended on the ration to meet their basic food intake, and households reported that collecting rations was a psychological burden due to the persistent insecurity (COSIT and WFP, 2005). According to one of the surveys used in this research, COSIT (2005), 97 percent of the population reported receiving rations in May 2004, but there is no information on the quantity and quality of food consumption. Therefore, the analysis presented cannot establish precise links between food consumption and nutrition. However, I assume that, because of the deterioration of the food inspection systems, probably, the quality of the ration decreased.

4. Nutritional Outcomes

Nutritional outcomes for children can be measured by several anthropometric indicators. The three most common used are acute malnutrition, chronic malnutrition and general malnutrition (WHO, 1995). Acute malnutrition, or weight-for-height, is an indicator of *wasting* caused by severe, recent onset of adversities such as rapid reductions in food availability or interference with food intake due to infections. Thereafter, reflects current malnutrition status (e.g. at the time of the survey) relative to height. Chronic malnutrition, or height-for –age, is an indicator of *stunting* attributed to long-term malnutrition resulting from low growth due to protein deficiency, low-food intake for longer periods, concurrent illnesses, or detrimental health of the mother during pregnancy. It reflects the accumulated detrimental effect over a period of time. Underweight, or weight-for-age, is an indicator of *general malnutrition*; it reflects the body mass relative to age. From the above mentioned indicators, chronic malnutrition is important because children that become stunted during their early months/years of life are likely to remain, in future periods, short in height for their age (Martorell and Habicht, 1986). While wasting is an indicator of short-term health, and general undernutrition can reflect both, short and long term nutrition status, they might be overcome at later stages in life by the gain of weight. The literature on nutrition indicates that these measures do not necessarily move together (Victoria 1991). So, children that develop chronic malnutrition, or stunting, might or might not have acute malnutrition, or wasting[31]. I use these three indicators in my analysis, but a deeper examination is dedicated to height-for-age, given its relevance as a long-term determinant of health.

I follow international standards and standardise measures by using a reference population of well-nourished children[32]. The reference population is used to calculate anthropometric indices that can be expressed in form of z-scores. These z-scores are calculated for a child's height (or weight), given age and gender, by subtracting the median height (or weight) in the reference population and dividing by the standard deviation of the reference population (see appendix for details). The idea behind the standardisation is that children in normal conditions grow in similar patters (Falkner and Tanner, 1986; WHO, 1995), so any deficiency on growth can be attributed to a detrimental situation.

5. Data and Sample

5.1 Data

I use four different sources of data. A first data source is the *Iraq Living Conditions Survey* (ILCS), a national-wide household survey conducted in May/August 2004. The survey was done by COSIT, the Iraqi National Statistics Office with support from Fafo, a Norwegian Institute. The survey design was done in two-stages. The initial sample consisted of 22,000 households. Fieldwork was conducted between the months of

[31] The relationship between these two indicators is further discussed in subsequent sections.

[32] NCHS/WHO US reference population has been commonly used with the argument that it reflects ethnic diversity of a well-nourished population. Recently, the WHO has developed its own growth charts using a world-wide reference population. I use the NCHS/WHO.

March to May 2004 for 16 of the 18 provinces, which are called governorates in Iraq, and between July and August for the remaining two provinces. Additional information about the survey and on how children were measured is included in the appendix.

The second and third surveys used are the Multiple Indicator Cluster Surveys (MICS) conducted by COSIT and the Ministry of Health together with Unicef. Both surveys, MICS 2000 and MICS 2006 are nationally representative and are part of Unicef's global monitoring system for children. The first survey was conducted at the beginning/mid-2000 and the sample included 13,430 households. The second survey was carried out between February 2006 and June 2006. The sample included 18,144 households.

A fourth data source is the Iraq Body Count (IBC) database, compiled by an NGO based in London. This database records violent deaths that have occurred since March 2003. IBC uses key words to search and scan internet based media reports of violent deaths, which are a direct result of the conflict. This process uses public domain search engines and media outlets. Sources include also Arabic-language news media as well as some Iraqi newspapers that publish information in English. Data is also compared with morgue information from the Ministry of Health[33].

For the analysis at the provincial level I use all three household surveys, however at the district level, and for the identification of mechanisms of the effects of the war, I only use the ILCS.

5.2 Sample

Graphs A.1 and A.2, included in the appendix, show the distribution of z-scores for height-for-age and for weight-for-height -or length-, given age and gender. The graphs

[33] For details on the IBC data collection and compilation see www.iraqbodycount.org.

also include a theoretical normal distribution, which can be thought of being an approximate of the reference population with mean zero. The first graph shows that height-for-age z-scores are skewed to the left in the three years, but the distribution is more spread in 2004 and 2006 in comparison to 2006. In the contrary, weight-for-height z-scores seem to be slightly skewed to the right during the last two years, but as indicated in the appendix, the measurement of weights may pose some problems. Nevertheless, in the results section, I come back to discuss this: gaining weight, given height, age and gender, could be seen not only as an improvement of nutrition, but also, as the outcome of a lack of exercise and an unbalanced diet.

Table A.1 presents the descriptive statistics of the observable characteristics of children, less than 5 years old, for each of the three cross-sectional surveys. In addition, it also shows the means of the sub-samples of included and excluded children, and their difference and statistical significance. The included observations represent children whose z-scores are within conventional levels, between -6 or + 6 standard deviations of the reference population. Conversely, observations are excluded where z-scores are not within these conventional levels, which would indicate that children were measured with error, or, in some cases, that children were not measured at all (see appendix for details).

In 2000, the sub-sample of included children represents 92 percent of the total number of children, in 2004 74 percent and in 2006 is about 94 percent. The means of z-scores for the three nutrition indicators seem to slightly increase. For example, the average height-for-age z-score in 2000 was one SD below the reference population, while in 2006 the mean is 0.76 below. It is important to mention that while this is an indication of the average z-score, it is not possible to explicitly compare estimates as these are from three different surveys. I will come back to this in section 6.

I use 2000 as the baseline year. A typical child, in the 2000 survey sample, is one SD, of the height-for-age z-score, below the reference population, and also 0.3 SD below in the weight-for-age z-score. The child has 49 percent chance to be a girl, 57 percent likelihood to be living in an urban area, is likely to be part of an eight-member household, has 70 percent chance to have access to drinking water, and is likely to be living in a 4-room dwelling. His or her mother probably has finished primary school (63 percent) but not necessarily high-school (6 percent). In 2004, a child has almost the same probabilities to be in a similar situation, but would have a weight-for-height z-score similar to the reference population. Though, in 2006, a child has a height-for-age z-score 0.7 SD below the reference population, he or she is 0.25 SD above in the weight-for-height z-score. This indicates that stunting, low height, given age and gender, is a problem in Iraq. The fact that children's z-scores are, on average, above the reference population in weight-for-height indicates that children are gaining weight. As stated above, I come back to this in the results section.

Similarly in 2006, an average child lives in a smaller household with 62 percent chance to be residing in a urban area, moreover, his or her mother has less than 50 percent likelihood to have completed primary school. Columns 1d, 2d and 3d present the difference in means (and standard errors) between included observations, reported and excluded. The differences for the age of the child are significant in the three surveys, showing that younger children were more likely to be either measured with error, or not measured at all. In the case of the presence of illness, the differences are also statistically significant at 5 percent level. However, except in 2004, included children are more likely to have reported being ill. This seems a bit odd as one would expect ill children to be not measured, and not the opposite. Other differences are reported for the number of household members, urban areas, and access to drinking water. The fact that there exist some statistically significant differences at conventional levels on observable characteristics may pose a selection bias problem. I approach this by looking further into the probabilities of being included in the sample and run a probit regression, of a dummy equal one if the child is included in the sample, on various individual and household characteristics. If the coefficients of these probits are statistically significant, it would indicate a selection on observables in the sub-samples and therefore, the estimation results could be biased. Table A.2 presents the marginal effects of these regressions for three different specifications in each year. In this table, I report coefficients of the sub-sample of the cohort of interest (the cohort that is treated as explained in the identification section), which includes children between 6 and 13 months old. The marginal effect coefficients are in the majority of cases not statistically significant. However, the age effect is statistically significant for the three specifications in 2004, although it changes sign from positive to negative. This suggests that a large number of children could be selected into the sample based on age. Indeed, in the 2004 survey, Fafo reported imputing age for 4.6 percent of the sample of children because age was not properly recorded. I discuss this further in the appendix. Nevertheless, in the estimation regressions, I add individual, household and location characteristics as well as month of birth to control for selectivity into the sub-sample (Wooldridge, 2002).

6. Identification and Empirical Strategies

6.1 Identification

In an ideal situation, but not necessarily feasible, in order to estimate the effect of the war on the nutrition status of children, one would first need to observe a child exposed to the war in two periods, before and after the conflict, and also observe the same child, but who is not exposed to the war, in the same two periods. This is clearly not possible in any kind of setting as we only can observe a child either exposed or not exposed. Moreover, in the Iraqi case, there is no data that would allow us to observe the same child before and after the war. In addition, potential growth is reached at very young ages; therefore, it might not be plausible to compare the same children after the war. So, the identification strategy, in this paper, comes by exploiting differences in the timing and the geographical intensity of the conflict, where I compare z-scores among cohorts born before and after the war (i.e. before and after treatment) in provinces affected by different levels of violence. I classify provinces into high-intensity conflict and low-intensity conflict areas in order to identify a causal effect. Therefore, the date of birth and the place of residence determine the intensity of exposure to the war[34].

6.2 Empirical Strategy

I follow two empirical strategies. In the first one, I use three independent, random sample surveys to create a sort of pseudo-panel of cohorts. The selection of the cohort of interest is done through the following steps. First, I identify, in the 2004 survey, the cohort born after the initiation of the war (March 2003): this cohort, as research has shown (reviewed in section two), is likely to be more susceptible to changes in nutritional intake and quality of food, and also be more vulnerable to diseases if not breast-fed. Second, I track this same age-group of children in the 2000 and 2006 surveys. Therefore, in the pseudo-panel, I have 2000 as a baseline year, which reflects the before treatment year, and two post-treatment years: 2004 and 2006. Similarly, the treatment and control groups are defined by classifying provinces into high-intensity conflict and low-intensity conflict areas. The advantage of creating a pseudo-panel is that, by following a specific age-cohort, in randomly selected samples, it allows us to

[34] Other studies using cross-sectional data that have identified exposure to treatment based on age are Almond (2006), Bundervoet et al. (2008) and Duflo (2001).

observe behavioural relationships and responses (Deaton, 1985), which make possible identifying the effect of the treatment. Figure 2 depicts the cohort, aged 13 months old or younger, who is followed in the three different surveys. Table A.3 shows the summary statistics of z-scores for the same age-cohort.

[INSERT FIGURE 2]

In the second empirical strategy, I only use one single cross-sectional survey, the 2004 ILCS, and compare young cohorts to older ones in high and low intensity conflict areas. The uniqueness of this survey is that all children present in the sample were conceived before the war, so the decision of parents to have children is not affected here, unlike the possibility that it does in 2006. Moreover, given that all children have been exposed to the war, either because they were born before the war or because were in-utero when the war started, one can assume that, to a certain extent, all children have been affected by the war. Consequently, the strategies may capture the *differential effect* and not the overall effect of the war. Results from the two strategies, however, do not vary significantly.

The need for a second strategy is important because estimates from the first strategy could potentially have problems. First, the children's heights, weights and z-scores are likely to be sensitive to each survey not only because the surveys were conducted at different periods of time, but also used different measurement instruments. The 2004 survey was conducted towards mid-year, during the summer months, unlike the others, which were conducted at the beginning of the year. This could create problems in the calculation of z-scores because children could be more likely to sweat and loose liquid during the summer, or be more prone to infections or to diseases during other time of the year[35]. Nevertheless, the MICS 2000 and 2006 both follow similar standards, their comparison could, however, avoid the problem of having different methods of measurement. Nonetheless, because the peak of the incidence of violence occurred in February 2006, after the bombing of the Samarra Mosque, displacement is likely to pose a potential selection bias in the 2006 survey. The magnitude of this bias cannot be estimated as there is no information about displacement in the 2006 survey.

Second, the sampling designs of the three surveys, although allow for representativeness at the provincial levels, are not similar. This, consequently, does not permit estimating coefficients and standard errors that are adjusted for the sample designs of the surveys. Third, the 2004 survey has the advantage to cover several socio-economic dimensions such as labour status, displacement and pre-war characteristics of the households, which the other two surveys not cover. This permits assessing, not only, the possible selection into displacement, but also, allows controlling for mother and pre-war characteristics. Fourth, the 2004 survey also permits classifying conflict areas at the district level, a lower administrative unit than provinces, and therefore, I can increase variation between control and treatment areas. In addition, a lower unit of analysis allows capturing the extent of violence more precise. This is in particular relevant because there is anecdotal evidence that the war and subsequent shocks affected households within a specific area (district) in a similar way. For example, as the number of people killed increases in Samarra town, and therefore, the level of insecurity rises, a larger area, Samarra district, may also be affected because the insecurity hampers communication, destroys infrastructure and disrupts access to basic services; as channelling of resources and efforts is done from the provincial to the district level.

[35] In particular, an outbreak of cholera episode spark in the south of Iraq in mid-2003, subsequent outbreaks hit the north in 2007.

Figure 3 shows how the identification of age groups is calculated based on the timing of exposure to the war using the 2004 survey.

[INSERT FIGURE 3]

6.3 Empirical Model

In the first strategy, the treatment effect of the exposure to the war on children's z-scores is estimated through the following equation:

$$Y_i = \beta_1 + \beta_2 \left(C_i\right) + \beta_3 \left(T_t\right) + \beta_4 \left(C_i T_t\right) + e_i \quad (1)$$

Where Y is the outcome of interest, C is a dummy to indicate if the cohort is born after the war (appears in 2004 or 2006 survey), and T is a dummy indicating if the cohort resides in a treated province (high-intensity conflict). β_1 is a constant term and e is a random, idiosyncratic, error term. The subscripts i and t represent the cohort i (born before or after the war) in province t (residing in treated or not treated province). The coefficient of interest, the Difference-in-Difference estimator (DID), is β_4, which is the interaction of dummies C (cohort born after the war) and T (born in treated province t). It indicates the differential effect of the war on z-scores of children. The identifying assumption in the DID estimator is that in the absence of the war, ceteris paribus, the difference in trends of z-scores between young and old cohorts would be similar in the treated and non-treated districts , so β_4 would be 0.

This empirical model 1 does not control for any possible difference among the characteristics of the children in treatment and control groups, or for any possible time-invariant correlation within provinces and districts. It is also possible that there are seasonal effects among cohorts. Although, selection into the sample does not seem to be a problem, it was shown in table A.2 that age in 2004 might be correlated with the inclusion in the sample. Therefore, it is important to control for this in the individual specifications. I therefore also run the following regression with various controls:

$$Y_i = \beta_1 + \beta_2 (C_i) + \beta_3 (T_i) + \beta_4 (C_i T_i) + \beta_5 X_i + \beta_6 PW_i + u + p + e_i \qquad (2)$$

In the empirical model 2, I allow for group and area specific effects: u, and p are cohort (month of birth) and province time-invariant fixed effects, respectively. X_i is a vector of individual, location and household characteristics and PW_i is a vector of pre-war household characteristics. Adding covariates to the regression accounts for the possibility that children in treatment and control groups have systematically different characteristics in the two time periods (Wooldridge 2002).

6.4 Treatment Areas

Iraq has 18 provinces, which are called Governorates; each of them is sub-divided into districts. In total the country has 104 districts. I identify treatment areas at two levels, province and district, and use them for the two empirical strategies describe above, respectively. I use two measures to classify areas according to their exposure to the conflict. The first measure, which I use as an objective indicator, is the war-related deaths. The second measure, and subjective indicator, is the frequency of shooting in the neighbourhood reported by the household[36]. I assume that the measures capture –to a large extent- the damages of the war describe in section 3. In section 9, I attempt to

[36] I am not aware of any quantification done of the damages of the war on infrastructure, electricity or water and sanitation. Other household reported data on the stability of public services could provide a subjective measure as infrastructure has been extensively damaged by the war. However, with the available data, it is not possible to control for the state of the water and electricity systems before the war.

relate direct war-related mortality to various indicators including the status of public infrastructure and services. The way in which I measure the intensity of the war is explained in detail in the appendix. In addition, I also provide comparisons among war-related mortality estimates between the ILCS and the IBC, which is an independent source, in order to validate the violence indicator used in the paper.

Tables A.3 and A.4 show summary statistics of provinces and districts classified by their intensity of exposure to the conflict, respectively. Table A.3 shows the total number of war-related deaths up to 2004 totals 23,723 fatalities. Provinces classified as high-intensity conflict areas account for 75 percent of the total deaths, and have, on average, 1,300 war deaths. Table A.4 shows the percent of war-deaths by type of district: 60 percent (15,239) occurred in high-intensity districts, around 30 percent (7,607) in medium-intensity, and 10 percent (898) in low-intensity. On average there are 530 war fatalities per district.

Table A.6 presents the percentage of children living in the different types of conflict areas. About 66 percent of children in urban areas reside in an area that was exposed to violent deaths, 40 percent live in high-intensity conflict provinces and 60 in low intensity-conflict areas. If treatment is based at the district level, 22 percent live in high-intensity conflict districts, which correspond to the top 25 percent of most violent districts.

A map included in the appendix shows how the intensity of the conflict is geographically distributed across Iraq. The most violent areas are not only concentrated in and around Baghdad, but mainly are the capitals of the districts such as *Basrha*, *Najaf* and *Nasiriyah*. The geographical distribution of war deaths maps well with the anecdotal evidence of the conflict describe in section 3. In Basra, for example, British forces clashed several times with militias before taking over the city in early 2003. Later on, the city was also in the hub of religious fighting between *Sadrists* and other religious groups. In *Falluja*, clashes between US troops and insurgents began in August 2003 but the fighting culminated in a siege of the town for several weeks a year later in 2004. Several districts in Baghdad were affected not only by fighting, but also, by bombing and revenge killings. The UN headquarters, the Red Cross and the Jordanian Embassy were targets of suicide bombers in the second half of 2003. The de-Baathification process[37] was linked to the various politically motivated murders as early as May 2003. In addition, violence spread with the emergence of local power groups and religious militants in several Shia cities in the south. This affected the holy city of *Najaf* in particular, where fighting among Shia political groups emerged after the killing of Ayatollah *Baqir al-Hakim*. Moreover, *Nasiriyah* fell under the rule of local tribesmen allied with the *Da'awa* Party, and in *Missan* province near the border with Iran, several towns were controlled by religious groups.

Graph A.3 show the results of a kernel local polynomial regression for height-for-age z-scores of children in 2000, 2004 and 2006 samples, respectively. The graphs show that there is a decrease in the average level of z-scores for high intensity conflict provinces from the baseline year, 2000, to the treatment periods, 2004 and 2006. The difference is clearer for 2006, where z-scores of children in high intensity conflict provinces are below the low intensity conflict areas. This provides initial evidence that the war has, probably, affected the nutrition status of children.

6.5 Threats to internal validity

The main assumptions in the identification and empirical strategies described above could potentially be violated. Hereafter, I therefore discuss some threats to the internal

[37] This refers to the process in which the CPA fired all officials who were in the highest three ranks of the Bath Party (the party of Saddam Hussein).

validity of the research. An essential condition of the identification strategy is related to the need to find variation that is exogenous to the outcome of interest (Meyer, 1995; Wooldridge, 2002). The war and its effects are seen as an exogenous shock to children's outcomes for the reasons describe in section 3, which provides evidence on the nature and initiation of the conflict. Although the war hit a great part of urban areas, the shock can be taken as exogenous to the individual and household characteristics.

However, a possible concern arises due to the displacement that occurred post-2003[38]. This is likely to be a problem in 2006 because displacement substantially increased from February 2006 onwards, after the bombing of the Samarra Mosque. Besides, I do not have displacement information. However, this is not necessarily a concern in 2004, not only because of the lower levels of movement, but also because the survey includes displacement information. Two questions help me identify the households that have migrated[39]. The first one asked: were you living in the same household in December 2002? A second question asked: were you living in the same household five years ago? For the 2004 sample of children, 9.6 percent live in households that are displaced during the past five years, and 7 percent are displaced after December 2002. This displacement could be attributed to the war and could pose a selection problem. Therefore, I check if there are differences on z-score outcomes between displaced and non-displaced children.

Table A.7 reports these comparisons: the differences are not statistically significant, which seems to point that displacement does not appear to pose a selection problem. However, as a robustness check, I do the following in the estimation of

[38] Infant mortality could also pose a selection problem. If increased, estimates from the analysis would be lower bias as those children that survive are potentially healthier. I have assessed infant mortality in the 2004 survey and it does not seem to increase after the war. However, this question is part of a separate paper which I am now in the process of assessing.

[39] This refers to internal migration. The questionnaires also asked questions on external migration of family members. However, if children migrated out of Iraq, they are not in my sample and therefore, lost from the analysis.

treatment effects. First, I treat all households displaced, either before or after 2002, as displaced; in order to avoid any kind of selection bias. Second, I drop all observations of children from households that reported being displaced after 2003. The results are robust.

A second concern that might confound the identification strategy is if the intensity of the conflict is correlated with pre-war conditions (i.e. treatment is associated with pre-treatment characteristics). This would create another selection problem, as some areas would be treated because of some pre-war situation. Again, I am only able to verify this in the second empirical strategy. I do the following. First, I select variables that could lead me to identify the situation of households before the war. The ILCS asked questions in reference to December 2002. I therefore, select the following variables: change of household place of residency, labour status of head, household size, street electricity functioning, household income, and infant mortality. Then, I aggregate the data to the district level and correlate with the measure of violence. The correlations are 0.25 for street lights functioning in 2002, -0.11 for average number of household members, 0.18 for district level infant mortality and 0.0 for average income per capita. These correlations are low. Although the highest correlation is with street lights functioning before the war, this seems to be because Iraq is by large an urban country. These areas were likely to have had street electricity functioning before the war. In the next section, I assess how various district characteristics are linked to the level of violence in each district.

6.6 Balancing Tests

The previous section outlined the main concerns for the validity of the identification strategy. Therefore, it is also important to check if the likelihood to be classified in high or low intensity conflict province depends on the characteristics of each province. Therefore, I test whether there is a significant relationship between provincial level characteristics and the level of conflict intensity[40]. Table 1 reports comparison of observable characteristics of children by type of province in each survey. The columns show the means of selected observable characteristics and their standard deviations, and also show their differences. In the majority of cases, the differences are not statistically significant. However, the differences on weights are statistically significant for the three surveys, unlike for heights, where only the differences exist for the two last periods. On household characteristics, the average number of household members is also different in all three surveys, suggesting that high intensity conflict provinces have on average less household members than low intensity conflict areas. This, conversely, is supported by the fact that the war has affected disproportionally urban areas, where people tend to have fewer children.

Table 2 reports similar results when classifying treatment areas at the district level. Here, I am able to do a more detail analysis as the ILCS data is richer. Overall, individual, mother and household characteristics seem to be similar. Mothers' year of schooling appears to be higher in high-intensity districts. The father's mean year of schooling is also higher in high-intensity districts in comparison to the rest. In relation to security and assistance, 97 percent of the Iraqi population has received food rations during the past month; this is very similar across districts and also reflects the universality of the distribution system. The situation is different in terms of security. The major difference is on the percentage of households reporting shooting every day, 45 percent in high-intensity districts.

[40] i.e. if pre-war characteristics are unbalanced between the different treatment areas and unaffected.

To be able to compare closer if certain district characteristics may vary substantially, I do various regressions for each type of districts on their selected observable characteristics. Table A.8 shows the coefficients of these regressions. The dependent variable is labelled one if the district belongs to each of the conflict-intensity districts. The first column reports the coefficient of a regression for high-intensity districts on various characteristics averaged at the district level. The table shows that urban coefficient is statistically significant for all type of districts even for non-affected. However the sign of the coefficient differs. For high and low districts the coefficient is positive while for medium and non-affected the coefficient is negative. This reflects the fact that violence hit urban and capital districts harder. Other characteristics such as number of household members, electricity availability, and access to water are significant for at least three of the four types of districts. Although this might pose problems, and one would question any kind of selectivity, I net out this effect by controlling for various household characteristics and by including district fixed-effects. Moreover, because violence affected (richer) urban centres one can assume that, before the war, health status of children was greater in these areas than in low-intensity conflict areas. The estimates below are therefore not contaminated by a (poor) rural area effect. This evidence is confirmed in the subsequent section.

7. Estimation Results

7.1 Treatment at Provincial Level

The core of the identification strategy is shown in a two-by-two table. Table 3 presents estimates of the effects of the war on height-for-age z-scores for children. Panel A shows the first and second differences of the comparison of cohorts, born before the war and after, in high and low intensity conflict provinces. The second difference, located in the third column, shows that cohorts born after the war, in provinces affected by high levels of violence, have 0.24 SD less in height-for-age than cohorts born in low-intensity conflict areas. However, these results do not control for time-invariant effects at the provincial level or for various characteristics of the children and households.

Table 4 presents the results of running models 1 and 2 when height-for-age is the outcome variable. Column one of panel A presents estimates of the baseline regression, model 1, and captures the same effect as in table 3. Columns two, three and four in the same panel add covariates: individual, household and provincial fixed effects, respectively. The estimates are very similar and significant at 10 percent level. In addition, the table also presents estimates using the subjective indicator, shooting in the neighbourhood, as a second measure of the intensity of the conflict. Here, the DID estimates are negative, but not statistically significant at conventional levels. These results point to the fact that, although the correlation between the two conflict measures is high, about 0.7, they do not necessarily provide similar impacts at the provincial level. In addition, it will be plausible that because the surveys were conducted in different periods there would be survey-specific or seasonal effects. I therefore now turn into the second empirical strategy.

Table 5 presents the results of running models 1 and 2 using the second empirical strategy. As explained in section 6.1, I consider young children, aged 6-13 months, and born after March 2003, as the after cohort, and similarly, old children aged 49-59 months as the before cohort, born before the war. Panel A presents unweighted estimates and panel B shows weighted results. Panel 1 shows the effects when taking war-mortality as a measure of the intensity of conflict and panel 2 presents the effects when taking shooting as the incidence indicator. The effects, when taking the objective measure, are between -0.22 with no controls to -0.21 when all controls are added, including mother's weight and height. These results are significant at 5 percent and 10 percent levels, respectively. Correspondingly, the estimated effects, when taking the subjective measure, range from -0.29 to -0.27, significant at the 1 percent and 5 percent levels, respectively. The weighted estimates are, as expected, slightly higher for both measures, ranging from -0.34 to -0.39, and are highly significant. This suggests that estimates in table 4, which do not adjust for surveys designs, are probably biased downwards[41]. The estimates of treatment effects, so far, show a negative effect of the war on height-for-age z-scores of children. However, these may vary when using smaller treatment areas. In addition, since the conflict has intensified, one would expect the effects in 2006 to be stronger. In the next sections, I address these two aspects.

7.2 Treatment at District Level

Table 6 presents estimates of the effects of the war by comparing districts in the top of the war-mortality distribution to districts in the lowest level of the same distribution, (hereafter high-intensity and non-affected districts). The table reports estimates of treatment effects by the two measures exposure to the conflict. Panel A presents unweighted results and panel B weighted estimates. The first column in each panel represents the baseline regression with no controls. Columns 2-6 present estimates when controls are added. The unweighted results show that, when using the objective measure of violence, the effect on height-for-age z-scores of young children, in comparison to older ones, is about -0.42, significant at 1 percent level. Results with controls are similar. On the contrary, when using the subjective measure of violence, the effect is -0.29, significant at 5 percent, but other estimates are not statistically significant at

[41] An interesting factor in the results shown in tables 4 and 5 is that being a girl increases substantially the likelihood of having higher z-scores of height-for-age. This could reflect the fact that baby girls, interestingly, are more resilient or physically stronger in Iraq. Similar estimates were done separate for girls and boys, however, the estimated effects, although negative, were not statistically significant at conventional levels.

conventional levels when adding controls. The weighted estimates are all significant and higher: about -0.38 and -0.44 for the objective and subjective measures, respectively.

These results provide evidence that the gap between young cohorts, born after the war, and old cohorts, born before the war, is 0.4 SD wide in terms of height-for-age. However, it would be important to see if this gap still remains or increases in 2006, as the situation in Iraq deteriorated and violence increased. At the same time, it is necessary to verify if this could be attributed to the war, looking into 2000 would allow seeing if this gap was already present before the war. These issues are addressed in the subsequent sections 7.3 and 7.4.

7.3 Further evidence

Previous analyses have only estimated the effects of the war in 2004; here I look into the plausible effects in 2006: the second post-treatment period. Panel B of table 3 presents a basic second difference analysis of the effects of the war on height-for-age z-scores of children born after the war. The estimated effect is -0.3, significant at 1 percent level and slightly higher than the effect in 2004, presented in panel A. Panel B in table 4 shows the treatment effects when running models 1 and 2 on height-for-age z-scores. Using the objective measure and adding controls do not change substantially the results. Estimates go from -0.26, when controlling for individual characteristics, to -0.3 when adding household characteristics and provincial effects. Using the subjective measure provides, contrary to 2004, statistically significant results. The effect of the violence in young children born in high-intensity conflict provinces is -0.29. Taking stock of the results, and given the fact that an average Iraqi child, 6-13 months old in 2006, has a z-score 0.41 SD below the reference child, the effect could be approximated to decrease the average z-score of children to -0.71.

An additional piece of evidence is presented in panel A of table 7. The panel presents the difference-in-difference estimates of treatment effects in 2006 using the second empirical strategy. The estimates indicate an effect of -0.40 on young cohorts. This result supports previous analyses and suggests that the gap between young and old cohorts is still present, and increases in 2006.

7.4 Falsification exercises

Panel B of table 7 presents a falsification exercise, where I test if the gap between old and young cohorts, which in the previous section has been estimated to increase, was already present before the war. The DID estimate is -0.05 and not significant, suggesting that, indeed, the gap between young and old cohorts can be attributed, ceteris paribus, to the effects of the war.

Furthermore, I do a second falsification exercise, where I test if there are differences in mothers' heights among children in high and low intensity province areas. This exercise serves as a control experiment since one would not expect any impact on the height of mothers: therefore, falsifying the hypothesis that young children could have lower height-for-age z-scores because of having mothers with lower height. Moreover, it also serves as a data quality check. Panel C in table 7 presents this additional control experiment. Estimates are not significant.

8. Additional Estimates of the Effects on Nutrition

8.1 Effects on wasting and underweight

So far, the analysis has concentrated in height-for-age. This sub-section presents the effects on weight-for-age and weight-for-height nutrition indicators. Table 8 presents a summary of similar analyses presented in tables 3-7, but it also includes the two other indicators. Panel A presents estimates of the treatment using the first empirical strategy and panel B presents the estimates for the second empirical strategy followed. Results from panel A indicate that weight-for-height z-scores of young children have not deteriorated after the war, in the contrary, the estimates in columns 1 and 2 show that, in comparison to 2000, children have 0.44 and 0.41 higher z-scores in 2004 and 2006, respectively. This could be interpreted as if the current nutrition status of children improved after the war. However, it is important to remember that since this indicator is calculated in reference to height. There are two possible explanations for this result: either the weight of children has increased or the change in weight is proportionally larger than the change in height. Estimates in panel B show also a significant and positive effect in 2004 for the same indicator, but the estimate for 2006 is statistically insignificant. These results provide some evidence that the current nutrition status of young children, in comparison to old ones, at the time of the survey in 2004, seemed to have improved, but this improvement is not persistent in a similar way in 2006. A look into the third nutrition indicator would also help to interpret what is possibly happening to the nutrition of children in Iraq.

Estimates for weight-for-age z-scores are also reported in panels A and B of table 8. In 2004, the effect reported in panel A is about 0.19, statistically significant at 5 percent level. Nevertheless, when looking into the effect in 2006, there seems not to be any, as the estimate is statistically insignificant different from zero. In panel B, the situation is reversed. The estimate for 2004 is zero while in 2006 decreases to -0.17, and is significant at 5 percent.

The following conclusions can be drawn from this analysis. First, there is a negative effect on height-for-age z-scores of young cohorts born after the war. This negative impact is greater in 2006. Second, the gap between young and old cohorts in height-for-age is increasing in 2004 and 2006. Third, children seemed to have gained weight in 2004, in comparison to 2000, but not necessarily in 2006, in comparison to 2000. Forth, the gap in terms of weight-for-height z-scores between young and old cohorts only appears to have increased in 2004 and not in 2006. Fifth, although an improvement on underweight (weight-for-age) is present in 2004, this is reversed in 2006.

8.2 Is the effect transitory?

A further important question is to see if the initial effect on height-for-age z-scores for young children exposed to the war in 2004 has increased in 2006. Previous sections were only focusing in the effects on the young cohort in 2004 and the young cohort in 2006. Here, I follow the 2004 young cohort (i.e. 6-13 months old) in 2006, which is now 26-33 months old. This would help identify if the initial effect of the war in this cohort has exacerbated or not. Panel C in table 8 presents the results. Height-for-age z-scores of this cohort in 2006 are not statistically significant, nor are the estimates for weight-for-height or weight-for-age. This suggests that the shock, once affecting the nutrition status of children, remains but does not becomes stronger. It also suggests that it is unlikely that children, once experiencing stunting, would catch-up in linear growth at later ages.

However, the effect on height is important because it occurs at the initial months in life, and it is likely to be irreversible. It might be possible that the effect starts in-utero and via the deterioration of the health of the mother. In this paper, I am not able to test this hypothesis because the exposure in utero is followed by exposure in birth. Nevertheless, I do an additional analysis using the 2004 sample where I subdivide children into months of exposure in-utero in comparison to their months exposed after birth. Results are not reported here but they indicate that young children below 13 months experience a similar decrease on height-for-age. There is no difference if they were exposed more months in-utero in comparison than after birth, this could be an indication that the effects are via the health of the mother. Though, further data would be needed to assess this hypothesis.

8.3. Linear or non-linear treatment effects

So far I have ruled out the possibility that my measure of treatment has a continuous linear effect on z-scores of children. I next run similar regressions of model 1 considering a continuous treatment. The continuous treatment is identified by the ratio of war-related deaths in each district over the population of the district per 1,000 ha. The coefficient β_4 which identifies the linear effect is taken by multiplying this ratio by a dummy for the cohorts born after the war.

Table 9 presents the results. Row one shows DID estimates for the youngest cohort. Row two shows DID estimates for the pooled cohorts born after the war. Panels A and B present estimates of for height-for-age. The first column in panels A and B reports results of running model 1 on the whole sample of children. Panel B reports weighted estimates adjusting for survey design. The coefficients are negative but not significant, therefore showing no effect. The two last columns in each panel report estimates for the sub-sample of districts where there were war-related deaths reported. The DID estimates are also not significant. These results are important to determine the type of effect that violence has had on nutrition. It reflects the fact that low levels of violence do not necessarily affect significantly health of children. This is either because households may be able to find coping strategies when affected by the war, or children have a certain level of resilience. However, when this violence accumulates, the treatment is then large enough to have an effect on nutrition of children, as shown in previous sections, where children born in high-intensity conflict districts after the war had z-scores lowered from 0.2 to 0.3. The evidence presented here suggests that violence and insecurity do not have linear effects on nutrition of children in Iraq but are rather the cumulative effects of these that affect health outcomes.

9. Possible transmission channels

The previous sections have shown evidence of a negative effect of the war on height-for-age z-scores of children. It was also shown that weight-for-height does not seem to be affected. Section 3 described some of the damages of the war on displacement, health services, infrastructure, water, sanitation and electricity. This section attempts to relate the status of some of these damages with the level of conflict intensity in each district. I use household reported data to estimate a possible association of the war on several outcomes, covering the following categories: child illnesses, health care during pregnancy, household difficulties and damages to infrastructure. In the first category, I take child illnesses within the past two weeks as reported by the mother or care taker. These illnesses, which include fever, cough or cold, and diarrhoea, determine the current status of health of the child and his or her vulnerabilities. I use the second empirical strategy outlined in section 6 and run models 1 and 2 on child outcomes. Table 10 presents DID estimates of these regressions. It shows that cohorts born after the war in high intensity conflict districts reported a higher incidence of diarrhoea, but not more cough, or cold, or fever. Column 4 of panel A reports that children in high intensity conflict districts have on average 5 percentage points more incidence of diarrhoea than children born in less affected districts.

Column 5 shows results when the outcome variable is breastfeeding. These are associations rather than causal effects because the information on breastfeeding practices for all children was not collected. Therefore, and contrary to previous results, the effects reported could only be seen as correlations. Column 5 in the second panel shows that children are 7 percentage points less likely to be breastfed in high conflict intensity districts. The results in this table show that a plausible mechanism of the war on nutrition is via a higher incidence of diarrhoea among children born in high-intensity districts and through the reduced likelihood of being less breastfed.

The second category of analysis in this section takes pregnancy related information. I take women self-reported data on antenatal and postnatal care of her last five pregnancies[42]. Unfortunately, the data reported to the interviewer did not include the date of the pregnancy. I therefore compare the latest pregnancy to the first pregnancy of each woman. I assume that the latest pregnancy is after the war because in the majority of the households there has been at least one birth after 2003. The estimates reported in table 11 should be therefore interpreted with this in mind. On average, women go to their first health visit on their sixth month of pregnancy. Column one in panel A reports estimates of the effects of residing in a high-intensity conflict district on the month of the first health visit. The specifications control for urban, log population in district, household size, log income, employment status of the head, and ethnicity, in addition to provincial and district fixed effects. Although I was not able to control for the access to public health centres, the district and urban dummies should account for the possible variation in the distribution of health centres. Women that reside in high violent areas are more likely to have their first health visit one month (0.22 * 4.6) earlier than women residing in non-affected districts. The results are

[42] The questions were posed to women in reproductive age, 15-54 years old.

somehow surprising as one would expect that violence and insecurity might hamper access to health services. However, this could reflect some noise induced by the lack of accurate dates of pregnancies, or could suggest that women go earlier to the health visit because they feel or anticipate possible complications. The rest of the estimates refer to number of visits to the health centre during pregnancy, if a woman received an injection to prevent the baby getting tetanus, if a child was delivered by a doctor and if the pregnancy outcome was still-birth. None of these are significant. Though, the results presented should be taken with caution, the fact that there is only a significant effect on the women's first health visit and not in other antenatal care (infections or number of visits), or on postnatal care (delivery) shows that access to primary health services did not affect districts with high levels of conflict mortality more than others. This could also be interpreted as if all districts were affected in similar way.

The third category in the analysis in this section looks at household reported information on illnesses of the head of household, displacement and overcrowding. These could serve as an indication of the difficulties experienced by the household during the war. Columns 1-6 in table 12 report the results of running an OLS regression of these indicators on the level of conflict intensity and various household and district characteristics. Two specifications are reported for each dependent variable, the first one takes high intensity conflict districts in reference to the rest of districts. The second specification adds dummies for the other two levels of conflict intensity, using non-affected districts as reference. The coefficients reported do not imply causality. Column one in the table presents the coefficient of the effect of residing in a high-intensity conflict district on the presence of illness of the head of household. This coefficient is 0.06 and insignificant. It increases to 0.07, statistically significant at the 5 percent level, when adding dummies for medium and low intensity districts. For displacement and overcrowding the pattern reverses and coefficients become significant when accounting for the other types of conflict intensity districts. The values are 0.03 and 0.21, respectively. These results suggest that there are no major significant differences among districts in the difficulties experienced by the head of household.

The last evidence presented refers to problems perceived by the household on several public services. I create several dummy variables based on questions asked within the household survey on the daily use of water, drinking water, frequency of problems with sewage network and frequency of problems with the electricity supply. I again run a regression of these variables on the conflict intensity dummies controlling for urban areas and province time-invariant effects. Results are shown in the last eight columns of table 13. Apart from the first question on having water problems, the rest of the coefficients are significant and positive, reflecting that households living in high-intensity conflict districts are likely to have experienced difficulties in accessing the needed drinking water. They are also more likely to have difficulties receiving electricity and problems with the sewage network. The damage to the public infrastructure appears to have been more relevant in high-intensity districts than in the other areas.

The results do not prove any causality of the effects of the war on infrastructure and should be taken only as indicative. As mentioned in section 3, public infrastructure before the 2003 war was in a precarious state. The data does not allow controlling for the state of water, electricity and sewage systems before 2003, so the problems perceived by the household could have been present already. However, in the case of electricity, anecdotal evidence suggests that each governorate, and subsequently each district, received a specific quota of electricity even prior to 2003. The shortage of electricity supply was therefore proportionally divided among all governorates according to population numbers, except for Baghdad, which received a larger proportion than the rest of the governorates. The perceptions of the household could therefore reflect the state of electricity supply post-2003.

The fact that drinking water was reported as a major problem by households residing in districts affected by high levels of violence supports the evidence shown on table 10. The quality of water is important as it may transmit water-borne diseases, which can cause diarrhoea. In addition, sewage network and electricity problems may also transmit not only water-borne diseases, but also, air and food-borne diseases, as the environment is less clean and fresh food cannot be kept cool, which is particularly an important concern during the summer months in Iraq.

10. Discussion and Conclusion

I conclude by a discussion of the main results presented in this paper. First, the analysis presented evidence that the war has affected the physical growth of children, where young cohorts born after the war in high-intensity conflict areas had lower height-for-age z-scores than children born in less violent areas. The effect on young cohorts is between -0.22 to -0.48 standard deviations, this is equivalent for a 6 month infant to be at least 0.8 cm shorter in height. This estimate is a lower bound, not only because violence within the period analysed is relatively lower than after, but also, because the war affected all areas. The results are not negligible considering that stunting is likely to be irreversible after 2 years. In comparison to other studies the results point to a significant impact[43].

[43] Hoddinott and Kinsey (2001) find that in Zimbabwe, 12-24 month old children in an aftermath of a drought grew -1.5 to 2 cm shorter. Bundervoet et al. (2008) find that children exposed to the 1994-96 civil war in Burundi have -.34 height-for-age z-scores lower. Alderman et al. (2006) also find that children exposed to the civil war and drought shocks in Zimbabwe are 3.4 cm shorter several years later in adult life.

Second, the results presented also showed that the impacts are not the same in the three nutrition indicators used. There was positive effect in 2004 on weight-for-height of young children, but this was slightly reversed in 2006. Although this could seem that children are gaining weight, in comparison to height, these results need to be analysed in conjunction with weight-for-age. The weight-for-age z-scores increased in 2004 but decreased in 2006. These results suggest that children are not losing weight, but rather are not growing properly in length in high violence affected areas. While it might seem odd that the three nutrition indicators have not been similarly affected, the nutrition literature and empirical evidence suggest that the indices do not necessarily move together (Cesar et al., 1996; Hoffman and Lee, 2005; Graff Zivin et al., 2006). Moreover, it is important for children to reach potential linear growth in early childhood since not achieving it is likely to have long-term health consequences. On the other side, the presence of wasting or general under-nutrition may be overcome later in life by having a healthy balanced diet and by gaining weight.

Third, the analysis shows that girls are less likely to be stunted than boys but there is no difference on weight-for-age or on weight-for-height. This reflects the fact that girls in Iraq are probably more vulnerable or have more possibilities in reaching potential linear growth. Separate analyses were done for boys and girls (not reported here due to space constraint) showing a similar treatment effect, although slightly higher for boys. Girls seem to have higher nutritional indicators. These could suggest that girls in Iraq are biologically stronger at early age.

Fourth, the evidence presented shows that the impact is likely to be important during the first years of life. The results also suggest, but do not confirm, that the effect is likely to start in-utero via the health of the mother. Further research, when data becomes available, is needed to identify clearer in-utero effects.

Fifth, the results show that children are more prone to get diarrhoea in more violent districts. At the same time, households living in these areas also are more likely to have water, sewage and electricity problems. This suggests that the mechanism in which the violence and insecurity could affect child health is through a large extent via the lack of well-functioning public services and through more incidence of illness.

Sixth, the results in this paper were limited to data availability. Therefore, two important questions that might affect health of children in Iraq were not addressed. The first aspect refers to food intake. Since almost every household in Iraq reported receiving food rations, it was not possible to identify if food availability is a major factor affecting growth of children, or if the food basket provides enough energy and proteins to pregnant women and infants. It is also plausible that the effects of the war could have been larger in the absence of the food distribution system. Moreover, household behaviour may play a role as families could sell their rations in order to cope with harsh times and vulnerability, which lowers the quality of their diet. Further research would be needed to establish more direct linkages between the quantity and quality of food available for children and pregnant women in Iraq.

The second aspect that was not addressed relates to physiological conditions. Coussons-Read et al. (2005) study suggests that mothers' prenatal stress can alter pregnancy and infant outcome via alterations of the immune system. But there is still little empirical evidence on the role that stress induced by violence and conflict plays on the physical development of the child (Camacho, 2008). However, medical literature suggests that prenatal stress bears pregnancy complications (Seng et al., 2001). It therefore remains the possibility that the effects on nutrition of children are through both, physical and psychological channels. Because of lack of data, this paper was not able to address these questions.

Seventh, the paper presents a quantification of the impact of the war in the short-term, but possible long-term economic implications can be anticipated by using other studies and naively extrapolate the results in this paper. The average child in Iraq in 2004 is -.98 standard deviations lower in height than the median child in the reference population. Using estimates from Alderman et al. (2006) and, taking the lowest DID, assuming that no other changes occur, that the shock is permanent with no catch-up in growth, children exposed to the conflict would have already 2.6 cm (-0.98 * 2.66) less of height as adults and would have 0.66 less schooling grades attained (-0.98 *0.67). The economic costs are also meaningful. Using estimates from Thomas and Strauss (1997), the reduced height could translate, ceteris paribus, in a decrease of at least 4 percent (1.6 7*2.4) of wages in adult life[44]. This reduction is equivalent to 66 percent of the yearly fees that households pay to receive food rations[45].

In summary, this paper has estimated a quantification of the effects of the 2003 war in Iraq on nutrition of children. The results show that children born after the war in high-intensity conflict areas have grown less than children born in less affected areas. The paper goes further and explores the mechanisms of these effects. It shows that one channel has been through the higher incidence of diarrhoea in high-intensity conflict areas. The war is likely to have affected not only the availability of food, but also, access to safe water, electricity and sanitation, which has translated into detrimental effects on the health of children. The research has highlighted some short-term consequences but has also given food-for-thought on the long-term implications.

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[44] This estimate is an underestimate since it is calculated considering the average height of women as the survey did not have height information for men. The 1.67 value is taken by using the extrapolation of reduced centimetres in adult life of 2.66*100 over the mean height of 159. The mean was calculated using mothers' heights.

[45] According to ILO (2008), the daily wage for skilled labour was 50,000 ID in 2005

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Appendix

Key events in Iraq up to end of 2006[46]:

1980-1988	Iran-Iraq War
1990-91	First Gulf War
1990	UN Security Council Resolution 661: sanctions tied to weapons
1990	Government of Iraq introduces food rationing system
1991	UN Security Council Resolution 687: economic sanctions in Iraq
1991	A no-fly zone is established in north of latitude 36º
1992	Semiautonomous region in the north is established
1992	A no-fly zone is established for Iraqi planes south of 32 degrees.
1995	UN Security Council Resolution 986 and Memorandum of Understanding to set up the Oil-for-Food Program (OFFP)
1998	Operation Desert Fox- US/UK bomb Iraq
1999	UN Resolution 1284 establishes the UN Monitoring, Verification, and Inspection Commission (UNMOVIC)
2002	Iraq agrees to allow the unconditional return of weapons inspectors
2003	US-led invasion, start of new war/conflict
2003 May 1	US President George W. Bush announces the end of the major combat operations in Iraq
2003 May 6	Paul Bremer is appointed as the new top civil administrator for Iraq
2003 May 11	Gen. Tommy Franks, dissolves the Ba'ath Socialist Party
2003 May 22	UN Security Council lifts sanctions on Iraq
2003 May 24	US coalition forces abolish the Iraqi Army, the Defence and Information Ministry and other networks of security
2003 July 13	Iraq interim government has its first inaugural meeting
2003 August 19	A bomb attack in the UN building in Baghdad killing UN envoy Sergio Vieira de Mello.
2003 August 29	Car bomb kills the leader of Iraqi Shias, Ayatollah Mohammad Baqr Hakim, in the city of Najaf.
2003 September 20	Aqila al-Hashimi killed: first assassination of a member of the Governing Council.
2003 October 24	Donor conference is held in Madrid.
2003 November 8	The International Committee of the Red Cross (ICRC) temporarily ends its operations in most parts of Iraq due to security concerns.
2004 April 4-29	Siege on Falluja
2004 May 17	Iraqi Governing Council (IGC) President Izz-al-Din Salim is killed
2004 June 7	UN Security Council Resolution 1546 transfers sovereignty to interim Iraqi Government. First Post-2003 Iraq's Prime Minister, Iyad Allawi, takes over
2005 January 30	First elections held
2005 August	Draft constitution is endorsed by Shia and Kurdish negotiators, but not by Sunni representatives.
2005 October	Saddam Hussein goes on trial on charges of crimes against humanity
2005 December 15	Iraqis vote for the first, full-term government and parliament since the invasion
2006 February 22	A bomb explodes on an important Shia shrine in Samarra, the Ali-Alskari Mosque.
2006 February	Violence intensifies, displacement and refugee situation worsens
2006 November	Saddam Hussein is found guilty of crimes against humanity and

[46] Taken mainly from (BCC,)

	sentenced to death
2006 December	The Iraq Study Group report describes the situation as grave and deteriorating. It warns of a slide towards chaos, triggering the collapse of the government and a humanitarian catastrophe
2006 December 30	Saddam Hussein is executed by hanging
2007 January	US President Bush announces the surge of troops

<u>Surveys</u>

ILCS

The 2004 ILCS used questionnaires: a household questionnaire covering education, labour, living conditions and health-related subjects; and a women and child questionnaire, covering specific issues related to pregnancy, anthropometry, morbidity and delivery. On average, interviews lasted for about 80 minutes. In total 21, 668 households were interviewed encompassing 143, 481 individuals.

MICS

The MICS target women between 14-44 years old and children under five, covering indicators on education, nutrition, water and sanitation, immunisation, vitamin supplements, child health, anthropometry and morbidity, as well as antenatal health and child labour. MICS 2000 sample included 13,430 households from which information was collected for 22, 980 women and 14, 587 children. MICS 2006 sample included 18,144 households, with a response rate of around 99 percent, and covered 27,564 women and 16, 469 children.

<u>Survey Measurements</u>

During the household interviews, children aged 6 to 59 months were measured by weight and height. The process follows strict international guidelines (Fafo, 2003; Unicef, 2006). <u>*Height*</u>. If children were less than 2 years old they were measured in length (laying), if older, were measured in height (standing). The interview teams carried a measurement boards necessary to perform these measurements. <u>*Weight*</u>. Mothers or caretakers were first measured in the scale. Then, they were asked to carry the child in the arms an then, they both were weighted again. In the ILCS, two separate numbers for weights were then put into the questionnaire answers. In MICS, an electronic scale calculates the weight automatically. <u>*Age*</u> was recorded by asking the household head (or caretaker) the age of the children. Interviewers asked day, month and year of birth.

Problems in data collection for ILCS

Some problems on data collection could arise when measurements and interviews were done. I outline below the ones that are relevant for this study[47]. In the case of age, some cases emerged were aged was not registered properly, either a child's age was registered older than the survey date, or there was a mismatch with the individual roster information. In such cases where ages of children did not correspond to mothers' birth history or cases in which day, month or year of birth was missing, Fafo imputed dates randomly. This was done for around 4.6 % of the sample. In my calculations, I calculate exact age in months by cohorts based on this imputed age. In the case of heights, young children, less than 2 years but able to stand, could have been measured in height and not in length. This may cause measurement errors when calculating z scores since children when measured in length are added .7 when computing z-scores. This would cause a downward bias to my estimates.

In the case of weights, the problems that could arise are the following. First, measurement error could occur by weighing incorrectly the mother or the mother and child. Second, weight of mother and mother with children could have been measured incorrectly in the case that children and mother were measured separately, although the guidelines say that children should be measured with mother. This could lead to misreporting of weights since the interviewer had to report the weight of mother and child in the questionnaire. Fafo corrected some of the cases. For my analysis, I drop all cases where mother and child weight are below the one of the mother since it was not possible to identify if it would really correspond to the child's weight.

The problems mentioned above could lead to bias estimates of wasting and stunting since z-scores are standardised not only by gender but also by age. It seems that heights would have less measurement error than weights since measurements were collected by only measuring the child, while for wasting the mother had to be weighed first and then again with the child. Nevertheless, z-scores can be used to identify such problems as it is implausible for children to have z-scores below a certain level. I follow other researches and therefore drop children from my sample with standard deviations below 6 or above 6[48][49].

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[47] Reference: Conversation with Jon Pedersen, Director of Fafo.

[48] See for example: (Hoddinott and Kinsey, 2001; Alderman et al., 2006; Bundervoet et al., April 2008).

[49] zanthro function is used in Stata

Reference population

I use the NCHS/CDC 2000 reference population. The use of this reference population is likely to undermine the results because the recent WHO reference z-scores are slightly higher (WHO, 2007). Therefore, prevalence and z-scores using the CDC/NCHS are lower than using the new WHO reference population (de Onis et al., 2007), my calculated z-scores would therefore provide lower impacts.

Variables

Age in months:	Exact age calculated in decimal months using the reported date of birth and date of interview. For ILCS, use the final age reported in the data set which includes some imputed ages
Height-for-age	Height is taken as measured and is standardised using the reference population. Calculated using zanthro function in Stata 10.1. Length is used for children under 2, Height for children above 2.
Weight-for-age	Weight is taken as measured and is standardised using the reference population. Calculated using zanthro function in Stata 10.1.
Weight-for-height	Weight is taken as measured and is standardised using the reference population. Calculated using zanthro function in Stata 10.1. Length is used for children under 2, Height for children above 2.
Child illness:	Dummy variable coded one if the mother or caretaker reported the child having a fever, cough, cold or diarrhoea during the past two weeks
Mother schooling:	Number of years of education completed of the mother or caretaker. In 2,250 cases data did not reported mother or caretaker id number. I therefore look into each children separately and identify at the household level the mother or the caretaker who is old enough to have children and who is married to the head of household
Mother's weight and height:	Restricted for weights between 40 & 90 kg, heights were restricted to 140 to 190 cm. The remaining was set to missing values as they do not seem to be recorded properly
Receiving food rations:	Dummy equal one if the household reported receiving food rations during the past month
Displaced since 2002:	Dummy equal one if the household responded to be living in a different place in December 2002
Street lights in 2002:	Dummy equal one if the household responded to have had street electricity in December 2002
Infant mortality ratio:	Calculated at the household level by taking the number of reported deaths less than 1 year over the total number of household members prior to 2003
Household members:	Number of household members (not dwelling members)

Damages:	Dummy equal one if the household responded to have damages in the dwelling
Electricity stability:	Dummy equal one if the household responded to have daily and frequent problems in electricity supply
Water stability:	Dummy equal one if the household responded to have daily and frequent problems in water stability
Sewage problems:	Dummy equal one if the household responded to have frequent problems in sewage system
Overcrowding:	Number of household members over number of rooms in dwelling for displaced households
Log income:	Log of total income reported for 2002 and 2003 respectively. Includes wage and non wage income as well as transfers
Ratio death over population:	Total number of war-related deaths per districts over total population in the districts using survey weights
Conflict intensity districts:	dummies equal to one for each type of conflict affected district
Conflict intensity provinces	Dummy 1 for high-intensity provinces

War-mortality and intensity of war

This sub-section explains further how I measure the intensity of the war. I use an objective measure, taken from war-related mortality, and a subjective one, taken from the frequency of shooting in the neighbourhood.

For the provincial level treatment effect: I calculate the total number of deaths in each governorate using the ILCS data and adjusting for sample design. I am able to identify the cause of death as interviewers explicitly asked households if the death was caused by the war[50]. Figure 4 shows the distribution of deaths. I identify the provinces according to their place in the distribution, coding high intensity provinces those that had at least 1,000 deaths. Table A.9 shows the number of deaths by governorate.

For district level treatment: First, I estimate the ratio of deaths over the total population in each of the 104 districts. I use war-related deaths to calculate the mortality ratios for each district. Second, I calculate the percentile rank of all districts according to this ratio. Third, I rank districts according to their percentile rank, and classify them

[50] The question asked was: Has any person(s) who was a regular household member died or gone missing during the past 24 months? A subsequent question asked: What was the cause of death?

accordingly. I then code the bottom (below 25-percentile of median) as low-conflict-intensity districts, the middle (between 25 and 75 percentile of median) as medium-conflict-intensity district and the top (above 75-percentile of median) as high-conflict-intensity districts[51]. The classification of medium intensity districts from the 25 to 75 percentile is done to create as much variation as possible across districts. I get 12 as high intensity, 23 as medium intensity and 12 as low intensity. I code the rest of districts, with no recorded war-related deaths as non-affected. The name "non-affected", reflects the fact, that there was no war death reported, however, to a certain extent, all district have been affected by the wear one way or another. This supposition does not affect the results as I use different counterfactuals in my specifications[52]. I therefore generate four types of conflict-intensity districts and exploit this variation in the intensity of treatment. Furthermore, I also do a sensitivity analysis using different cut-off points.

For shooting in the neighbourhood: Shooting in the neighbourhood is taken a question in the ILCS household questionnaire: How often did you hear weapons-shot in your neighbourhood last month? Households reported the following: (1) every day, (2) several times a week, (3) less than several times a week and; (4) never. I take the ratio of 1 + 2 over 3+4, and classify provinces accordingly. For classification of districts, I follow a similar approach as outlined for war-related mortality measure.

Validity of the measurement of violence

Since I use household reported war-deaths as my measurement of war-shock, it is important to verify how reliable this information is in comparison to other sources, because there is a great degree of controversy on the number of people killed in Iraq

[51] Papers with similar strategies taking rankings or classifying treatment effects by certain threshold are (Lavy and Schlosser, 2005; Card and Krueger, September, 1994; Duflo, September, 2001).
[52] The exclusion of these districts into the ranking does not affect the distribution.

since March 2003. A comparison to other sources will help to assess the reliability and independence of the information.

IBC collects data on casualties that occurred due to the war. However, at the time of writing, the data cannot be disaggregated up to the district level. Therefore, I am only able to use it as a comparison and to validate the use of household reported deaths. For the comparison I do the following. First, I calculate the mean and confidence intervals of the number of people killed by the war at the provincial level for each of the 18 provinces using sample weights (and corrections for stratification). Second, I use the IBC time series database to calculate the maximum and minimum total number of victims per province up to the ILCS interview date in each province. Fourth, I correlate the IBC and the survey estimates for the total (mean) values of war-related deaths and for the lower and upper confidence interval estimates. Table A.9 presents the results showing a correlation of .92 for provincial values and .74 for regional totals. The same table shows a correlation of 0.71 between shooting in the neighbourhood and war-related mortality. Figure 4 shows the distributions between ILCS and IBC. These results are reassuring and provide evidence that both data are very much consistent and are a good approximation of the war-related mortality.

Table 1: Characteristics of children and households by year of survey and conflcit intensity provinces

	MICS 2000						ILCS 2004						MICS 2006					
	Baseline: Before Treatment						Treatment Begins: After 2003 War						Treatment Continues: After Samarra Bombing					
	Low Intensity Provinces (1)		High Intensity Provinces (2)		(3)		Low Intensity Provinces (4)		High Intensity Provinces (5)		(6)		Low Intensity Provinces (7)		High Intensity Provinces (8)		(9)	
	mean	SD	mean	SD	Differenc	se	mean	SD	mean	SD	Differenc	se	mean	SD	mean	SD	Difference	se
Number of Children	n=1148		n=763				n=1010		n717				n=1045		n= 662			
Individual Characteristics																		
age in months (mean)	9.46	1.96	9.55	1.93	-0.09	0.09	9.20	2.00	9.28	1.97	-0.07	0.10	9.59	1.73	9.53	1.70	0.06	0.09
female (mean)	0.48	0.50	0.51	0.50	-0.04	0.02	0.49	0.50	0.48	0.50	0.01	0.02	0.50	0.50	0.48	0.50	0.02	0.02
weight (kg)	7.98	1.18	7.88	1.18	0.10	0.06 ***	8.10	1.17	8.21	1.12	-0.11	0.06 ***	8.31	1.11	8.18	1.25	0.14	0.06 **
height/lenght (cm)	69.83	4.77	69.56	5.10	0.26	0.23	70.38	5.58	69.87	5.20	0.51	0.27 *	70.66	4.75	69.71	5.56	0.94	0.25 ***
zscore height-for-age	-0.52	1.42	-0.54	1.51	0.02	0.07	-0.15	2.01	-0.41	1.86	0.26	0.10 ***	-0.26	1.66	-0.55	1.97	0.28	0.09 ***
zscore weight-for-height	-0.43	1.9667	-0.61	2.04	0.18	0.10 *	-0.16	1.87	0.16	1.74	-0.32	0.09 ***	-0.01	2.04	0.00	2.72	-0.01	0.12
reported illness (mean)+	0.47	0.50	0.55	0.50	-0.08	0.02 ***	0.36	0.48	0.33	0.47	0.03	0.02	0.49	0.50	0.47	0.50	0.02	0.02
Household Characteristics																		
Number of Households	n=7995		n=5206				n= 11,839		n= 9,796				n= 10,518		n= 7,355			
Num. Household members	7.46	3.66	7.63	3.59	-0.17	0.06 ***	6.82	3.33	6.41	2.95	0.40	0.04 ***	6.63	3.23	6.30	2.93	0.33	0.05 ***
Head is male (percent)	89.48		89.42		0.06		88.76		89.2		-0.44		88.63		89.84		-1.21	**
Highest education level head+																		
Primary	45.78		42.24				42.52		36.16				42.45		36.73			
Secondary	34.83		38.68				42.76		44.76				45.60		51.70			
Tertiary	15.3		17.47				9.14		12.95				9.45		9.47			
Non-standard curriculum	4.1		1.61				5.6		6.13				2.49		2.11			
Highest education level mother (percent) +																		
Primary	50.41		49.91				58.29		48.69				57.93		51.72			
Secondary	30.81		29.58				34.08		40.15				35.60		42.27			
Tertiary	14.19		19.2				3.81		6.84				3.91		3.99			
Non-standard curriculum	4.6		1.3				3.81		4.31				2.56		2.04			
Dwelling (percent)																		
House/ independent kitchen+	98.66		97.09				81.2		84.15									
Apartment/balcony+	1.05		1.18				14.35		16.59									
Sarifa-Kookh/Garden Plot+	0.14		0.97				45.43		41.26									
Tent-beit shaar/roof area+	0.00		0.05				68.02		76.34									
Caravan	0.09		0.58															
Others	0.06		0.14															
# Rooms (mean)	3.80	1.69	4.23	1.61	-0.44	0.03 ***	4.29	1.98	4.59	1.83								
# Rooms for sleeping (mean)													2.04	0.98	2.15	1.21	-0.11	0.02 ***
Area																		
Urban (percent)	57.2		65.9				63.31		74.96				66.59		69.46			
Rural (percent)	42.8		34.1				36.69		25.04				33.41		30.54			
Num. Governorates	11		7				11		7				11.00		7.00			
Total sample population	59,641		39,733				80,687		62,794									

Note: Table presents main characteristics of children and households using three different independent suverys (2000, 2004, 2006). Provinces are divided in Low intensity and High Intensity conflict provinces. Characteristics are presented with means and standard deviations or with proportions. Variables marked with a + sign are not strictly comparable because questions in the surveys are not the same. See appendix for a list. For example, Illness in 2006 only includes cough or diahrroea, while for 2000 and 2004 hh where asked about diaorrhoea, cough and fever. 2006: Education head Pearson chi2(4) = 54.7034 Pr = 0.000, Education mother Pearson chi2(6) = 49.7047 Pr = 0.000

Table 2: Characteristics of children and households by conflcit intensity dinstricts in 2004

	All Sub-sample		High-intensity		Medium-intensity		Low-intensity		Non-affected	
	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD
Individual Characteristics										
age in months (mean)	33.4988	15	33.38	14.93	33.36	15.0672	33.65	14.98	33.69	14.99
female (prop)	49.13		49.14		49.68		49.57		48.11	
weight (kg)	12.8695	3.27	13.05	3.18	12.80	3.39	12.88	3.28	12.81	3.18
height/lenght (cm)	87.7891	11.4	88.03	11.68	87.92	11.51	88.08	11.12	87.23	11.25
reported illness (prop)	22.44		23.48		23.19		22.90		20.27	
Mother characteristics										
age (mean)	30.5129	6.72	30.46	6.64	30.43	6.76	30.90	6.79	30.42	6.67
height of mother(mean)	158.846	7.31	158.93	6.84	158.74	7.81	159.47	7.43	158.51	6.89
weight of mother(mean)	65.7135	12.7	67.59	12.48	65.30	12.91	65.24	12.84	65.00	12.47
Years of schooling (mean)	7.73887	3.43	8.58	3.61	7.77	3.40	7.39	3.25	7.08	3.21
Household Characteristics										
Age of head (mean)	41.6483	13.1	41.20	12.45	42.61	13.60209	42.14	13.16	40.433	12.98
Household size (mean)	8.1864	3.81	7.376	3.11	8.666	4.15	8.42	3.688	8.08	3.849
Fathers years of schooling	9.69818	3.98	10.403	3.969	9.760	3.982877	9.44	3.956	9.1439	3.891
Male Head (prop)	95.1		94.31		94.98		94.25		96.47	
Head never attended school	23.4		17.55		25.11		25.93		24.42	
Head did not complete elementary	12.06		9.64		11.4		13.22		14.24	
Head completed elementary school	28.4		28		27.96		27.41		29.95	
Head completed Intermediate school	11.83		13.75		12.06		10.87		10.51	
Head completed secondary school	10.06		12.01		9.51		9.78		9.33	
Head completed higher education	14.25		19.05		13.95		12.79		11.54	
Total income 2003 (Log Iraqi Dinars)	14.6697	0.63	15	0.648	15	0.609555	14.67	0.66	14.68	0.639
Head is Employed	77.68		80.32		73.72		75.31		82.3	
Head is Unemployed	3.72		3.46		3.79		4.81		3.1	
Head is not in the LF	18.6		16.22		22.49		19.87		14.6	
Security & Assistance										
Percentage receivig food rations	97.1201		97.91		96.10		98.40		96.99	
Posess fire arms	34.83		25.60		39.81		29.00		39.68	
Shooting in neighborhood every day	30.5		45.43		34.19		18.13		20.99	
Shooting in neighborhood several times a week	42.28	72.8	47.61	93.04	40.40	74.59	43.14	61.27	39.72	60.71
Shooting in neighborhood never	27.22		6.96		25.41		38.72		39.28	
Percentage displacement after 2003	6.87157		5.053		7.214		8.861		6.671	
Mother thinks security deteriorated in	0.46341	0.5	0.753	0.434	0.362	0.482421	0.31	0.465	0.463	0.503
Dwelling looted	0.02111	0.14	0.024	0.154	0.02	0.138662	0.025	0.157	0.0175	0.131
Dwelling damaged	0.06075	0.24	0.07	0.256	0.063	0.243273	0.042	0.201	0.0614	0.24
Pre-2003 war Characteristics										
Road Electricity in 2002	0.19143	0.39	0.33	0.469	0.14	0.34949	0.193	0.395	0.1319	0.338
Household members in 2002	7.53926	3.71	6.90	3.015	8.06	3.991274	7.833	3.539	7.4931	3.72
Ratio of HH members in 2002 over total members										
Ratio of HH members working in 2002	0.22532	0.14	0.22	0.128	0.22	0.148012	0.21	0.137	0.2264	0.14
Household Infant Mortality Ratio (num infants died over total members)	0.04839	0.08	0.05	0.079	0.05	0.074162	0.048	0.074	0.0512	0.079
Displaced before 2003	0.32001	1.28	0.05	0.49	0.09	0.668717	0.792	2.136	0.5555	1.466
Total income 2002 (Log Iraqi Dinars)	14.1461	0.73	14.16	0.714	14.11	0.719015	14.11	0.785	14.206	0.732
Location Characteristics										
Percentage of living in urban areas	60.51		80.48		55.69		64.89		47.31	
Duhouk	6						21.07		7.62	
Nineveh	6.44				9.92				11.38	
Suleimaniya	3.76								14.33	
Al-Tameem	3.89						21.15		1.25	
Erbil	2.79				5.34				3.53	
Diala	5.01				5.3		8.6		6.54	
Al-Anbar	5.85		7.63		5.83				8.14	
Baghdad	10.85		44.46		1.19				2.38	
Babil	5.37				6.26		7.74		7.17	
Kerbala	5.47				15.61				0.1	
Wasit	5.4		7.99		1.87		10.71		4.51	
Salahuddin	6.77				9.65		5.08		9.7	
Al-Najaf	5.48		12.16		4.26				5.01	
Al-Qadisiya	5.83				15.21				0	
Al-Muthanna	6.92				9.52		21.38		1.98	
Thi-Qar	5.26		6.73		10.05				1.03	
Missan	5.18		13.2						8.64	
Basrah	4.2		7.84				4.26		6.69	

The table presents means and percentages of various characteristics at the individual, household and locational levels by type of district. Districts are divided in four categories as outlined in section 6. Not all information is available for all households and therefore, aggregations reflect only values where information was available.

Table 3: Effect of the Treatment on Height-for-age in 2004

	Low-intensity Provinces	High-intensity Provinces	Difference
Panel A	n= 2098	n=1419	
Baseline: 2000 Cohort n= 1790	-0.521	-0.537	0.017
			0.070
After Treatment: 2004 Cohort n=1727	-0.154	-0.410	0.255 ***
			0.095
Difference	-0.366 ***	-0.128	-0.239 **
	0.075	0.090	0.118
Panel B	n= 2293	n= 1465	
Baseline: 2000 Cohort n= 1790	-0.521	-0.537	0.017
			0.070
After Treatment: 2006 Cohort n=1727	-0.287	-0.615	0.328 ***
			0.083
Difference	-0.234 ***	0.078	-0.312 ***
	0.066	0.092	0.112

Source: MICS 2000, ILCS 2004 and MICS 2006. The table reports zscores for height-for-age cohorts aged 6-13 months and before the war in 2000 (Baseline) and after the war in 2003 (Treatment). Classification of Low Intensity and High Intensity is according to provinces that reported more than 1000 war-related deaths as explained in the appendix. Robust standard erros in parenthesis

Table 4: Treatment Effects on Heigh-for-Age Z-scores of Young Children in High-violence Provinces

	Panel A: Effect in 2004				Panel B: Effect in 2006			
Baseline year: 2000	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Panel 1: War-related mortality								
DID	-0.239**	-0.232*	-0.224*	-0.249*	-0.312***	-0.264**	-0.267**	-0.302***
	(0.118)	(0.134)	(0.135)	(0.139)	(0.112)	(0.111)	(0.112)	(0.114)
Female		0.241***	0.241***	0.229***		0.0847	0.0867	0.0708
		(0.069)	(0.069)	(0.068)		(0.053)	(0.053)	(0.053)
Urban		0.160**	0.0755	0.0675		0.346***	0.272***	0.256***
		(0.072)	(0.085)	(0.089)		(0.055)	(0.065)	(0.065)
Panel 2: Shooting in the neighbourhood								
DID	-0.132	-0.136	-0.128	-0.143	-0.293***	-0.234**	-0.238**	-0.268**
	(0.116)	(0.116)	(0.116)	(0.119)	(0.107)	(0.107)	(0.108)	(0.110)
Female								
		0.195***	0.197***	0.187***		0.0838	0.0862	0.0735
		(0.058)	(0.058)	(0.057)		(0.053)	(0.053)	(0.053)
Urban								
		0.205***	0.0973	0.0945		0.348***	0.262***	0.251***
		(0.061)	(0.072)	(0.074)		(0.055)	(0.064)	(0.065)
Controls:								
Individual		✓	✓	✓		✓	✓	✓
Household			✓	✓			✓	✓
Province FE				✓				✓

Note: Table reports estimates of Difference-in-Difference coefficients obtained by runing a regression of z-scores height-for-age on young cohorts in treatment and non treatment areas. Two treatment indicators are used: an objective measure which refers to war-related mortality and a subjective measure which refers to shooting in the neighbourhood. All specifications report robust standard errors. Covariates include: sex, urban, number of household members, water in dwelling, mother education is included as a dummy for missing values when the mother's education was not reported, in order to avoid losing observations.Significance levels at *** 1%, ** 5%, * 10%, respectively.

Table 5: Treatment Effects on Heigh-for-Age Z-scores of Young Children in High-violence Provinces

Baseline: old Cohort born before March 2003	Panel A: Unweighted Estimates							Panel B: Weighted Estimates						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel 1 : War-related Mortality														
DID	-0.222**	-0.229**	-0.267**	-0.267**	-0.239**	-0.221*	-0.218*	-0.339***	-0.345***	-0.370***	-0.370***	-0.339***	-0.345**	-0.327**
	(0.108)	(0.108)	(0.107)	(0.107)	(0.109)	(0.113)	(0.115)	(0.131)	(0.130)	(0.128)	(0.128)	(0.130)	(0.135)	(0.137)
Female		0.296***	0.292***	0.292***	0.286***	0.275***	0.287***		0.272***	0.274***	0.274***	0.265***	0.257***	0.257***
		(0.048)	(0.047)	(0.047)	(0.047)	(0.049)	(0.051)		(0.051)	(0.051)	(0.051)	(0.051)	(0.053)	(0.054)
Ethnicity		0.168**	-0.139	-0.139	-0.142	-0.211	-0.230*		-0.0775	-0.0780	-0.0780	-0.0790	-0.116	-0.175
		(0.070)	(0.123)	(0.123)	(0.125)	(0.129)	(0.139)		(0.083)	(0.155)	(0.155)	(0.154)	(0.161)	(0.158)
Urban		0.0854*	0.0283	0.0283	0.0389	0.0178	-0.0480		0.0792	0.0343	0.0343	0.0504	0.0433	-0.0292
		(0.051)	(0.059)	(0.059)	(0.059)	(0.064)	(0.068)		(0.064)	(0.073)	(0.073)	(0.073)	(0.078)	(0.080)
Panel 2: Shooting in the neighbourhood														
DID	-0.299***	-0.301***	-0.301***	-0.301***	-0.268**	-0.276**	-0.270**	-0.386***	-0.384***	-0.393***	-0.393***	-0.364***	-0.392***	-0.382***
	(0.099)	(0.107)	(0.105)	(0.105)	(0.108)	(0.112)	(0.112)	(0.130)	(0.129)	(0.126)	(0.126)	(0.129)	(0.133)	(0.132)
Female		0.298***	0.290***	0.290***	0.285***	0.274***	0.266***		0.272***	0.272***	0.272***	0.263***	0.256***	0.243***
		(0.048)	(0.047)	(0.047)	(0.047)	(0.049)	(0.049)		(0.051)	(0.051)	(0.051)	(0.051)	(0.053)	(0.053)
Ethnicity		0.0900	-0.134	-0.134	-0.137	-0.203	-0.202		-0.122	-0.0733	-0.0733	-0.0744	-0.109	-0.111
		(0.069)	(0.123)	(0.123)	(0.125)	(0.129)	(0.128)		(0.082)	(0.155)	(0.155)	(0.154)	(0.162)	(0.157)
Urban		0.0573	0.0249	0.0249	0.0357	0.0149	-0.0504		0.0549	0.0317	0.0317	0.0480	0.0410	-0.0277
		(0.052)	(0.059)	(0.059)	(0.059)	(0.064)	(0.066)		(0.065)	(0.073)	(0.073)	(0.073)	(0.078)	(0.078)
Controls:														
District FE			✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
Province FE				✓	✓	✓	✓				✓	✓	✓	✓
Month of Birth FE					✓	✓	✓					✓	✓	✓
Pre-war control variables						✓	✓						✓	✓
Mother and Father characteristics							✓							✓

Note: Panel A reports unweighted estimates and Panel B weighted estimates adjusting for sampling design. All specifications report robust standard errors. Individual charaterictis are: female, urban and ethnicity are dummy variables. Ethnicity equals one for Arab, zero for Kurd, Assyrian, Turkomen or other. Specifications 2-7 include dummies for each district to account for within and between correlation. Specification 3-7 add province FE to account for effects at the provincial level. Specifications 4-7 add month of birth FE to account for specific cohort effects. Specifications 6-7 add controls for pre-war characterisitcs (a list of variables is included in the annex).The specification 7 adds household characteristics, including dummy for sex of the head, age of the head, mother's weight and height, dummy for employment status of the head, schooling of father, dummies for missing values when the mother's or schooling was not reported. Significance levels at *** 1%, ** 5%, * 10%, respectively.

Table 6: Treatment Effects on Heigh-for-Age Z-scores of Young Children in High-violence Districts

Baseline: old Cohort born before March 2003	Panel A: Unweighted Estimates						Panel B: Weighted Estimates					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
DID : War-related Mortality	-0.421***	-0.411***	-0.370**	-0.387**	-0.384**	-0.417**	-0.379**	-0.377**	-0.373**	-0.373**	-0.396**	-0.429**
	(0.142)	(0.152)	(0.150)	(0.152)	(0.160)	(0.164)	(0.185)	(0.185)	(0.182)	(0.180)	(0.191)	(0.195)
DID: Shooting in the neighbourhood	-0.292**	-0.282**	-0.271**	-0.213	-0.249*	-0.225	-0.436***	-0.438***	-0.431***	-0.349**	-0.416**	-0.373**
	(0.138)	(0.139)	(0.136)	(0.141)	(0.147)	(0.151)	(0.161)	(0.162)	(0.155)	(0.161)	(0.165)	(0.169)
Controls:												
Individual and Location		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
District FE			✓	✓	✓	✓			✓	✓	✓	✓
Province FE			✓	✓	✓	✓			✓	✓	✓	✓
Month of Birth FE				✓	✓	✓				✓	✓	✓
Pre-war control variables					✓	✓					✓	✓
Mother and Father characteristics						✓						✓

Note: Table reports unweighted and weighted estimates of effects on height-for-age z-scores when the treatment area is classified at the district level. Districts are taken from the top and lower parts of the war-related mortality distribution. All specifications report robust standard errors. Individual and location characteristics include dummies for female, urban and ethnicity. Ethnicity equals one for Arab, zero for Kurd, Assyrian, Turkomen or other. Specifications 2-6 include dummies for each district to account for within and between correlation. Specification 3-6 add province FE to account for effects at the provincial level. Specifications 4-6 add month of birth FE to account for specific cohort effects. Specifications 6 add controls for pre-war characterisitcs, and head of household and mother characteristics, including dummy for sex of the head, age of the head, mother's weight and height, dummy for employment status of the head, schooling of father, dummies for missing values when the mother's or schooling was not reported. Significance levels at *** 1%, ** 5%, * 10%, respectively.

Table 7: Effect of the War on 2006 Height-for-Age Z-scores and Falscification Excercise of No Effect in 2000

	Low intensity Provinces	High intensity Provinces	Difference
Panel A: Effect in 2006	n= 2732	n= 1787	
Older cohorts aged 49 to 60 months	-0.818	-0.737	-0.080
n=2551			0.062
Young cohorts aged 6-13 months	-0.287	-0.615	0.328 ***
n= 1968			0.083
Difference	-0.531 ***	-0.122 ***	-0.409 ***
	0.060	0.086	0.102
Panel B: Falsification exercise of no effect in 2000	n= 2459	n= 1565	
Older cohorts aged 49 to 60 months	-1.2088	-1.1708	0.0379
n= 2221			0.05
Young cohorts aged 6-13 months	-0.5194	-0.5375	-0.0180
n= 1803			0.07
Difference	0.6893 ***	0.6334 ***	-0.0559
	0.052	0.068	0.085
Panel C: Falsification Exercise: No Effect on Mother's Height	n= 1490	n= 1371	
Mothers of older cohorts aged 49 to 60 months	158.6921	158.8509	0.1588
n= 1605			0.34
Mothers of young cohorts aged 6-13 months	158.3028	159.0995	0.7967 **
n=1256			0.38
Difference	-0.3893	0.2486	0.6379
	0.342	0.376	0.508

*** significant at 1 % ** significant at 5%, * significnat at 10 %. Unweighted estimates. Unadjusted means. Standard erros in parenthesis.
note: Author's calculations based on MICS 2000 and MICS2006 data. Intensity areas are coded at the provincial level and not at the district level. High intenstity provinces based on war-mortality in 2004. zschores below -6 SD and above +6SD are not included in the analysis.

Table 8: Effects on Nutrition Indicators of Young Children Born After the War

	2004	2006
Panel A: Baseline Year 2000		
Height-for-Age	-0.239 **	-0.312 ***
	0.118	0.112
Weight-for-Height	0.447 ***	0.415 ***
	0.120	0.117
Weight-for-Age	0.194 **	0.101
	0.095	0.091
Panel B: Baseline Cohorts Born Before the War 49-59 months		
Height-for-Age	-0.222 **	-0.409 ***
	0.101	0.102
Weight-for-Height	0.258 **	0.158
	0.105	0.102
Weight-for-Age	-0.023	-0.174 **
	0.080	0.080
Panel C: Follow up of 2004 Young Cohort in 2006. (Now 26-33 months old)		
Height-for-Age		0.194
		0.125
Weight-for-Height		-0.058
		0.118
Weight-for-Age		0.132
		0.094

Table 9: Estimates based on Continous Treatment Effects on Height-for-Age Z-scores

	Panel A: Unweighted		Panel B: Weighted	
	Whole Sample	Sub-sample of districts with war-related mortality Only	Whole Sample	Sub-sample of districts with war-related mortality Only
	(1)	(2)	(3)	(4)
Continous treatment effect over pooled cohorts born after the war	-0.0380	-0.0149	-0.0670	-0.0404
	(0.033)	(0.038)	(0.043)	(0.050)
N	15209	10780	15209	10780
adjusted R2/R2	0.093	0.074	0.0922	0.0804

Note: The table reports difference-in-difference estimates from various regressions of z-scores. Treatement is treated as a continous effect and is measured by the ratio of total war deaths in each district over population in the same district (1,000). All specifications control for age measured in decimal months in addition to control for cohort and district effects. Unweighted estimates are reported in Panel A and weighted estimates adjusting for survey design are reported in panel B. Specifications 1 and 3 are based on the whole sample of children where I was able to calculate z-scores of height-for-age. Specifications 2 and 4 are based on a sub-sample of these children where war-related deaths at the district level were greater than zero. Robust standard erros in parenthesis. Significance levels at *** 1%, ** 5%, * 10%, respectively.

Table 10: Effects on Various Child Health Outcomes

Treatment: Children born after the war in	Panel A: Restricted					Panel B: Unrestricted				
	Any Illness	Fever	Cough	Diarrhoea	Breast-feeding child	Any Illness	Fever	Cough	Diarrhoea	Breast-feeding child
DID	-0.002	-0.003	-0.010	0.053**	-0.0471	-0.013	-0.015	0.009	0.034*	-0.0758***
	(0.027)	(0.025)	(0.076)	(0.021)	(0.041)	(0.020)	(0.019)	(0.059)	(0.017)	(0.021)
_cons	0.718***	0.583**	-1.062***	0.286***	1.118***	0.718***	0.583**	-1.062***	0.286***	0.770***
	(0.272)	(0.269)	(0.296)	(0.087)	(0.370)	(0.272)	(0.269)	(0.296)	(0.087)	(0.160)
N	19263	19263	2719	19551	2143	19263	19263	2719	19551	14101
R2	0.0906	0.0594	0.105	0.0723	0.148	0.0906	0.0594	0.105	0.0723	0.115

Table reports weighted DID estimates for running model 2 (as for anthropometric outcomes) where the dependent variable is a dummy where the child reported having an illness, fever, cough or diaorrhea. Restricted estimates are taken from taking a sub-sample for hight intensity conflict districts and non-affected and comaring cohorts born after the war with the oldest cohort. *** 1%, ** 5%, * 10%, respectively.

Table 11: Effects on Various Antenatal and Postnatal Care

Dependent Variable: Treatment=High intensity conflict districts	Panel A: Restricted						Panel B: Unrestricted				
	Month First Pregancy Visit	Month First Pregancy Visit	Visits to Health Care	Injection	Delivery Doctor	Still Birth	Month First Pregancy Visit	Visits to Health Care	Injection	Delivery Doctor	Still Birth
DID	-0.209*	-0.221**	0.335	0.0207	-0.0128	0.00403	-0.220**	0.272	-0.00113	-0.0226	-0.000419
	(0.124)	(0.108)	(0.270)	(0.025)	(0.034)	(0.008)	(0.099)	(0.210)	(0.022)	(0.031)	(0.008)
_cons	4.329***	4.679***	3.399***	0.798***	0.875***	0.0577*	6.038***	-0.254	0.248	0.770**	0.225***
	(0.731)	(0.569)	(0.886)	(0.084)	(0.098)	(0.034)	(0.782)	(1.788)	(0.200)	(0.314)	(0.070)
N	5280	6833	6778	6893	3511	8086	12224	12134	12289	6449	14564
R2	0.114	0.113	0.0736	0.141	0.213	0.0150	0.103	0.0542	0.107	0.216	0.0199

Table reports weighted estimates. Sample includes women between 15-54 who have been pregnant during the past five years and where asked separate questions on women and child health. Identification comes by comparing the first youngest cohort born after the war with the eldest cohort within the same household. Districts are divided similar conflict-intensity levels as in previous sections. This table reports weighted estimates controling for district and province effects as well as controls for household characteristics inlcuding, number of household members, labour force status of head, log income 2003, head of household schooling, woman's weight, height, education and age. Column 1 in panel A reports mother's education and age taken as an average of women who have been pregnant in each household as the data received did not allowed to identify separately each woman. The rest of the columns account for missing values in the women's education variable. Unrestricted estimates compare high-intensity districts to the rest. Restricted specifications take high-intensity conflict districts and compare them with non-affected. *** 1%, ** 5%, * 10%, respectively.

Table 12: District intensity conflict and Household reported outcomes

Dependent Variable	Head Ill		Displacement		Overcrowding		Water problem		Drinking water problem		Sewage Problem		Electricity Problem	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Level of Conflict Intensity:														
High-intensity	0.0620	0.0712**	0.0512***	0.0340	0.130**	0.209	0.0469*	-0.00177	0.0921***	0.0547*	0.192***	0.0503***	0.0239*	0.0326**
	(0.083)	(0.036)	(0.019)	(0.038)	(0.051)	(0.130)	(0.024)	(0.024)	(0.029)	(0.030)	(0.020)	(0.012)	(0.014)	(0.015)
Medium-intensity		0.0388		0.0645***		0.274***		-0.0928***		-0.0703***		-0.00172		0.0189**
		(0.048)		(0.023)		(0.105)		(0.022)		(0.024)		(0.007)		(0.009)
Low -intensity		-0.134		0.160***		0.297***		-0.0804***		-0.0643**		-0.00332		0.00130
		(0.083)		(0.034)		(0.071)		(0.023)		(0.031)		(0.006)		(0.020)
_cons	0.175***	0.206**	0.0588	-0.101	0.374	0.0766	0.398***	0.438***	0.416***	0.449***	-0.0426***	0.481***	0.0465***	0.0588***
	(0.033)	(0.099)	(0.108)	(0.104)	(0.258)	(0.248)	(0.033)	(0.035)	(0.033)	(0.037)	(0.007)	(0.014)	(0.010)	(0.015)
N	20211	20211	19551	19551	19545	19545	21635	21635	21635	21635	21635	21635	21635	21635
R2	0.0320	0.0320	0.0688	0.0688	0.0475	0.0475	0.0776	0.0852	0.0607	0.0654	0.243	0.456	0.0470	0.0513

Columns 1-6 include controls for urban, log population, number of household members, log income 2003, if head is employed, ethnicity, province and district fe. Columns 6-14 include controls for urban areas and privince fe. Water problem is a dummy indicating one if the household reported disagreeing or strongly disagreing to the statement No problem obtaining daily use of water. Drinking water problem is a dummy indicating one if household reported disagreeing or strongly disagreeing to the statement: No problem obtaining the drinking water needed. Sewage problem is a dummy indicating one if the household reported frequent problems or never works properly to the statement: Frequency of problems with sewage network. Electricity problem is a dummy indicating one if the household reported daily and always to the statement: Frequency of electricity supply going bad. All dummies are reversed to indicate negative outcomes. *** 1%, ** 5%, * 10%, respectively.

Table A.1: Descriptive Statistics for survey samples

	MICS 2000						ILCS 2004						MICS 2006					
	All	Included	Excluded				All	Included	Excluded				All	Included	Excluded			
	1a	1b	1c	1d			2a	2b	2c	2d			3a	3b	3c	3d		
Variable	Mean/SD	Mean/ SD	Mean/ SD	Diff /SE		Imbens	Mean/SD	Mean/ SD	Mean/ SD	Diff	se		Mean/SD	Mean/ SD	Mean/ SD	Diff	se	
Observations	14,587	13,429	1,158				20,211	14,918	5,293				16,570	15,548	1,022			
Individual																		
female	0.49	0.49	0.49	0.00		0.01	0.49	0.49	0.49	0.00	0.01		0.49	0.49	0.50	0.00	0.02	
	0.50	0.50	0.50	0.01		-0.03	0.50	0.50	0.50				0.50	0.50	0.50			
height-for-age	-1.01						-0.98						-0.76					
	1.40						1.75						1.77					
weight-for-height	-0.30						0.02						0.25					
	1.49						1.72						1.70					
weight-for-age	-0.97						-0.65						-0.39					
	1.24						1.36						1.33					
illness [a]	0.35	0.35	0.32	0.04	**	0.08	0.23	0.22	0.24	-0.02	0.01	**	0.41	0.41	0.33	0.09	0.02	***
	0.48	0.48	0.47	0.01			0.42	0.42	0.43				0.49	0.49	0.47			
weight	12.82	11.55	25.13	-13.57	***	-0.60	12.74	12.88	11.69	1.19	0.07	***	12.13	12.26	9.60	2.66	0.14	***
	11.59	3.41	33.94	0.31			3.17	3.16	3.10				3.96	3.87	4.77			
height	83.48	84.02	77.06	6.95	***	0.46	87.20	88.03	81.22	6.81	0.27	***	83.99	84.43	75.89	8.53	0.53	***
	13.88	13.54	16.13	0.43			11.65	11.33	12.19				14.96	14.37	21.84			
age in months	29.29	29.71	25.27	4.44	***	0.27	29.51	33.50	18.26	15.24	0.25	***	28.59	28.84	24.29	4.55	0.58	***
	17.13	17.18	16.09	0.49			17.15	15.02	17.79				17.04	16.99	17.41			
Household																		
hh members	8.55	8.52	8.92	-0.40	***	-0.10	8.19	8.19	8.20	-0.01	0.06		7.90	7.88	8.14	-0.26	0.12	**
	3.73	3.70	4.01	0.15			3.85	3.81	3.95				3.73	3.70	4.08			
mother's ed yrs [a]							7.74	7.74	7.72	0.02	0.08							
							3.42	3.42	3.39									
Primary	0.63	0.63	0.64	-0.01		-0.03							0.48	0.48	0.46	0.02	0.02	
	0.48	0.48	0.48	0.02									0.50	0.50	0.50			
Secondary	0.28	0.28	0.26	0.02		0.04							0.30	0.30	0.26	0.05	0.01	***
	0.45	0.45	0.44	0.02									0.46	0.46	0.44			
Higher	0.06	0.06	0.07	0.00		0.00												
	0.24	0.24	0.25	0.01														
Non-standard curriculum	0.03	0.03	0.03	0.00		-0.02							0.01	0.01	0.01	0.00	0.00	
	0.17	0.17	0.18	0.01									0.09	0.10	0.09			
hh urban area	0.57	0.57	0.51	0.06	***	0.12	0.61	0.61	0.63	-0.02	0.01	**	0.62	0.62	0.60	0.01	0.02	
	0.50	0.49	0.50	0.02			0.49	0.49	0.48				0.49	0.49	0.49			
rooms dwelling [b]	4.12	4.12	4.17	-0.05		-0.03	4.45	4.46	4.45	0.01	0.03		2.17	2.16	2.34	-0.19	0.04	***
	1.77	1.76	1.88	0.05			1.96	1.92	2.06				1.18	1.17	1.28			
drinking water in dwelling	0.71	0.71	0.63	0.08	***	0.17	0.73	0.73	0.73	0.00	0.01		0.73	0.74	0.68	0.05	0.01	***
	0.46	0.45	0.48	0.01			0.44	0.44	0.44				0.44	0.44	0.46			
time get water [a]	28.75	28.98	26.99	2.00		0.04	17.1004	17.07252	17.17906	-0.11	0.41		23.43	23.73	19.95	3.78	1.94	***
	47.61	47.96	44.85	2.31			22.98597	22.92054	23.17217				32.11	32.52	26.50			

Note: Table presents summary statistics of 2000, 2004 and 2006 samples for: all, included, and excluded children . Excluded observations represent children where z-scores of height-for-age or weight-for-height were >6 or <-6 standard deviations from the reference population. Differences between children included and excluded in each sample are reported in columns 1d, 2d and 3d. a indicates that questions are not comparable among surveys. b indicates that number of rooms for 2000 and 2004 but sleeping rooms for 2006. Significance levels at: 1 percent ***, 5 percent **; and 10 percent *, respectively.

Table A.1: Probit Regressions Estimating Probability to be Included in the Sample

Dependent Variable: =1 if included	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		MICS 2000			ILCS 2004			MICS 2006	
Female	0.00398	0.0227	0.179*	0.0553	0.0505	-0.0679	0.0504	0.0608	0.222
	(0.087)	(0.088)	(0.100)	(0.052)	(0.053)	(0.078)	(0.121)	(0.124)	(0.145)
Reported illness	0.119	0.0865	0.117	0.114**	0.0847	-0.119	0.105	0.132	0.354**
	(0.088)	(0.091)	(0.096)	(0.056)	(0.058)	(0.083)	(0.126)	(0.127)	(0.150)
Age in months	0.00675	0.00880	-0.0197	0.295***	0.300***	-0.0751***	0.0450	0.0463	-0.0329
	(0.023)	(0.023)	(0.030)	(0.009)	(0.009)	(0.022)	(0.038)	(0.036)	(0.051)
Num hh members	0.00246	0.00651	0.00985	0.00315	0.00205	0.00309	-0.00735	-0.0122	-0.0131
	(0.011)	(0.011)	(0.012)	(0.007)	(0.007)	(0.011)	(0.017)	(0.018)	(0.021)
Urban	0.0621	0.0521	0.0214	-0.0808	-0.0980	-0.0965	0.127	0.202	0.111
	(0.108)	(0.114)	(0.120)	(0.067)	(0.073)	(0.102)	(0.144)	(0.137)	(0.161)
Water in Dwelling	0.0809	0.0555	0.0754	-0.116*	-0.0709	-0.0161	0.0537	-0.0663	-0.108
	(0.115)	(0.124)	(0.133)	(0.070)	(0.079)	(0.110)	(0.155)	(0.184)	(0.213)
Num hh rooms	-0.0176	-0.0128	-0.0408	0.000814	-0.00622	0.0120	-0.0495	-0.0392	-0.0294
	(0.030)	(0.030)	(0.030)	(0.013)	(0.013)	(0.023)	(0.069)	(0.072)	(0.078)
Education Mother missir	-0.0574	-0.0772	0.0246	0.957***	0.969***	0.0463	-0.0644	-0.0132	0.0911
	(0.095)	(0.099)	(0.110)	(0.056)	(0.057)	(0.096)	(0.159)	(0.169)	(0.194)
War Shock-high intensity	-0.277***	-0.386	-0.482	-0.0399	0.0422	-0.00205	-0.412***	-0.530	-0.305
	(0.090)	(0.302)	(0.456)	(0.054)	(0.191)	(0.272)	(0.134)	(0.413)	(0.436)
Weight			0.193***			-0.0493			0.567***
			(0.056)			(0.031)			(0.097)
Height			-0.0161			0.00206			-0.0294
			(0.013)			(0.009)			(0.024)
Province FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
_cons	1.430***	1.589***	1.898**	-2.729***	-2.872***	2.261***	1.714***	1.632***	-0.0463
	(0.266)	(0.355)	(0.857)	(0.113)	(0.178)	(0.586)	(0.395)	(0.457)	(1.392)
N	1894	1824	1799	4266	4266	1919	1707	1601	1601
pseudo R-sq	0.015	0.044	0.081	0.479	0.488	0.061	0.039	0.057	0.328

Note: The table reports marginal effects of a probit of being included in the sample on various individual and household characteristics. Robust standard errors in parenthesis. Significance levels at: 1 percent ***, 5 percent **, and 10 percent *, respectively.

Table A.3 : Descriptive Statistics of Z-scores and Age for cohort of interest

Year		Num children	mean	SD	min	max
2000	HAZ	1,790	-0.53	1.45	-5.90	5.54
	WHZ	1,791	-0.33	1.66	-6.00	5.78
	Age	1,897	9.51	1.95	6.01	12.98
2004	HAZ	1,727	-0.26	1.95	-5.96	5.89
	WHZ	1,712	-0.02	1.82	-5.78	5.97
	Age	1,727	9.23	1.99	6.01	12.98
2006	HAZ	1,968	-0.41	1.81	-5.95	5.90
	WHZ	1,956	0.20	1.80	-5.86	5.43
	Age	2,016	9.61	2.07	6.01	12.98

Note: Table reports summary statistics of Z-scores for height-for-age (HAZ) and weight-for-height (WHZ) for sub-sample of children in three surveys. Exact age in months is calculated by substracting the interview (day, month, year) by the date of birth (day, month, year) divided by 30.4375. Cohort of interest is children aged less than 13 months.

Table A.4: Summary Statistics of Provincial War-related Mortality

	All Provinces	High -Intensity	Low -Intensity
Population (000)	27,130	14,008	13,122
Total num deaths	23,743	18,029	5,714
SE (linearized)	2,833	2,666	959
Num provinces	18	7	11
Average num deaths	1,319	2,576	519
Maximum	2,962	2,962	907
Minimum	0	1,163	0

Note: Table reports summary statistics of the war-related mortality. High-intensity conflict provices have >1,000 deaths. Low-intensity conflict provinces <1,000 deaths. Total number of war-related deaths is calculated using survey weights, strata and psu. Estimates and linearised standard errors calculated in Stata 10.1. Source is ILCS 2004.

Table A.5: Characteristics of Districts by Treatment Intensity

	All districts	High -Intensity	Medium-Intensity	Low-Intensity	Non-affected
Population (000)	27,130	9,043	8,954	2,795	6,338
Total num deaths	23,743	15,239	7,607	896	0
Num districts	104	12	23	10	45
Average num deaths	505.17	1269.95	330.75	89.63	
Standard Deviation	567.74	628.50	153.22	33.04	
Age of head (mean)	41.6	41.2	42.6	42.1	40.4
Household size	8.2	7.4	8.7	8.4	8.1
Head schooling	9.7	10.4	9.8	9.4	9.1
Food rations	97.1	97.9	96.1	98.4	97.0
Shooting in neighborhood	30.5	45.4	34.2	18.1	21.0
Displaced (5-yr ago)	6.9	5.1	7.2	8.9	6.7
Urban	60.5	80.5	55.7	64.9	47.3

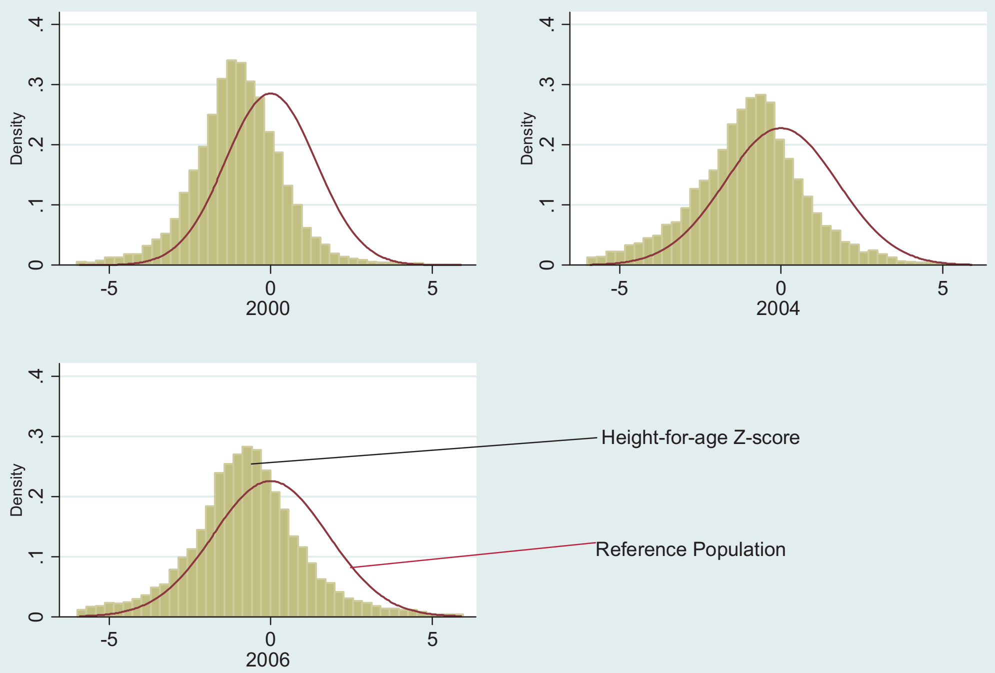
source: ILCS 2004

Table A.6: Cohorts exposure to war shock

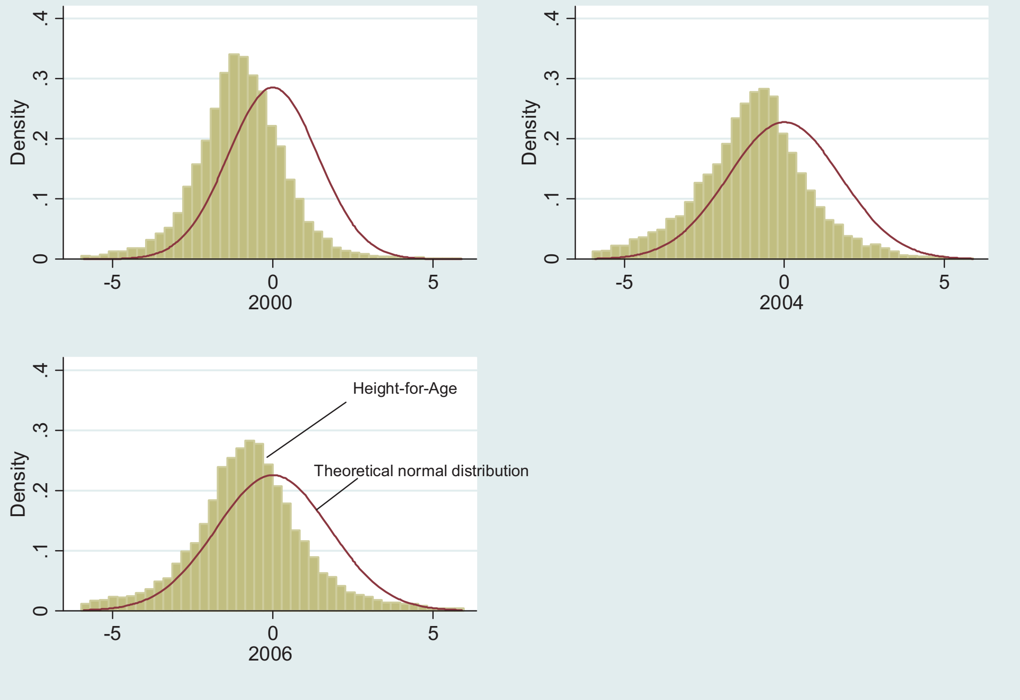
Percentage children of total	Cohort 1 *9-13 months*	Cohort 2 *14-24 months*	Cohort 3 *25-36 months*	Cohort 4 *37-48 months*	Cohort 5 *49-60 months*
In urban areas that expericed war-shock	66.3	65.9	65.7	65.2	65.7
In high-intensity conflict provinces	41.4	40.4	42.7	43.0	41.6
In low-intensity conflict provinces	58.6	59.6	57.3	57.0	58.4
In high-intensity conflict districts	22.2	21.1	22.2	21.9	22.0
In medium-intensity conflict districts	36.1	35.2	34.2	35.4	34.2
In low-intensity conflict districts	16.5	17.4	16.7	16.6	16.9
In non-war deaths districts	24.2	25.2	25.8	25.3	26.1

Note: Based on ILCS 2004. High-intensity and low-intensity conflict provinces and districs as described in the appendix.

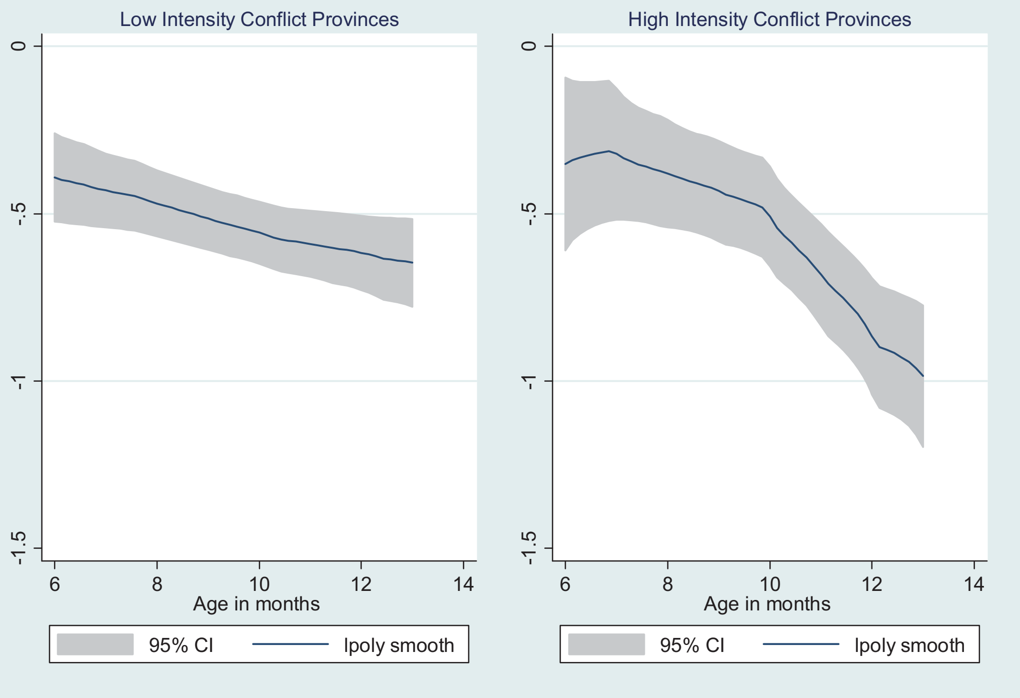
Graph 1: Standarised Z-scores of Height-for-age in 2000, 2004 and 2006 Samples



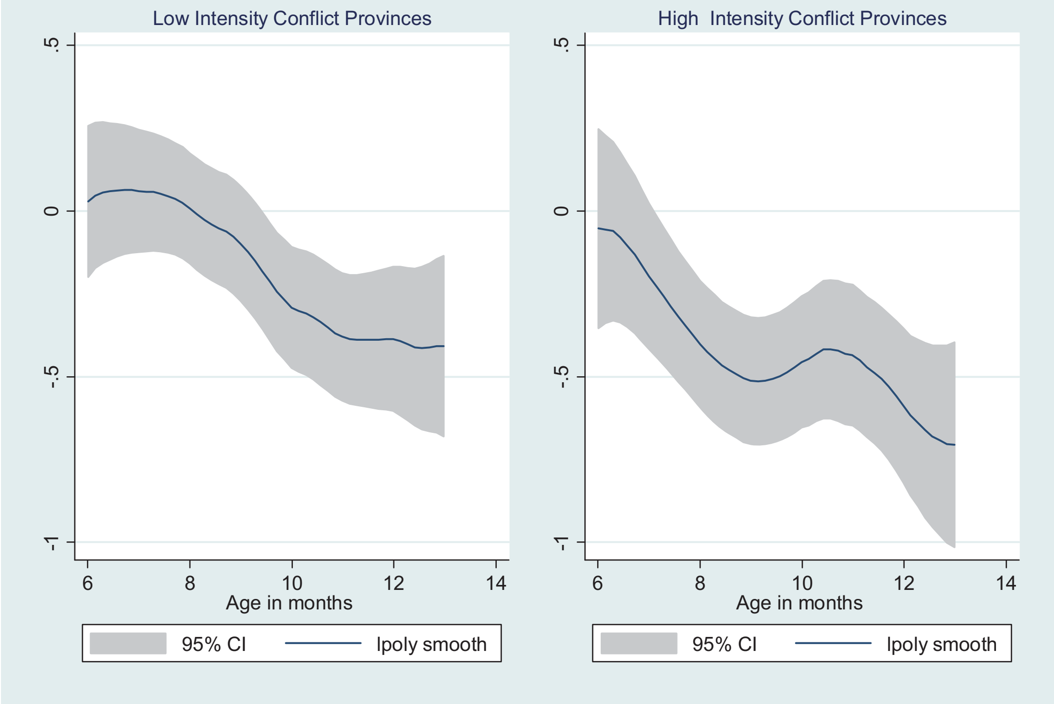
Graph 1: Standarized Height-for-Age Z-scores 2000, 2004 and 2006 Samples



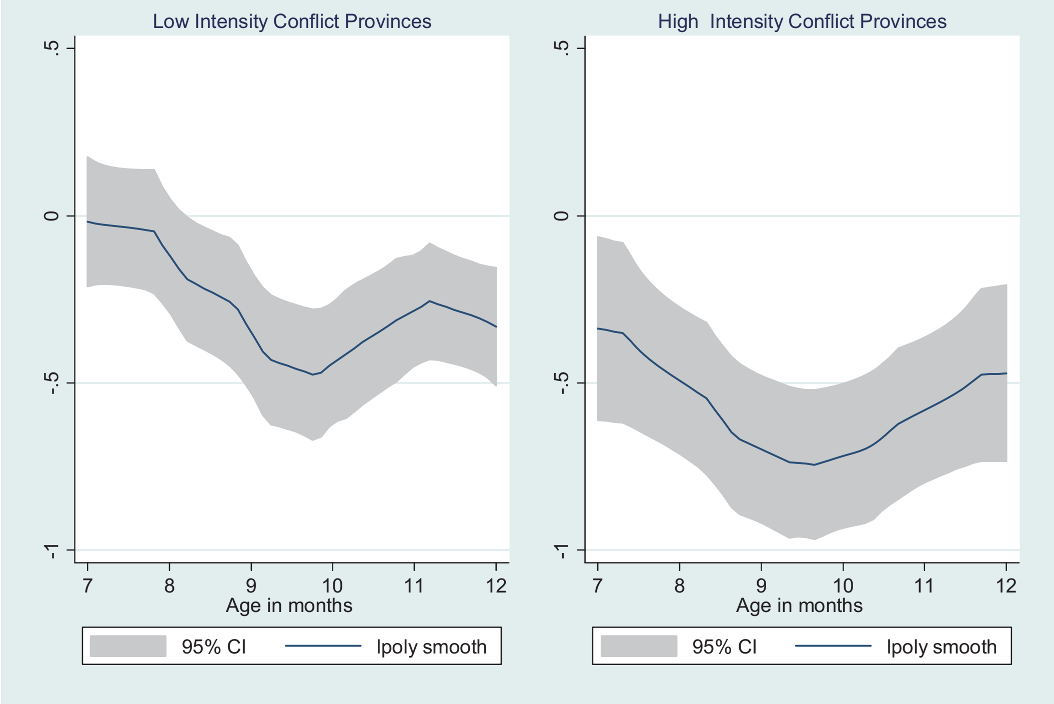
Graph A.3: Zscores of Height-for-age in 2000 for Cohort <13 months

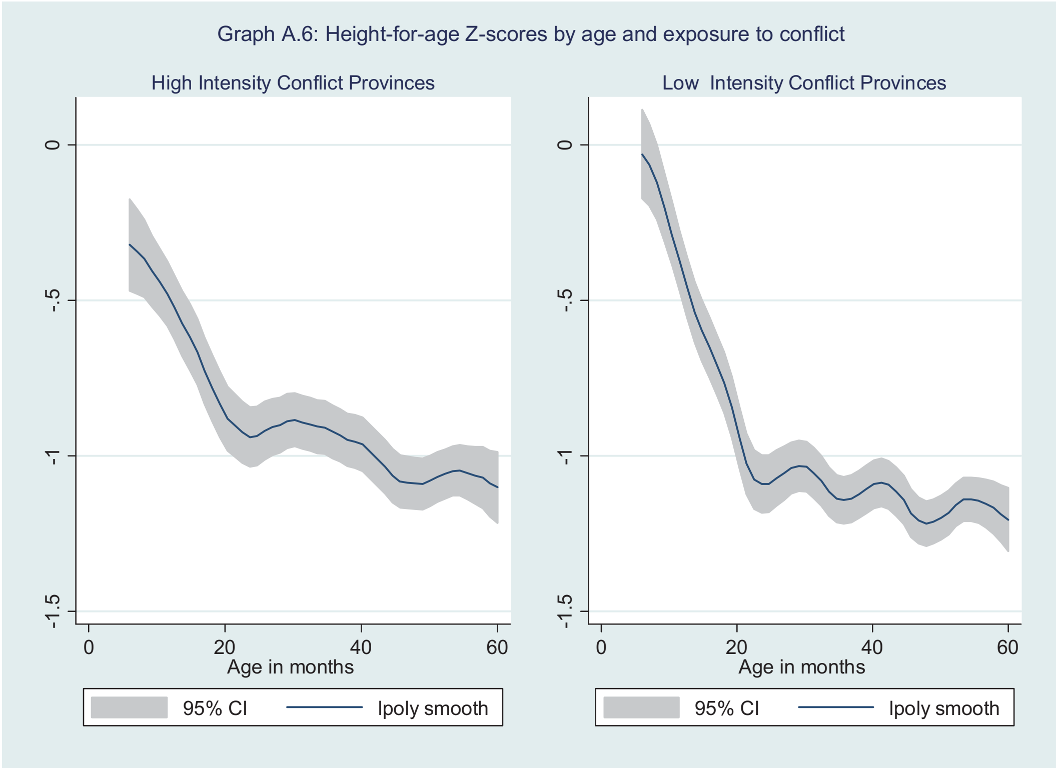


Graph A.4: Z-scores for Height-for-age in 2004 for Cohort <13 months



Graph A.5: Z-scores of Height-for-age in 2006 for Cohort <13 months





Graph A.6: Height-for-age Z-scores by age and exposure to conflict

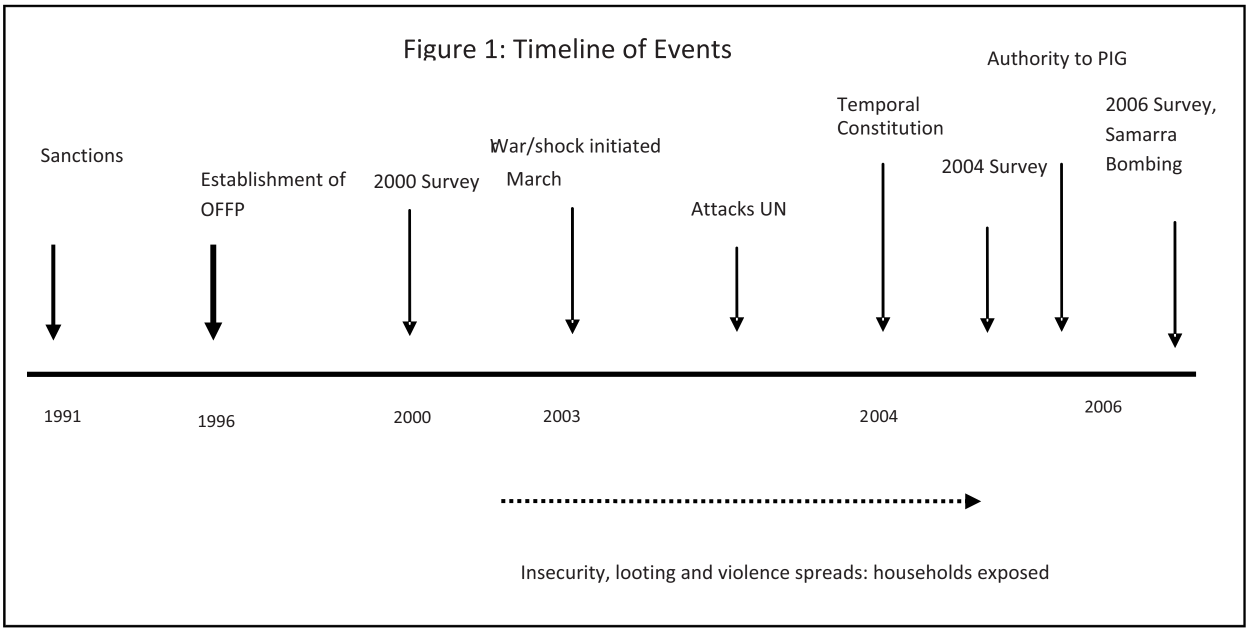


Figure 1: Timeline of Events

Figure 2: Selection of Cohort of Interest in Pseudo-panel

Year	2000		2004		2006	
Survey	MICS		ILCS		MICS	
Cohorts	Old Cohorts > 13 months	Young Cohort < 13 months	Old Cohorts > 13 months	Young Cohort < 13 months	Old Cohorts > 13 months	Young Cohort < 13 months

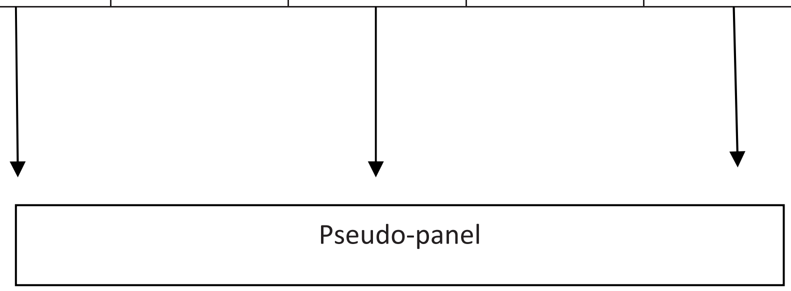


Figure 3: Identification of exposure to war by age

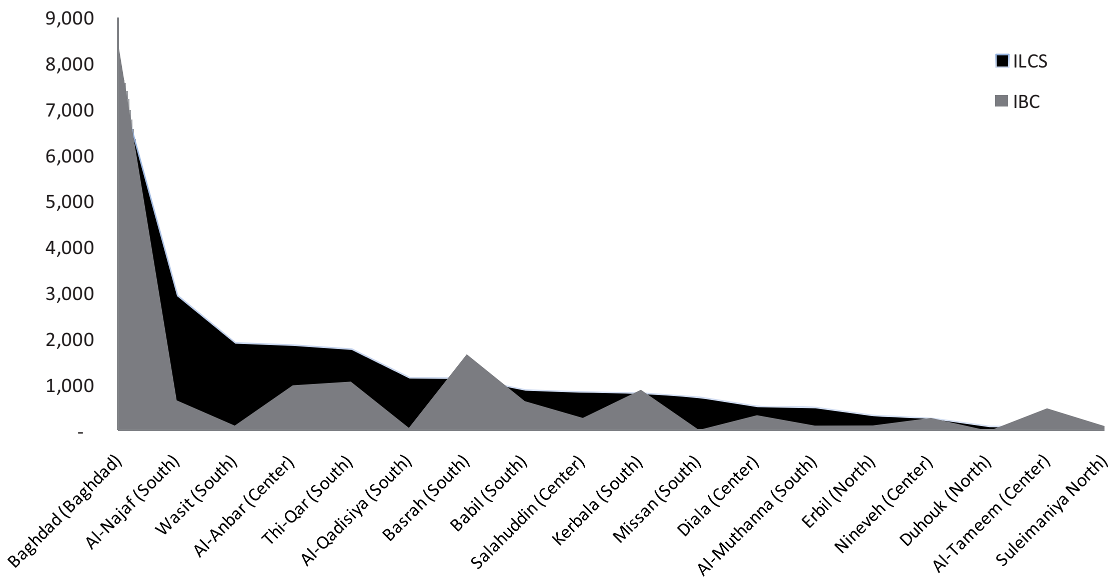
Pre-war period: Cohorts born before the warL — War — Cohorts born after the war

Month of Birth	May-99 - Apr-00	May-00 - Apr-01	May-01 - Apr-02	May-02 - Mar-03	Apr-03 - Aug-03	Sep-03 - Nov-03	Dec-03 - M
				P R E G	N A N C Y		
Exact age in months at time of interview	49-60 months	37- 48 months	25-36 months	14-24 months	9-13 months	6-8 months	
Cohort	Cohort 5	Cohort 4	Cohort 3	Cohort 2	Cohort 1	Cohort 0	

OLDER — **YOUNGER**

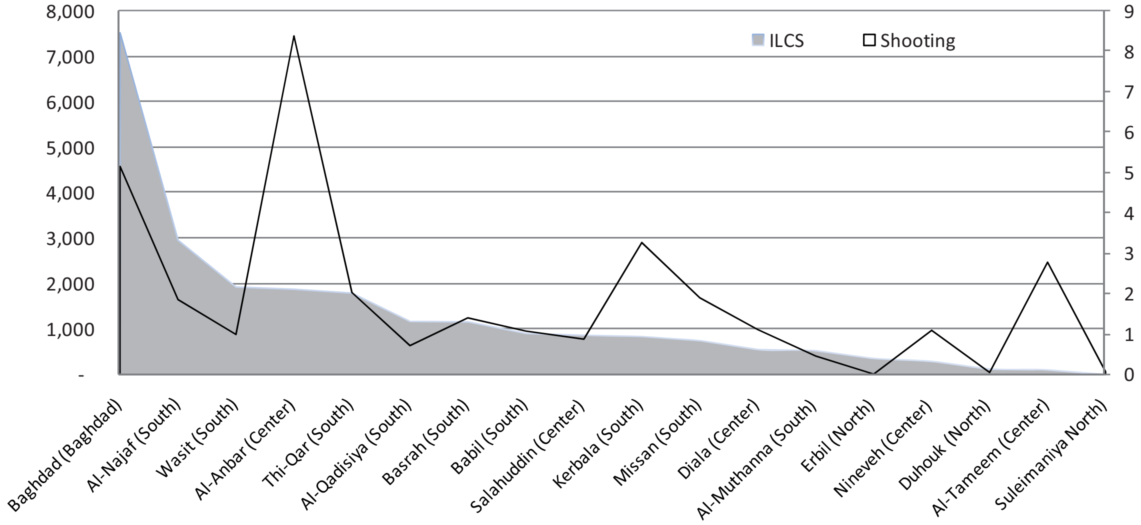
The figure represents how the division of cohorts is done based on their age of exposure to the war. All children are conceived before the war. Children in cohort 0 are exposed in-utero to the conflict and after being born. They were at least 6-8 months old at the time of the interview. Cohort 5 was at least three years and three months when the war started and at least 49 months at the time of the interview. Cohorts are highlighted in colour to show the difference in age at the time of exposure. Darker colours represent that children are younger and more vulnerable.

Figure 4: Number of People Killed by the War



Source: ILCS 2004 and IBC. Number of people killed by the war estimates are weighted and up to ILCS interview dates.

Figure 5: Number of People Killed by the War and Households Reporting Frequent Shooting in the Neighbourhood



Source: ILCS 2004 and IBC. Number of people killed by the war estimates are weighted and up to ILCS interview dates. Shooting counts number of households that reported daily shooting in their neighbourhood.Left aixs is for number of people killed, right axis for reported daily shooting.

Iraq Districts by Treatment of Conflict Intensity