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Terror and Birth Weight

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Abstract

Tension and anxiety during pregnancy have been connected to low birth weight, which in turn has a negative impact on a range of lifetime outcomes. The current research examines the effect of Palestinian terror during the Second Intifada on birth weight in Israel, based on variation in the intensity of terror over time and between geographical areas and on panel data for the change in birth weight between consecutive newborns of the same mother.

Terror during any of the trimesters was not found to have any effect on birth weight. The result holds even for fatal terror attacks that took place in the woman's city of residence and in Judea, Samaria and Gaza and Jerusalem, where terror attacks were far more frequent. In contrast, the small number of previous studies generally found a negative effect for terror on birth weight. It is hypothesized that the lack of effect in Israel is related to the population's acclimatization to terror over a long period.

In addition, the number of days of reserve duty served by the spouse during the pregnancy did not have any effect on birth weight, a phenomenon that has not been investigated previously.

טרור ומשקל ילודים

נעם זוסמן ואסתר טולידנו

תקציר

מחקרים מלמדים שמשקל נמוך של ילודים משפיע לרעה על מגוון משתני תוצאה במהלך החיים, ומתח וחרדה של האם בתקופת ההיריון מפחיתים את המשקל. המחקר הנוכחי בחן את ההשפעה של הטרור הפלסטיני במהלך האינתיפאדה השנייה על משקל ילודים ישראלים, תוך הסתמכות על השונות על פני זמן ומרחב בעוצמת הטרור, ואמידות פאנליות של השינוי במשקל ילודים עוקבים לאותה אישה.

לא נמצאה השפעה של הטרור – בכל אחד משלבי ההיריון – על משקל ילודים ישראלים. התוצאה תקפה אפילו ביחס לפיגועים קטלניים שהתרחשו בעיר המגורים וביהודה ושומרון וירושלים מוכי הטרור. המחקרים המועטים בעולם מצביעים לרוב על השפעה שלילית, וניתן לשער שהיעדר התגובה בישראל קשור לחוסנה של האוכלוסייה כתוצאה משגרת חיים בצילם של מעשי איבה.

כמו כן נמצא שלמספר ימי המילואים של בן הזוג במהלך ההיריון לא הייתה השפעה על משקל הילודים, תופעה שלא זכתה להתייחסות מחקרית.

1. Introduction

There is a vast literature indicating that low birth weight has a negative effect on lifetime outcomes, including increased mortality and illness, lower achievement in terms of education, employment and salary, etc.,[1] and therefore low birth weight constitutes a rough index of the newborn's initial health capital. The findings in the literature also indicate that stress and anxiety during pregnancy, as a result of terror or natural disasters among other things, are likely to reduce birth weight and increase the probability of a low-weight birth, although there is no consensus as to the stage of pregnancy in which this process occurs.

The current research looked at the effect of terror attacks on the birth weight of Israeli newborns during the Second Intifada, which broke out during late 2000. From the beginning of the Second Intifada until the end of 2004, about one thousand Israelis were killed in terror attacks, which represents about 0.14 fatalities per one thousand Jewish residents.[2] Terror incidents were accompanied by stress and anxiety (see Romanov et al., 2012) and therefore may have had an adverse impact on birth weight.

The research population consists of about 93.5 thousand live (singleton) births of second and third order, whose pregnancies occurred during the period 1998-2004.[3] The database was created by merging a file of live births provided by the Ministry of Health, which includes birth weight, and administrative files of the National Insurance Institute, which include demographic characteristics of the mothers and their spouses, Parents income from labor and from allowances and the number of days of reserve military duty served by the spouse. Information on fatal terror attacks was gathered from various sources. Identification is based on the large variation over time and geographical area in the number of terror attacks and their intensity and on panel estimations of the change in weight of consecutive newborns from the same mother.

The main finding of the research is the lack of effect of terror attacks, which was found to be valid for all pregnancy trimesters, on the weight of Israeli newborns and on the probability of a low birth weight. The result is robust to fatal terror attacks location – whether they occurred in the city of residence or in broader geographic units (and even in Judea and Samaria and Jerusalem which were particularly hard-hit by terror) – and to both civilian and military casualties. The length of a spouse's

[1] For a survey, see Toledano et al. (2010a).

[2] For purposes of comparison, the number of fatalities in the September 11th attack in the US was about 0.01 per thousand US citizens (the number of fatalities in the Twin Towers and its environs represented about 0.32 per thousand residents of New York City).

[3] During the research period, there were significant changes in the child allowance for children of fourth order and higher, which may have had an influence on birth weight (see Toledano et al.. 2010a).

reserve duty during a pregnancy, which makes day-to-day routine more difficult for a pregnant woman and increases her anxiety, did not have an effect on birth weight, whether during the Second Intifada or otherwise.

The few previous studies carried out in other countries on this subject have usually found a negative relationship between terror (and disasters) and birth weight. The lack of effect for terror attacks during the Second Intifada on the weight of Israeli newborns is apparently related to the resilience of the population, which can be explained by the exposure to terror attacks over a long period and by the existence of well-developed support systems.

The present research contributes to the literature by explicitly analyzing the effect of terror attacks on birth weight in a high-intensity and long-lasting terror environment (in contrast to the one-time event such as the September 11th attack), in which attacks are widely dispersed in a developed country. Furthermore, the study is based on a large research population and on reliable identification strategy through a kind of natural experiment, as well as the use of rich panel data. In addition, it is the only study, to the best of our knowledge, that examines the effect of reserve military duty on birth weight, particularly during a period of wide-scale conflict.

The paper is organized as follows: Section 2 reviews the literature. Section 3 discusses the database, the research population and the methodology. Section 4 is devoted to descriptive statistics and Section 5 to the estimation results. Finally, a summary and discussion are presented.

2. Survey of the literature

The literature points to several factors that affect birth weight and the probability of a low-weight birth (under 2,500 grams) or very low-weight birth (under 1,500 grams). These include genetic and physiological factors, characteristics related to birth, demographic-socioeconomic factors, behavior patterns, health status and level of medical attention, etc. (for further details, see Toledano et al., 2010a).

Stress and anxiety during a pregnancy raise the level of corticotrophin-releasing hormone (CRH), which regulates the development of the fetus and the duration of the pregnancy and influences the production of andrenocorticotrophic hormone and cortisol, which are related to the progress of the birth and therefore also to low birth weight[4] (see, for example, Wakhwa et al. 1993; Hobel, 2004; Beydoun and Saftlas, 2008; Hobel et al., 2008; and Dunkel Schetter, 2011). The medical literature is divided as to the stage of pregnancy during which stress and anxiety lead to these physiological phenomena and

[4] About two-thirds of low-weight newborns are premature (Dunkel Schetter, 2011).

low weight.

Numerous studies have looked at the relationship between stress and anxiety during pregnancy and birth weight; however, they are usually unable to uncover the causality involved, since women who experience tension during pregnancy are likely to differ from other women in their genetic and socioeconomic traits, behavior patterns, etc. and these factors in themselves were found to have a significant effect on birth weight. In order to overcome the selection problem, a small number of studies, including the present one, have made use of a kind of natural experiment, by focusing on the possible negative effect of extreme stress-causing events, such as terror attacks and natural disasters, on birth weight.

Eskenazi et al. (2007) found that one week after the World Trade Center attack, there was an increase in the chances of a woman living in the city[5] giving birth to a newborn weighing less than 2,000 grams. They also found an increased proportion of very low-weight premature babies, whose mothers were in the first or second trimester at the time of the attack and lived in New York City or upstate New York. Eccleston (2011) also found a drop (of between 8 and 19 grams) in the weight of babies born to mothers who lived in New York City at the time of the attack and who were in their first or second trimester.[6] In contrast, she did not find any effect on birth weight for women living in other locations during the same period. Endra et al. (2009) also did not find any link between the 9/11 attack during the first trimester and the duration of pregnancy among women whose spouse was serving in the US military at the time. Similarly, Rich-Edwards (2005) came to the same conclusions with regard to women in the Boston area. In Holland, lower birth weights were recorded when terror attacks occurred during pregnancy (Smith et al., 2006).

Lauderdale (2006) showed that among women with an Arab-sounding name who gave birth in California during the six months following the 9/11 attack, there was a moderate increase in the chance of a low-weight birth relative to similar women one year previously and this phenomenon was not observed in other population groups. The author hypothesized that this phenomenon is linked to the increase in vigilantism, violence and discrimination in hiring directed against Arabs.

Camacho (2008) examined the effect of the explosion of mines in rural areas in Columbia during the period 1998-2003 on birth weight. Using panel data, she found that birth weight for mothers living in an area where at least one mine had exploded during the first trimester was lower by about 9 grams than for the previous birth, compared to other mothers.

[5] Mothers living in the polluted area surrounding the World Trade Center were not included.

[6] Other studies (Lederman et al., 2004 and Berkowitz et al., 2003) found that among babies born to women who were pregnant during the attack and lived near the site, birth weight was lower, duration of pregnancy was shorter, etc. In contrast, Lipkind et al. (2010) found no such effect.

Rees and Mansour (2011) examined cross-section data for about one thousand births in the West Bank and found that the number of Palestinians killed by Israelis in the mother's area of residence during the Second Intifada, in each of the trimesters, had a negative though statistically insignificant effect on birth weight. The number of fatalities in the first trimester had a negative and statistically significant effect on the probability of low birth weight (each death raised the probability by 0.0032).

In the case of Israel, Omer et al. (1986) found that during the period immediately following the Yom Kippur War, there was in fact a drop in the proportion of premature births relative to the same period one year later. Schenker and Mor-Yosef (1993) showed that the First Gulf War in 1991, during which missiles were fired at Israel from Iraq and the population was forced to take shelter in protected areas and even to wear gas masks, did not have any effect on the rate of premature births.

Several studies have focused on the effect of natural disasters and other extreme events on birth weight. Tan et al. (2009) showed that the major earthquake in China in 2008, which caused extensive damage to persons and property, reduced birth weight (by about 170 grams) and raised the proportion of low-weight births (by about 1.3 percentage points). Using data on the major earthquake that took place in northern Chile in 2005, which caused only minor damage, Torche (2011) found that birth weight in the case of women in their first trimester who lived in the area in which the earthquake was strongly felt fell by about 50 grams (and by about 13 grams for the second trimester) and the probability of a low-weight birth grew from 4.7 to 6.5 percent, as a result of the shortened duration of pregnancy.[7]

Simeonova (2009) did not find any connection between natural disasters (hurricanes, earthquakes and the like) in the US and birth weight, although she did find that they lead to shorter pregnancies. Currie and Rossin-Slater (2012) also found that hurricanes in Texas do not have an effect on birth weight (or on the duration of pregnancy) although if the hurricane occurred in the third trimester there was a higher incidence of complications in birth and medical problems among the newborns.

Catalano and Hartig (2001) examined cross-section data from Sweden and found that the murder of the Prime Minister in 1986 and the sinking of a ferry in 1996[8], led to an increase in the probability of a very low-weight birth (by 15 and 21 percent respectively) among women in their third trimester at the time of the events.

In summary, terror attacks and other extreme events, which are accompanied by stress and anxiety and constitute a kind of natural experiment, have a negative effect on birth weight and on the

[7] Glynn et al. (2001) found that a major earthquake in California in 1994 shortened the duration of pregnancy among a sample of 40 pregnant women, especially if it occurred during their first trimester.

[8] The sinking of the ferry Estonia killed 501 Swedes, which constitutes about 0.06 deaths per thousand residents.

probability of a low-weight birth in most cases and this is generally the case when the events occur in the first trimester.

The absence of the husband from the home due to military service, and reserve duty in particular, naturally leads to stress and anxiety for the wife, both during pregnancy and in general (Milrgram and Bar, 1993 and Burgh et al., 2011), due both to the absence itself and the exposure of the husband to danger. It is worth mentioning that to the best of our knowledge there have been no studies published that attempt to link reserve duty of the husband to birth weight.[9]

3. The database, the research population and the methodology

a. The database

The database for the research includes a file of live births, obtained from the Ministry of Health, which was merged with files from the National Insurance Institute (which was previously used by Toledano et al. (2010, 2010a)), data on fatal terrorist attacks, and a file containing information on payments for reserve duty, also from the National Insurance Institute.

The file of all live births covers the period 1995-2007 and includes birth weight and the mother's identity number.[10]

The National Insurance Institute files of mothers who gave birth and their spouses includes demographic characteristics, information on employment, annual income from labor (both salary and self-employed), the receipt of various allowances and their value (the child allowance, guaranteed income payment, general disability allowance, alimony and survivors benefits) and address of residence according to the Population Register.[11]

Information on terrorist attacks in which Israelis were killed was gathered from a number of sources:

[9] Hass and Pazdernik (2006) found that among 95 women whose husband served in the US army in 2003, birth weight among women whose husband was serving abroad was *higher* than among the other women.

[10] No birth weight was recorded for about 0.6 percent of the births. A cross-check between the file of live births and the file of child allowance payments showed that only a negligible number of births in Israel do not appear in the file of live births.

[11] Actual place of residence is liable to differ from that in the Population Registry, such that the number of fatalities in terrorist attacks in a particular city/district may not be correct. This is probably a minor problem, for the following reasons: (a) Internal data from the Central Bureau of Statistics indicate that among respondents to the 2008 Census, only about 8 percent reported a different city of residence than that which appears in the Population Register. (b) The rate of internal migration between districts is much lower than that between cities and the district of residence is the primary geographical unit used in the research. (c) The research population includes households in which there is already at least one child and therefore their rate of internal migration is relatively low; they also have more contact with the government authorities (as a result of birth, the registration of children for kindergarten, etc.), such that they have an interest and sometimes even an obligation to report their correct address to the Ministry of the Interior, which maintains the Population Register (which is used by all the government ministries).

the International Institute for Counter-Terrorism of the Interdisciplinary Center Herzliya, the Ministry of Defense,[12] the Foreign Ministry, the National Insurance Institute (civilian fatalities in terror attacks) and the local newspapers "Haaretz" and "Yediot Aharonot". In addition, a file of the National Insurance Institute was made available to us which contains information on terror attacks, based on reports from the Israeli Red Cross (Magen David Adom), the hospitals, the police and other sources. The file includes the details of the attack and the extent of the injuries of each victim. This information was merged with that from the Haaretz newspaper.

The National Insurance Institute's file of reserve duty payments was used to derive the dates of the husband's reserve duty.

b. The research population

The research population is composed of Israeli women[13] who gave birth to a (singleton) newborn of second or third order during the period 1998-2004, on the condition that the previous pregnancy started after the beginning of 1998 (which is the first date for which data was available on fatalities in terror attacks) and was a single birth. Multiple births were not included since they are in general characterized by low birth weight. Also left out were births of fourth and higher order since during the period being investigated, there were significant changes in the size of the child allowance for these children, which in itself may have had an influence on birth weight (see Toledano et al., 2010 and 2010a). The period being investigated does not include the years following 2004 since in 2005 Israeli settlements in Gaza and Northern Samaria were evacuated (as part of the "Disengagement Plan") and in 2006 the Second Lebanon War took place, events that involved stress and anxiety which may have had an effect on birth weight.

In total, the research population numbered 93,504 single births of second or third order,[14] of which 4.8 percent were low weight (less than 2,500 grams). The average weight for a son (daughter) of second order was 3,288 (3,159) grams and of third order was 3,325 (3,186) grams. The standard deviation of the difference in the weight of a second (third) newborn relative to the first (second) was about 550 (about 527) grams, with small differences according to the gender of the newborns.

The research differentiates between various population groups. Among Jews,[15] a differentiation is made between the ultra-Orthodox and the rest. Among non-Jews, differentiation is made between

[12] At the site www.izkor.gov.il.

[13] Arab women in Jerusalem, almost all of whom are Palestinians living in East Jerusalem, were not included due to their close ties to the Palestinians in the territories.

[14] Due to constraints on computing power, the data files used by Toledano et al. (2010 and 2010a) and in the current research included a random sample of one-fifth of the Jewish non-ultra-Orthodox women and all the other women.

[15] Jews also include non-Jewish immigrants.

Bedouins in the South (Arabs in the Southern District) and Bedouins in the North (Arabs in the Bedouin settlements in the Northern District[16]), other Arabs (no differentiation was possible between Moslems and Christians) and Druze (including Circassians). An ultra-Orthodox woman was defined as one who studied/is studying in an ultra-Orthodox seminary and/or a woman whose husband studied/is studying in a yeshiva and did not serve in the military or served up to one year and also a woman for whom the following relatives are defined as ultra-Orthodox according to the above definition: at least two brothers/sisters, father and/or mother or at least two sons/daughters and a woman whose husband has two such relatives (for further discussion, see Toledano et al., 2010).

The differentiation between the various population groups is necessary in light of the possible differences between them with regard to genetics (for example, the rate of inbreeding), lifestyle (such as smoking habits) and the like, which have a direct effect on birth weight, but are not observed by us (for further discussion, see Toledano et al., 2010a). Furthermore, there are significant differences according to population group in the degree of exposure to terror and in the length of reserve duty. Thus, the rate of fatalities among non-Jews during the Second Intifada was much lower than among Jews and almost all non-Jews, like the ultra-Orthodox, do not do reserve duty.

c. Methodology

In order to examine the effect of Israeli fatalities in terror attacks during the Second Intifada on birth weight, the following basic equation was estimated:

$$(1) \qquad \Delta W_{ijt} = \alpha + \sum_{tr=1}^{3} \beta_{tr} \Delta T_{jtr} + \delta' \Delta X_i + \gamma' X_{it} + \eta_j + \mu_t + \varepsilon_{ijt}$$

where ΔW_{ijt} is the difference between the weight of a second (third)-order newborn and that of a first (second)-order newborn for woman i who resides at the time of the later birth in area j during period t. ΔT_{jtr} is the difference in the number of fatalities in terrorist attacks in the area of residence during trimester tr of the pregnancy as compared to the same trimester in the previous pregnancy. ΔX_i are the differences in the characteristics of the birth and in household and macroeconomic conditions between the pregnancies (for example, gender of the newborn; family status and family income and rate of

[16] Aramsha, Basmat Tab'un, Bir El-Maksur, Bu'eine-Nuyeidat, Demeide, Hamam, Hussniyya, Ibtin, Ka'abiyye-Tabbash-Hajajare, Kamane, Khawaled, Mansiyyet Zabda, Rumat Heib, Sallama, Sawa'id (Hamriyye), Shibli-Humm Al-Ghanam, Tuba-Zangariyye and Zarzir.

regional unemployment), as well as the time period between the two births. X_{it} are the characteristics of the woman and the household at the time of the later birth (age, family status, family income, etc.). η_j is the fixed effect of region, μ_t is the trend (year and month) and ε_{ijt} is the random error.

The coefficients of interest are β_{tr}, which represent the effect of each additional fatality in the area of residence during trimester tr of the later pregnancy, relative to the same trimester of the earlier pregnancy, on the difference in birth weight.

It is worth noting that when the earlier birth preceded the outbreak of the Second Intifada (and the pregnancy began after the beginning of 1998), when there was only a negligible number of Israeli fatalities in terror attacks, and the later pregnancy occurred subsequent to it, the difference reflects the number of fatalities in terror attacks during the Intifada. In contrast, when the two pregnancies occurred during the Intifada, the difference in the number of fatalities reflects the change in the intensity of terror during the conflict.

Since the dependent variable is the difference in birth weight, the estimation implicitly assumes that the characteristics of the mother and her family (such as genetic characteristics, education and behaviors such as smoking), which are likely to have an effect on weight, remained unchanged between consecutive births.

Estimations were carried out separately for the difference in the weight of second-order newborns (relative to first-order newborns) and third-order newborns (relative to second-order newborns) since the literature indicates that birth weight rises in a non-linear manner with birth order (see Toledano et al., 2010a).[17] The estimations were also carried out separately for the various population groups, for the reasons mentioned above.

In addition, the effect of terror on the probability of a low-weight birth (less than 2,500 grams) was estimated using the following basic equation:

$$(2) \qquad LW_{ijt} = \alpha + \lambda LW_{ijt-1} + \sum_{tr=1}^{3} \beta_{tr} \Delta T_{jtr} + \delta' \Delta X_i + \gamma' X_{it} + \eta_j + \mu_t + \varepsilon_{ijt}$$

where LW_{ijt} is a dummy variable that takes a value of one for a second (third)-order newborn with low weight and zero otherwise; the other variables are as described above.

[17] It would have been possible to estimate together the change in weight of the second-order newborn relative to the first-order newborn and the third-order relative to the second, while adding an explanatory variable for birth order; however, the effect of the other explanatory variables on birth weight may be differential according to birth order.

Some of the estimations were restricted to women who were married throughout the period between the beginning of the earlier pregnancy and the later birth since the level of stress and anxiety may differ between married and unmarried women and, in addition, the transition from one family status to another is likely to also have an influence on stress and anxiety.

Mothers of newborns who switched areas of residence between those dates (for example, from a terror-stricken area to a relatively calm area) are likely to be those who more easily develop stress and anxiety as a result of terror attacks and this selective behavior is liable to result in a downward bias in the effect of terror on birth weight. Therefore, the connection between terror and internal migration was also looked at, as described below.

4. Descriptive statistics

The security situation in Israel was calm during the period prior to the outbreak of the Second Intifada on September 28, 2000 (see Figure 1). From that date onward, the number of terror attacks and their deadliness rose sharply, reaching a peak in March 2002. Following that, a major military operation was carried out ("Defensive Shield"), which led to a significant drop in the number of Israeli fatalities. In total there were 1,046 Israelis killed between the outbreak of the Intifada and the end of 2004. Of these, 733 were civilians (520 of whom lived inside Israel proper) and 313 were soldiers (of which 231 died in the territories), 45 of whom were doing reserve duty. There is a high level of variation over time. Almost all of those killed were Jews and their proportion of the population stood at about 0.14 per 1,000 Jewish residents.

There are significant differences in the number of civilians killed according to the region in which the event occurred (Figure 2). Thus, most attacks took place in Judea, Samaria and Gaza area, as well as Jerusalem; a smaller number of attacks took place in Haifa District and in all the other regions the number of civilians killed was relatively small. This ordering is preserved and becomes even more pronounced when we consider the number of civilians killed per thousand Jewish residents in each region. Yuchtman-Yaar and Feniger (2010) found that the civilians killed in terror attacks in Israel proper since the signing of the Oslo agreements in 1993 and until the end of 2003 were almost all Jews and that they included a disproportionate number of men aged 17-24 and individuals belonging to the middle class, characteristics that are consistent with a high presence in public places.

The research focuses on fatal terror attacks since they received the most media attention. Thus, for example, Yarhi and Tsafti (2009) showed that the prominence of articles in the Israeli press covering the terror attacks during the Second Intifada was dependent on the number of casualties, such that each

additional fatality raised the prominence of the attack's coverage in the press five times more than an additional wounded victim. It is worth mentioning that the public learns of a terrorist attack primarily from the media.

From the outbreak of the Second Intifada until the end of 2004, there were 961 terror attacks with casualties, of which only 717 resulted in non-fatal causalities. The number of civilian casualties (including victims of shock) in all the attacks reached 6,580, about 14 percent of whom were injured either seriously or moderately. Figure 4 shows that the number of wounded in a terrorist attack grew in tandem with the number killed. The attacks with the largest number of casualties were usually suicide attacks.

Following the outbreak of the Second Intifada, there was a significant increase in the number of reserve duty days served by the husbands of women in the research population (Figure 4). Thus, for example, the average monthly number of days of reserve duty during the period starting from the outbreak of the Intifada until the "Defensive Shield" military operation was about one-quarter higher than during the period from January 1999 until the outbreak of the Intifada. The level of reserve duty days grew significantly during "Defensive Shield" (in parallel with the diminishing number of security events in the territories) and following that there was a marked drop-off.

Average birth weight was stable during the period being investigated (Figure 5), as was the proportion of low-weight newborns (Figure A1 in the Appendix).[18]

Figure 6 presents the gross relationship between the number of civilian deaths in attacks that occurred within the pregnant woman's district of residence, or outside it, in each of the three trimesters of her second pregnancy and the difference in weight between a Jewish non-ultra-Orthodox newborn of second order and one of first order (for women whose second pregnancy started after the outbreak of the Second Intifada and whose first birth was prior to it).[19] As can be seen, there is no clear relationship between the number killed and the difference in weight. A similar picture (not presented) is obtained for ultra-Orthodox Jews and for the difference in weights between third-order and second-order newborns. Even among Jewish mothers who live in Jerusalem or in Judea, Samaria and Gaza, which had very high ratios of civilians killed to total Jewish population, there is no connection between number of civilians killed and the change in birth weight (Figure A2 in the Appendix).

Figure 7 focuses on the relationship between the number of soldiers killed throughout the country

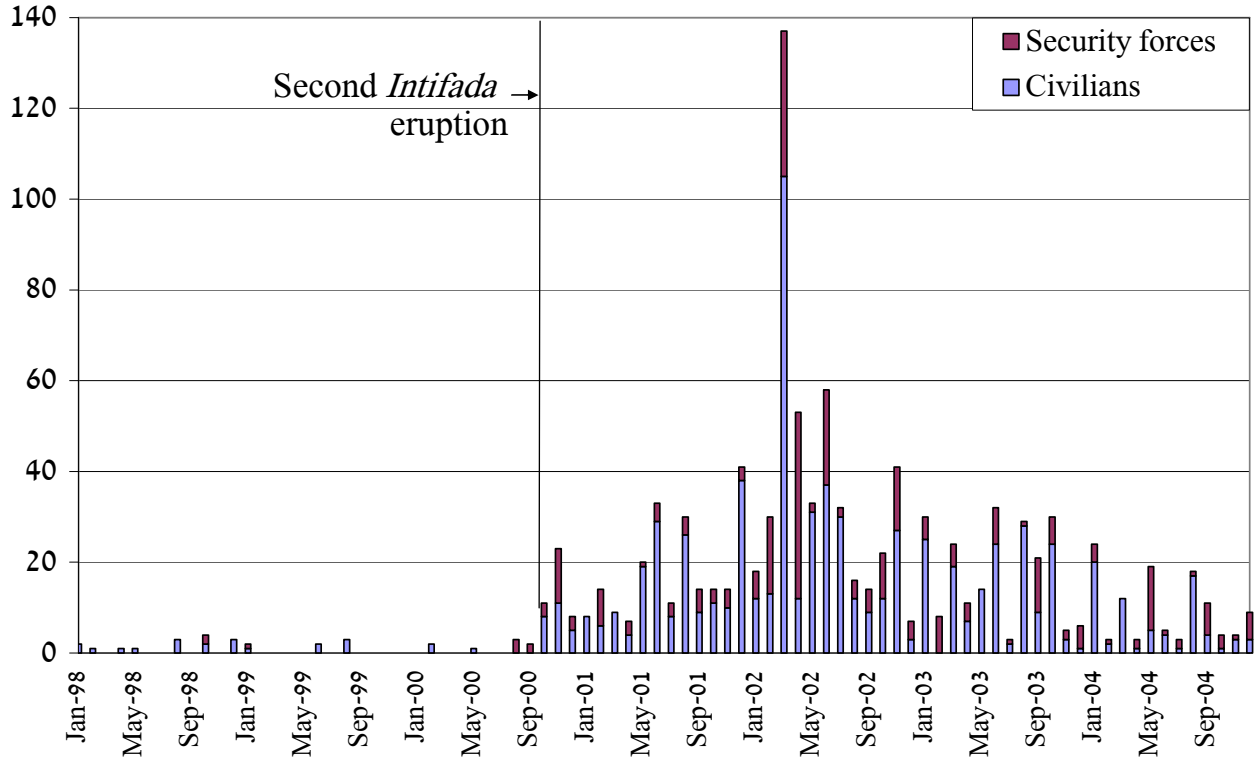
[18] Toledano et al. (2010a) contains a discussion of the behavioral factors and the medical and other phenomena that happened during that period and which had opposite effects on birth weight and on the proportion of low-weight newborns.

[19] The two additional conditions are: (a) the period of time between the first-order birth and the pregnancy of the second-order newborn exceeds two yeas, since a short break between births is liable to lead to a drop in the weight of the second newborn; and (b) the newborns are the same gender.

during the various trimesters and the difference in weight between a Jewish non-ultra-Orthodox newborn of second order and one of first order. At first glance, there appears to be no connection between the two variables and this is also the case for ultra-Orthodox Jews and for a third-order newborn relative to a second-order newborn (not presented).

The difference in the average weight of a Jewish newborn of second (third) order, who was conceived after the outbreak of the Second Intifada and the weight of the first (second) newborn from that same mother, who was born prior to the Intifada, was not significantly different between areas in which a large number of civilians were killed (i.e. Jerusalem and Judea, Samaria and Gaza) and other areas (Table 1).

Figure 1: Number of Israeli killed in terror attacks[1], 1998-2004

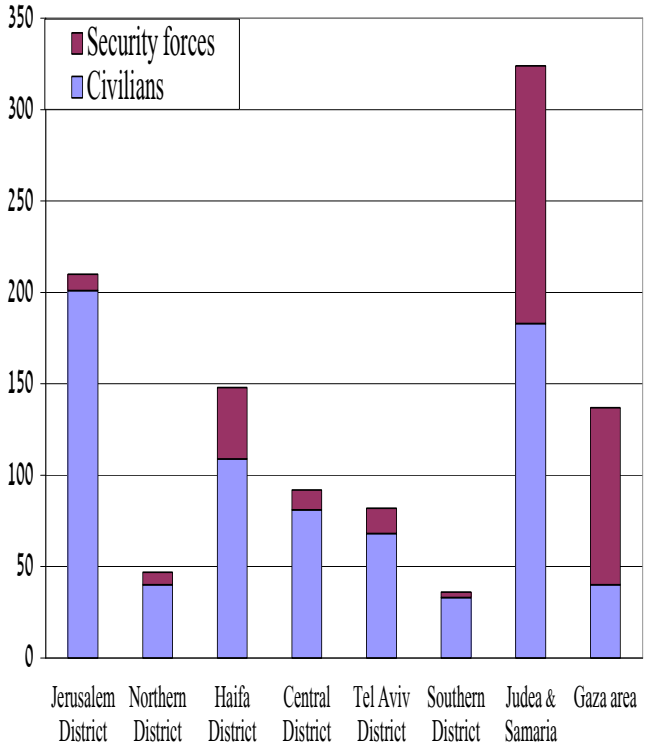


Source: see description in the text.

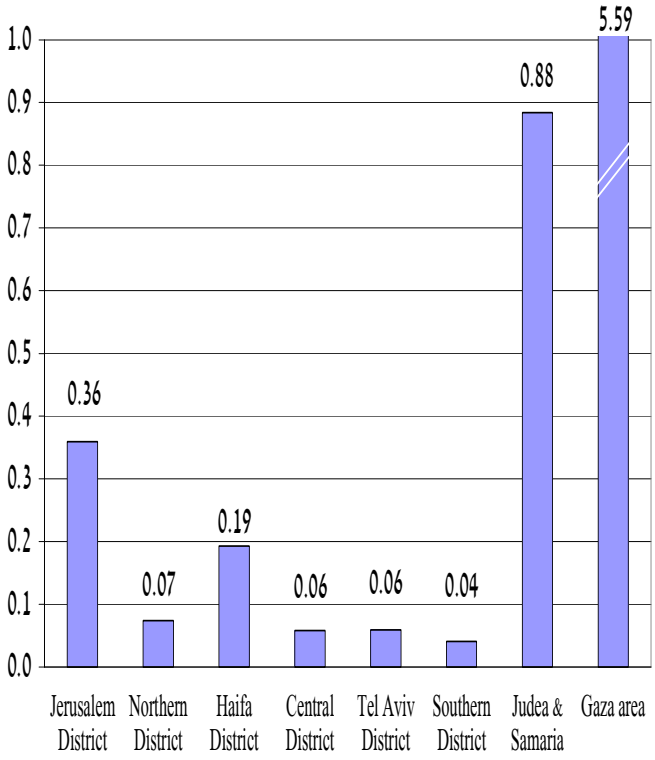
1) Terror attacks that occurred in Israel proper and in Judea, Samaria and Gaza.

Figure 2: Number of Israelis killed in terror attacks from the outbreak of the Second Intifada until the end of 2004, according to region

a. Total killed



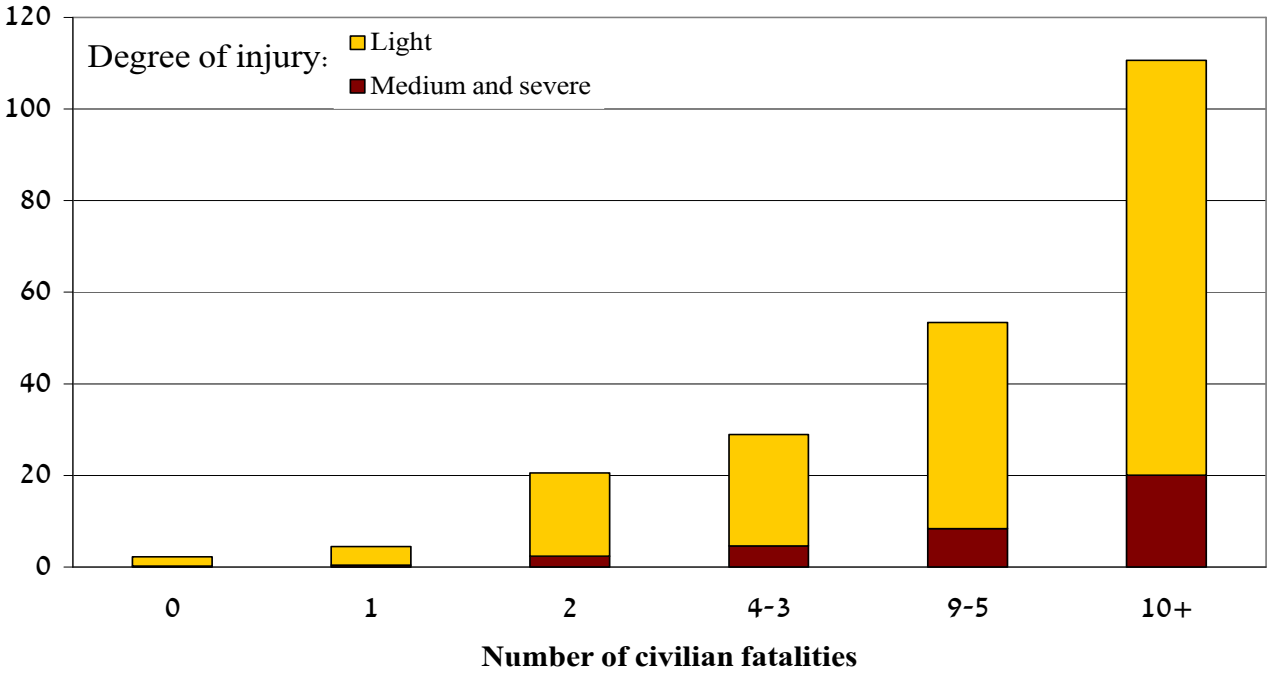
b. Civilians killed per 1000 Jewish residents[1]



Source: Number killed – see the text; residents – Central Bureau of Statistics (various years).

1) Average number of Jewish (and other) residents in 2002.

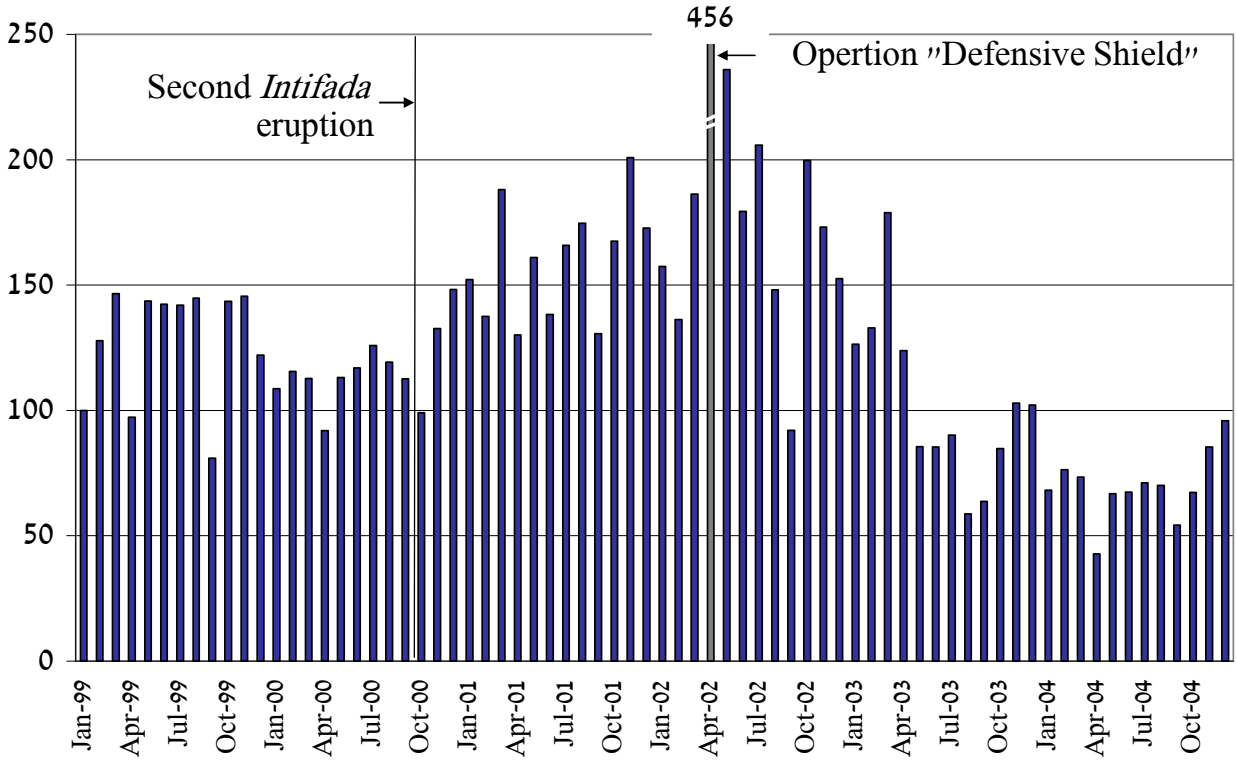
Figure 3: Average number of wounded Israeli civilians in fatal terror attacks according to degree of injury,[1] 1998-2004



Source: see description in text.

1) Lightly wounded – including shock victims.

Figure 4: Number of days of reserve duty,[1] 1999-2004 (January 1999=100)



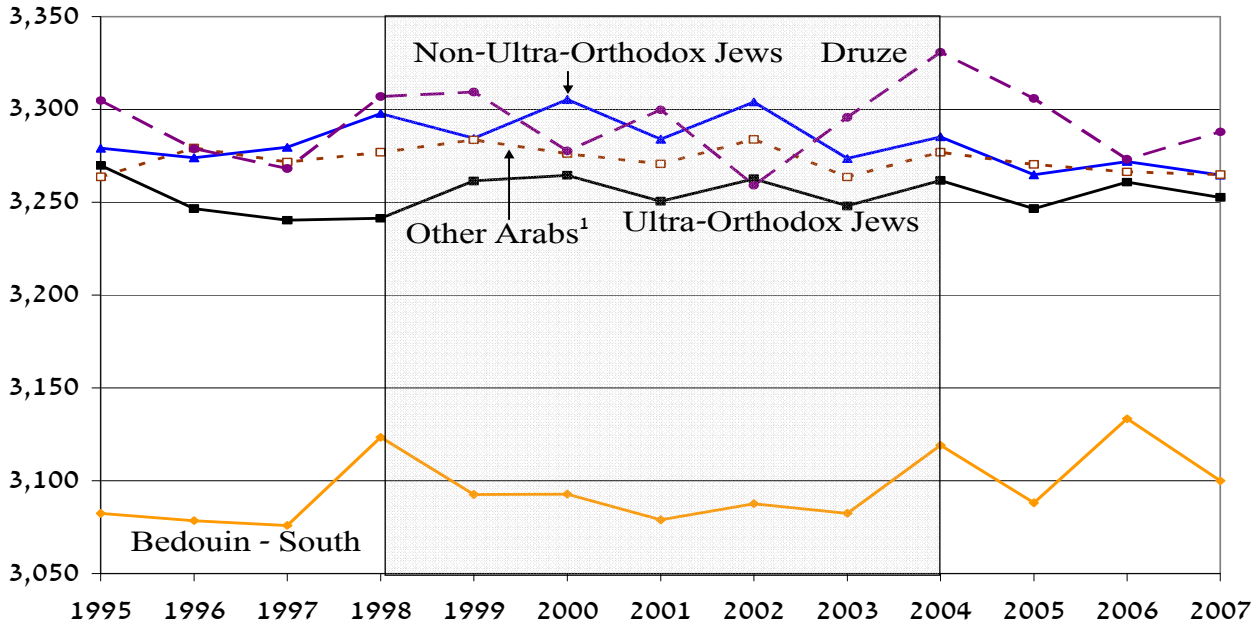
Source: National Insurance Institute and calculations by the authors.

1) Number of days of reserve duty for men who were husbands of newborn mothers included in the research population.
2) There are no available data for 1998.

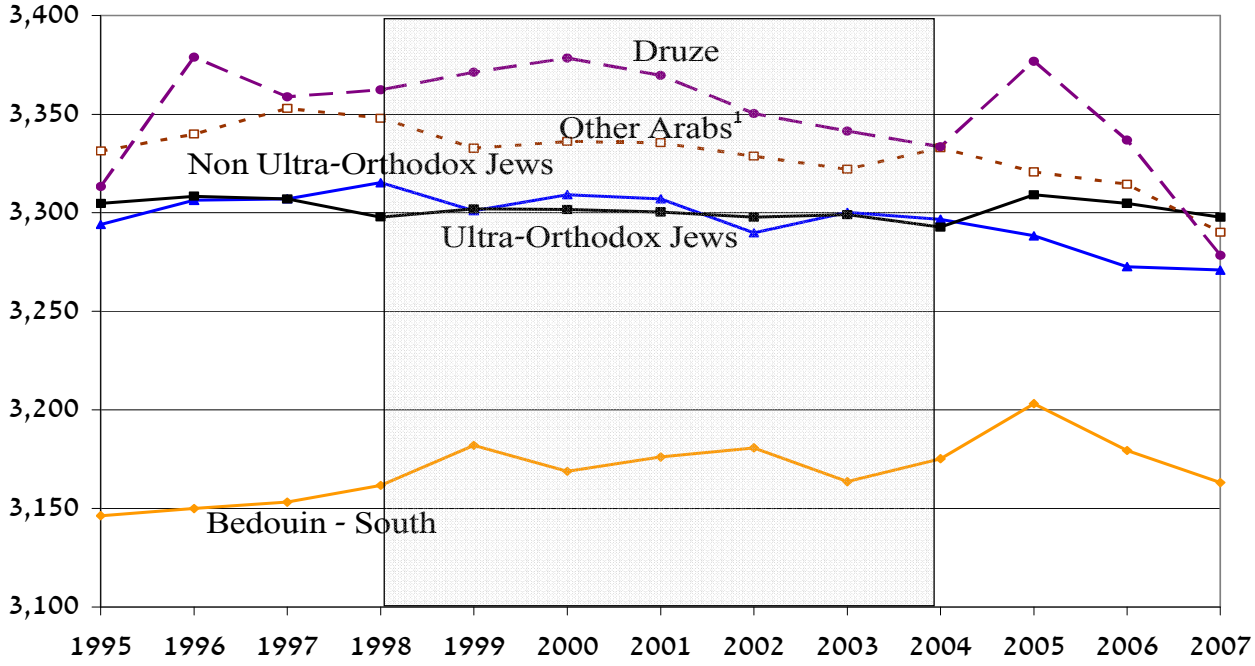
Figure 5: Average weight in a single birth according to ethnic group and birth order, 1995-2007

(grams)

a. Birth of second order



b. Birth of third order



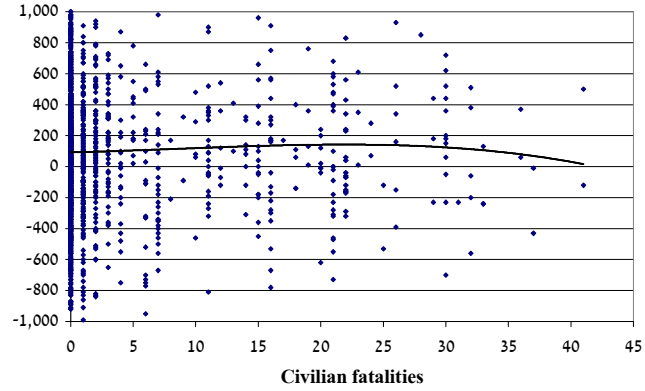
Source: Ministry of Health, National Insurance Institute and calculations of the authors.

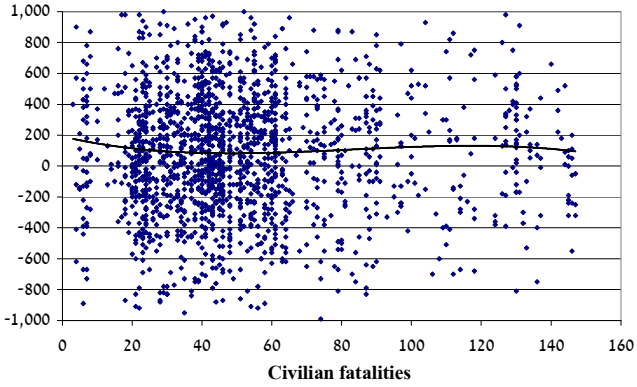
1) Arabs who are not Bedouins or residents of Jerusalem (does not include Druze either).

Figure 6: Number of Israeli civilian killed during the Second Intifada and the change in the weight of Jewish non-ultra-Orthodox newborns: second birth after the outbreak of the Intifada relative to a first birth prior to it[1,2] (grams)

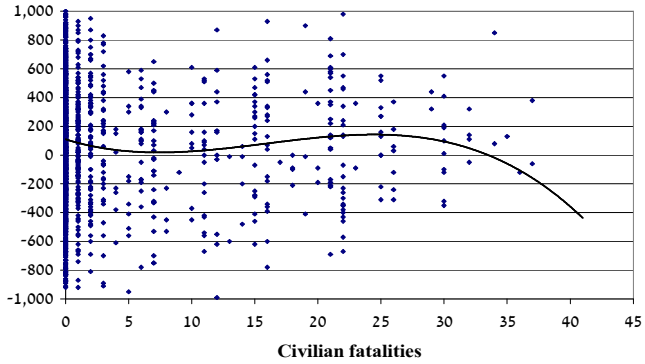
Fatalities in District of residence **Fatalities out of district of residence**

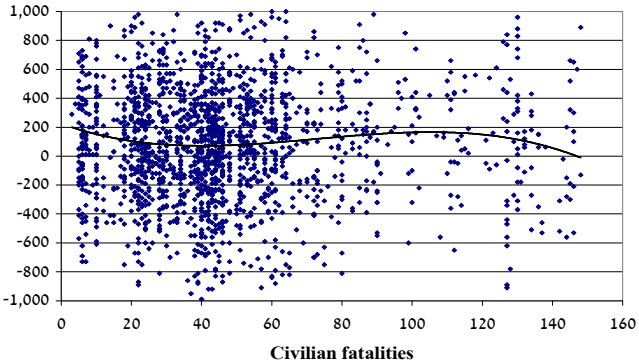
First trimester



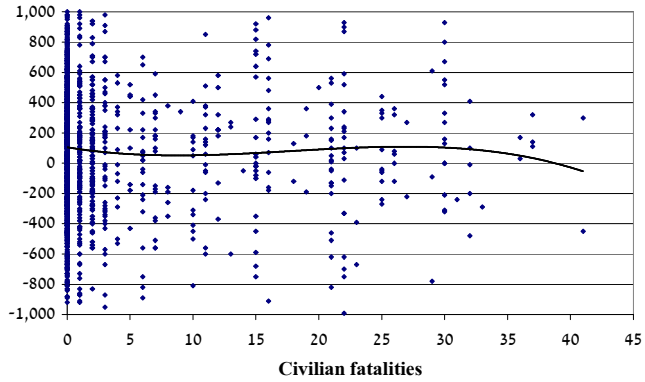


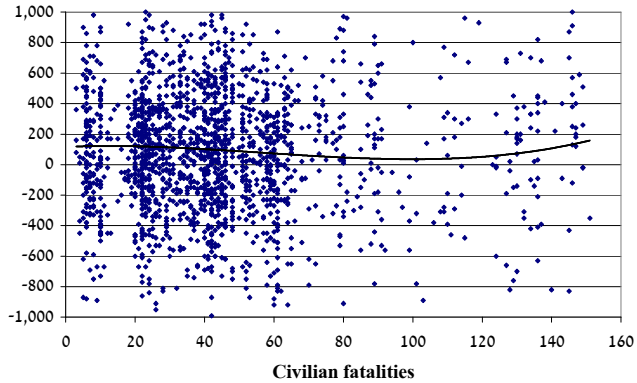
Second trimester





Third trimester

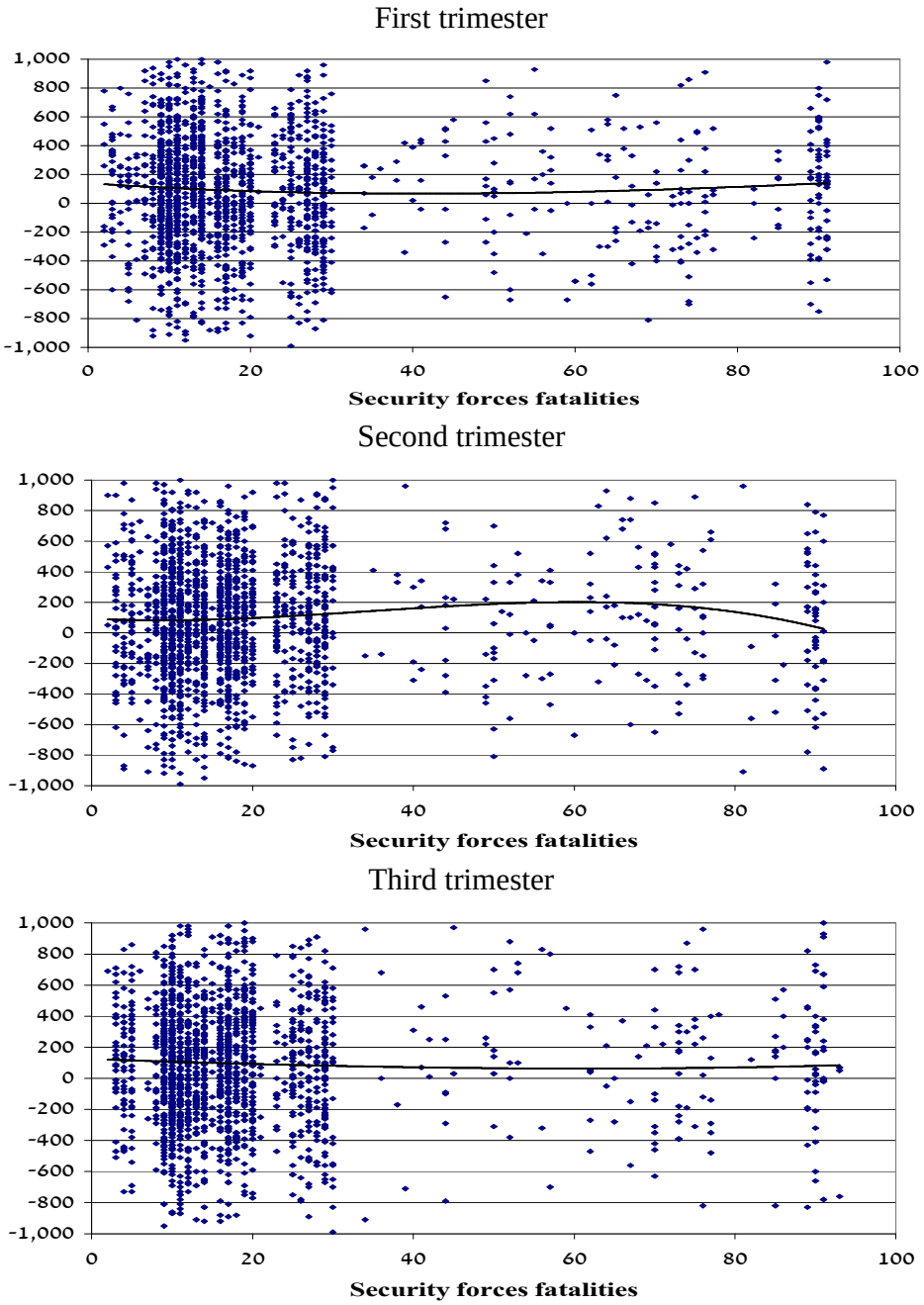




Source: see the description in the text.

1) Beginning of pregnancy of first newborn from January 1st, 1999 onward and the birth not later than the outbreak of the Second Intifada; beginning of pregnancy for the second newborn following the outbreak of the Intifada and the birth not later than December 31, 2004; time period between the first birth and the beginning of the second pregnancy not less than two years; first and second newborns are same gender; single births.
2) Trend line – polynomial of third degree.

Figure 7: Number of Security forces fatalities during the Second Intifada and the change in weight of Jewish non-ultra-Orthodox newborns: second birth after the outbreak of the Intifada relative to a first birth prior to it[1,2] (grams)



Source: see the description in the text.

1) Beginning of pregnancy for the first newborn from January 1st, 1999 onward and the birth not later than the outbreak of the Second Intifada; beginning of pregnancy for the second newborn following the outbreak of the Intifada and the birth not later than December 31, 2004; time period of not less than two years between the first birth and the beginning of the second pregnancy; first and second newborns are same gender; single births.
2) Trend line – polynomial of third degree.

Table 1: Difference in weight for Jewish newborns born after the outbreak of the Second Intifada relative to those born prior to it and to the same woman,[1] according to area of residence and birth order (grams)

	First difference[2]			Second difference	
	Total (excluding Jerusalem, Judea, Samaria and Gaza and Haifa District)	Jerusalem	Judea, Samaria and Gaza	Jerusalem *less* total	Judea, Samaria and Gaza *less* total
Second newborn compared to first	***99.9	**118.5	***173.4	18.6	73.5
Third newborn compared to second	19.4	14.2	71.5	-5.2	52.1

Source: see the description in the text and calculations by the authors.

* significant at a level of 10 percent, ** significant at a level of 5 percent, ***significant at a level of 1 percent.

1) Beginning of pregnancy of earlier newborn prior to January 1st, 1998 and birth not later than the outbreak of the Second Intifada; beginning of pregnancy of the later newborn not later than the outbreak of the Intifada and birth not later than December 31st, 2004; time period of not less than two years between the earlier birth and the beginning of the later pregnancy; both newborns are the same gender; single births.
2) Average weight of newborns born after the outbreak of the Intifada *less* that of newborns born prior to it.

5. Results

The estimation results presented in Table 2 to 5 shows the effect of the difference in number of Israelis killed in terror attacks—during a particular trimester of a current birth relative to the previous birth—on the change in the weight of consecutive Israeli newborns of the same mother.

A differentiation was made between various population groups, with the main focus of attention on Jews, who accounted for the vast majority of Israeli victims. The estimations were carried out separately for the difference in weight of a newborn of second order relative to one of first order and of third order relative to second order, since birth weight increases with birth order at a declining rate (see Toledano et al., 2010a).

The number of fatalities in terror attacks in each trimester is counted separately for civilians and for soldiers since it can be assumed that the general population, and in particular pregnant women, are more sensitive to the number of civilians killed, which is positively correlated with their degree of risk

exposure and that of their relatives. It should be mentioned that the vast majority of soldiers killed were doing their compulsory military service and apparently only a small number of them were the children of pregnant women in their late childbearing years and in any case the relationship between the reserve duty of the husband and the weight of newborns will be analyzed separately below.

With regard to the choice of the geographical area of a terror attack in which civilians were killed, the district of residence of the newborn mother (at the time she conceived) was selected.[20] In addition, estimations were carried out for terror attacks in the city of residence, with attention focused on the residents of Jerusalem and Judea, Samaria and Gaza which were the hardest hit by terror. In the case of soldiers killed in terror attacks, use was made of data on the national level since most of them were killed in Judea, Samaria and Gaza.

Due to the possible influence of a change in family status between consecutive births on the emotional state of the mother during her pregnancy, some of the estimations were restricted to women who were married from the beginning of the earlier pregnancy until the following birth.

Before turning to the findings, it is worthwhile considering whether terror led to increased migration out of the areas particularly affected by terror among, for example, pregnant women who are more sensitive to terror attacks. Such selective behavior is liable to result in a downward bias in the estimated effect of terror on birth weight. Therefore, the probability of leaving a given district of residence (and also the city of Jerusalem and Judea, Samaria and Gaza) between the earlier birth and the later pregnancy was estimated and assumed to depend on the number of civilian fatalities (in the mother's area of residence at the time of the earlier birth) during the period up until the later pregnancy and the household's characteristics at the time of the earlier birth, as well as the changes in those characteristics during the period. The results presented in Table 1 do not provide evidence of an increased tendency to migrate as a result of terror. Nonetheless, some of the main estimations were restricted to women who did not change their district of residence between the earlier birth and the later pregnancy since migration itself may be related to situations of stress and anxiety and since the migrating women may differ from the others with respect to unobservable traits that are relevant to birth weight.[21]

[20] Judea, Samaria and Gaza are defined as one geographical unit for the purposes of the research.

[21] Another possible bias is liable to be present if birth rates changed differentially in a way that is correlated with birth weight. For example, if women from a weak socioeconomic background (and young women) who are more sensitive to situations of stress and anxiety (for further details, see below) reduced their number of births as a result of the terror attacks more than other women, then we are likely to obtain a negative effect for terror on the average weight of newborns. In order to test this claim, the probability of Jewish married women, with no more than two children, giving birth was estimated as a function of demographic-socioeconomic characteristics (as in Toledano et al., 2010; Table 3) and the number of killed in the current year. It was found that terror attacks in fact lead to a statistically significant increase in the birth rate, although the increase is negligible, which is larger among low-income women (and older women). The results can be obtained from the authors.

Table 2 presents the estimation results for the effect of terror attacks on birth weight for non-ultra-Orthodox Jews. According to the base case results, in which the explanatory variables were only the changes in the intensity of the terror attacks between the same trimester in consecutive births, the gender of the newborns and a dummy variable for a short period of time between the earlier birth and the later pregnancy (which is likely to decrease birth weight), the estimated coefficients of terror are not significant (Model 1).[22] Furthermore, the addition of demographic-socioeconomic variables does not change the picture (Model 2, total). The restriction of the sample to women who were married during both pregnancies and did not change their district of residence yielded similar results.

It should be mentioned that in the small number of cases (which did not reveal a systematic pattern) in which the effect of terror attacks was nonetheless significant (Table 2 and also the tables presented below), the estimated coefficients were very small and according to the literature their contribution to birth weight[23] is not sufficient to influence lifetime outcome variables (see Toledano et al., 2010a; Table A1).

The explanatory power of the estimations presented in Table 2 and the tables presented below is low, although this was to be expected due to the large variance of the differences in weight of consecutive births for the same woman (see the end of Section 4).[24]

Table 3 presents the estimation results corresponding to those presented above for various population groups.[25] Although only a small number of non-Jewish Israelis were killed in terror attacks during the Intifada, the increased hostility and discrimination they encountered from Jews (in, for example. the labor market; see Miaari et al., 2012) would, according to the literature, contribute to increased levels of stress and anxiety (see Dunkel Schetter, 2011). However, the number of Israelis killed during the Intifada did not have any effect on birth weight in any of the population groups.

Due to the interrelationships between Arab Israelis and Palestinians in the territories, additional estimations were carried out which included as explanatory variables the differences in the number of

[22] The same estimations were carried for all Jewish non-ultra-Orthodox women (and not just for a random sample of 20 percent as was done here) and very similar results were obtained.

[23] The average monthly number of civilians (soldiers) killed in terrorist attacks throughout the country from the outbreak of the Intifada until the end of 2004 stood at 14 (6). Therefore, the effect of the estimated coefficient of the number of civilians (soldiers) killed in a district during a given trimester whose absolute value is, for example, 1.0 is at most 42 (18) grams and in actuality far less than that.

[24] It should be mentioned that if the dependent variable was birth weight (as opposed to the difference between the weight of a newborn and that of the previous newborn) and the weight of the previous newborn was added as an explanatory variable, the estimated coefficients would have remained unchanged and as expected the explanatory power would have risen dramatically (adjusted R^2 of about 0.3).

[25] This is for women who were married during both pregnancies and lived in the same district (and this applies to the following tables as well).

Palestinians killed in the territories (with separate estimations for the West Bank and Gaza[26]) in each of the trimesters of second or third-order pregnancies relative to the corresponding number killed during the previous pregnancies. However, the number of Palestinians killed was not found to have any effect on the weight of Arab newborns of second or third order (not presented).

The rest of the empirical analysis was restricted to Jews only. In Table 4, a distinction is made between the total number of Jews and those living in Judea, Samaria and Gaza and Jerusalem, which had the largest number of terror attacks. Similarly, separate estimations were carried out for the group of women for whom the first of the pair of consecutive births took place prior to the outbreak of the Intifada and the following pregnancy subsequent to it, with the aim emphasizing the differences in the intensity of terror during the pregnancies. However, the number of those killed in terror attacks in each of the geographical regions did not have any effect on birth weight.

It should be mentioned that in the case of civilians killed in Judea, Samaria and Gaza during the first trimester, the negative estimated coefficient for the difference in weight for both the second and third-order newborn is relatively large in absolute terms (exceeding 3) and is close to being significant.[27]

Finally, we tested for a connection between fatal terror attacks in the woman's city of residence within Israel proper[28] and the weight of Jewish newborns. However, no relationship was found in this case either (Table 5).

In the last stage, the link between fatal terror attacks during pregnancy and the **probability of a low-weight birth** (less than 2,500 grams) was tested, using the framework of Equation 2 and Tables 2-5. Terror was not found to have any effect on the probability of a low-weight birth (not presented).

Sensitivity analysis for the effect of terror on birth weight

Various sensitivity analysis were carried out on the results in Tables 2-5 and all of them showed that the difference in number of Israelis killed in terror attacks during a particular trimester relative to the same trimester in a previous pregnancy did not have an effect on the change in birth weight or the probability of a low-weight birth.

Some of the newborns in the earlier (single) births had outlying weights, which may indicate that the

[26] From the outbreak of the Second Intifada until the end of 2004, 3,201 Palestinians were killed by Israelis, of whom 1,482 were killed in the West Bank, 1,663 in Gaza and the rest in Israel proper. Source: Betselem – The Israeli Information Center for Human Rights in the Occupied Territories.

[27] The average monthly number of civilians killed in Judea, Samaria and Gaza starting from the outbreak of the Second Intifada until the end of 2004 stood at 4.2. If the negative coefficient of civilians killed in Judea, Samaria and Gaza ("in the district") in the first trimester had been significant, then its effect would be in the neighborhood of 38 grams and according to most of the literature this would not be sufficient to change lifetime outcome variables.

[28] There is no point in including residents of Judea, Samaria and Gaza since most of the civilian fatalities there were on the roads, outside of the settlements.

mother suffered from some physiological or other type of problem. Therefore, the estimations were restricted to those cases in which the newborn's weight in the earlier birth is not located in the upper or lower two percentiles according to gender[29] or those in which the weight is not low (i.e. over 2,500 grams) and also not overly high (i.e. under 4,500 grams).

The weight of a newborn boy is much higher than that of a newborn girl, for all birth orders, and therefore gender of the newborn in consecutive births has a significant effect on the difference in weight, as can easily be seen in Table 2. Therefore, estimations were carried out for consecutive newborns of the same gender.

Following the outbreak of the Second Intifada, the economic situation began to deteriorate and the rate of unemployment rose dramatically and these developments may have increased the anxiety of some pregnant women. Although the estimations included the gap between the rate of regional unemployment that prevailed during the later pregnancy relative to the earlier one and the change in family income, it is possible to directly test for the effect of a change in a woman's employment status between the pregnancies. Thus, a variable was added to the estimations that reflects the number of months worked by the women during the later pregnancy relative to the earlier one or a dummy variable for the transition from employment to non-employment.

Studies have shown that mothers from a weak socioeconomic background are more exposed to situations of stress and anxiety and that they have a higher level of hormones that are related to premature birth and low birth weight as a result of these situations (see Dunkel Schetter, 2011). In contrast, the middle class was overrepresented among the Israeli civilians killed in the terror attacks (Feniger and Yuchtman-Yaar, 2010). Therefore, separate estimations were carried out for Jewish non-ultra-Orthodox (married) women whose family income was in the lower pentile and for all the rest.[30]

In all the estimations described thus far, the number of fatalities in each trimester was counted separately. Therefore estimations were also carried out that included the number of fatalities during the entire pregnancy and again no effect on birth weight could be detected.

The difference in weight between the newborn of second (third) order and that of the previous newborn is an outcome variable in the estimations and therefore the estimations implicitly include the fixed characteristics of the woman. Nonetheless, estimations were carried out for the weight of the first newborn, since it is possible that the woman's level of stress and anxiety is higher during her first

[29] For a first-order birth, the weight of newborn boys (girls) in the lower two percentiles is less than 1,950 (1,940) grams and in the upper two percentiles exceeds 4,170 (4,000) grams.

[30] A significant proportion of the households that are not non-ultra-Orthodox Jews are poor. The family income of Jewish non-ultra-Orthodox (married) women in the year of the second pregnancy stood at about NIS 67 thousand, as compared to a median of about NIS 142 thousand (in 2007 prices).

pregnancy than during her later ones.

One of the possible explanations for terror's lack of effect on birth weight is that the population habituated/adapted to terror (see the discussion in Section 5). In order to test this hypothesis, the following tests were carried out, although none of them yielded a significant effect for number of fatalities on birth weight:

a) Restricting the research population to women whose later pregnancy was during the first half of the year following the outbreak of the Second Intifada;[31]
b) The addition of the difference in the number of fatalities – according to the various classifications, one or three months prior to the pregnancy – to the explanatory variables;
c) Addition of a cumulative count of fatalities to the explanatory variables, according to the various classifications, from the birth until the following pregnancy, where a lower value was given to fatalities the farther they were in time from the following pregnancy (a linear or exponential reduction).
d) Addition of dummy variables to the explanatory variables, that take the value 1 if the first civilian death starting from the outbreak of the Intifada in the district of residence (city of residence) occurred during the first trimester.[32]

The "Defensive Shield" operation (March 29th to May 10th, 2002) constituted a turning point in the Second Intifada and following it a gradual decline took place in the intensity of the terror attacks. The estimated coefficient of the dummy variable for a pregnancy after "Defensive Shield" was not found to be significant, as was the case for the estimated coefficients of terror.

Finally, the terror variable has been measured up to this point according to the number of fatalities while the number of wounded was not taken into account, nor were terror attacks in which no one was killed. The estimations presented in Table A2 in the Appendix also included the difference in the number of civilians wounded in the various trimesters relative to the previous pregnancy as an explanatory variable. However, the results indicate that the number of wounded did not have an effect on birth weight. Since the number of wounded in a terror attack increases with the number of those killed (see Figure 3 above) and about two-thirds of the wounded were in fatal terror attacks (about four-fifths of the seriously and moderately wounded), the result is largely equivalent to the addition of the square (or some other exponent) of the number of fatalities to the basic estimations in order to reflect

[31] The six-month period was defined as starting from two weeks after the outbreak of the Second Intifada since the start of the pregnancy is the result of a calculation. It was not possible to restrict the period to be closer to the outbreak of the Intifada (for example, the first month) due to the small number of observations.

[32] In the case of non-ultra-Orthodox Jews, the estimated coefficient for the first fatal event in the city of residence was negative and had a relatively large value (about 47 grams); however, it was not significant at a level of 20 percent.

the non-linear effect of terror attacks on birth weight.

Number of days of reserve duty and birth weight

This section will examine the relationship between the number of days of reserve duty served by the husband[33] during the pregnancy and birth weight. The vast majority of those serving in the reserves are non-ultra-Orthodox Jews and therefore the estimations were carried out only for their newborns. Those who serve in the reserves differ in their socioeconomic characteristics, and in other unobservable characteristics, from those who do not and these factors are likely in themselves to have an effect on birth weight. Therefore, the estimations were carried out only for those who served in active reserve duty for at least one day during the period 1999-2007 (the period for which data on reserve duty is available).[34]

The main explanatory variable is the difference in the number of days of reserve duty served by the husband in each trimester between a pregnancy of second (third) order and the preceding pregnancy and therefore the estimations were restricted to newborn mothers who were married to the same husband from the beginning of the earlier pregnancy until the later birth (and who also resided in the same district). In addition, the number of days of reserve duty in each trimester of the later pregnancy was included as an explanatory variable. However, since the correlation between the monthly number of days of reserve duty during the period being studied and the monthly number of soldiers killed in terror attacks is about 0.42 this variable was omitted from some of the estimations.

Table 6 indicates that the number of days of reserve duty served by the husband does not have an effect on the weight of the second newborn. Similar results (not presented) were obtained for the weight of the third newborn in estimations that were restricted to women whose earlier birth was prior to the outbreak of the Intifada and the second pregnancy subsequent to it, and when the outcome variable is probability of a low-weight birth. When the explanatory variable of number of soldiers killed was split into reserve soldiers and others the results remain unchanged.

Since the dates of reserve duty are irregular—for example, in a particular year the reserve soldier's unit may not have any training exercises or operational activity—estimations were carried out that also included the cumulative number of days of reserve duty served by the husband between the date of the earlier birth and the later pregnancy. This provides a measure of the scope of his overall reserve duty, not just during the pregnancies, and is likely to provide an indicator of the extent to which his reserve duty has become routine in the household. The estimated coefficient of this variable is not significant

[33] Women who become pregnant generally receive an exemption from reserve duty.

[34] Defining those who serve in the reserves as those who serve a higher number of days of reserve duty did not alter the estimation results and neither did the inclusion of those who did not do even one day of reserve duty.

and neither is the coefficient of the difference in the number of days of reserve duty during the same trimester in consecutive births (not presented).

Table 2: The effect of terror on the difference in weight between consecutive non-ultra-Orthodox Jewish newborns (grams)

		Second newborn relative to first			Third newborn relative to second		
		Model 1	Model 2		Model 1	Model 2	
		Total	Total	Married in same district of residence[1]	Total	Total	Married in same district of residence[1]
Difference in number of civilians killed in district of residence	Trimester I	0.228 (0.718)	0.271 (0.722)	0.610 (0.809)	-1.572 (1.126)	-1.579 (1.140)	-1.710 (1.553)
	Trimester II	-0.551 (0.725)	-0.593 (0.727)	-0.457 (0.767)	-0.556 (1.129)	-0.479 (1.136)	-0.320 (1.561)
	Trimester III	0.488 (0.687)	0.468 (0.687)	0.043 (0.767)	0.606 (1.118)	0.619 (1.116)	0.892 (1.536)
Difference in number of civilians killed outside of district of residence	Trimester I	-0.190 (0.292)	-0.181 (0.294)	0.251 (0.334)	-0.375 (0.538)	-0.378 (0.538)	-0.279 (0.762)
	Trimester II	-0.233 (0.283)	-0.230 (0.283)	-0.409 (0.322)	0.063 (0.532)	0.077 (0.531)	0.893 (0.774)
	Trimester III	-0.038 (0.276)	-0.017 (0.276)	-0.014 (0.310)	**-1.260 (0.531)	**-1.238 (0.531)	**-1.043 (0.756)
Difference in number of soldiers killed for entire country	Trimester I	0.273 (0.321)	0.220 (0.326)	-0.351 (0.380)	0.319 (0.476)	0.282 (0.483)	0.482 (0.678)
	Trimester II	0.143 (0.310)	0.133 (0.313)	0.169 (0.364)	0.655 (0.484)	0.668 (0.485)	-0.180 (0.668)
	Trimester III	-0.124 (0.281)	-0.151 (0.281)	-0.110 (0.318)	-0.080 (0.474)	-0.105 (0.473)	0.371 (0.660)
Gender of first and second newborns (relative to boy-girl)	Girl-girl	***115.067 (12.974)	***115.315 (12.968)	***120.717 (14.575)	***103.680 (25.242)	***106.566 (25.184)	***122.942 (35.535)
	Boy-boy	***114.363 (12.719)	***115.034 (12.713)	***120.023 (14.197)	***115.926 (24.904)	***119.752 (24.852)	***120.872 (34.672)
	Boy-girl	***261.627 (12.756)	***261.457 (12.749)	***263.656 (14.278)	***249.425 (25.084)	***252.320 (25.024)	***240.628 (35.070)
Time between births less than two years		-11.216 (11.579)	-3.118 (11.912)	2.708 (13.577)	-24.004 (22.940)	-23.395 (23.566)	-34.750 (31.609)
Change in family income[2] (thousands of 2007 shekels)			-0.044 (0.033)	-0.040 (0.036)		***0.239 (0.059)	***0.314 (0.013)
Change in rate of regional unemployment[2] (percentage points)			0.917 (4.492)	-4.898 (6.674)		1.913 (5.643)	7.628 (12.933)
Age of woman[4]			16.821 (10.961)	18.272 (13.476)		32.184 (23.189)	21.028 (31.072)
Age of woman squared			-0.213 (0.189)	-0.228 (0.232)		-0.444 (0.381)	-0.304 (0.518)
Married[4]			14.253 (22.641)			56.492 (41.093)	
New immigrant[5]			0.723 (13.650)	-17.297 (15.939)		-39.147 (26.746)	-30.149 (39.146)
Family income[4] (thousands of 2007 NIS)			0.045 (0.038)	0.069 (0.044)		-0.030 (0.075)	-0.097 (0.010)
Trend + constant		V	V	V	V	V	V
FE for district of residence		V	V	V	V	V	V
Number of observations		12,978	12,809	9,514	5,491	5,381	2,277
Adjusted R^2		0.037	0.039	0.044	0.029	0.029	0.040

Source: see description in text and calculations by the authors.
* significant at a level of confidence of 10 percent; ** significant at a level of confidence of 5 percent; *** significant at a level of confidence of 1 percent.
Standard deviations appear in parentheses.
1) Women who were married to the same spouse from the beginning of the earlier pregnancy until the later birth and living in the same district (or Judea, Samaria and Gaza).
2) Income of the woman and her spouse from labor (salaried and self-employed), child allowance, guaranteed income supplement, general disability allowance, alimony and survivors benefits.
3) Rate of unemployment in the district of residence at the time the pregnancy began.
4) At the time the later pregnancy began.
5) Immigrated since 1989.

Table 3: Effect of terror on the difference in weight between consecutive newborns, according to population group[1,2] (grams)

a. Second newborn relative to the first

		Jewish non-ultra-Orthodox	Ultra-Orthodox	Bedouins in the South	Other Arabs	Druze
Difference in number of civilians killed in district of residence	Trimester I	0.610	0.101	3.621	0.698	-3.268
		(0.809)	(0.577)	(13.062)	(1.044)	(3.390)
	Trimester II	-0.457	-0.642	-0.405	-0.415	2.158
		(0.767)	(0.561)	(0.497)	(0.970)	(3.067)
	Trimester III	0.043	-0.766	-1.058	-0.293	-0.090
		(0.767)	(0.515)	(4.037)	(0.967)	(3.230)
Difference in number of civilians killed outside of district of residence	Trimester I	0.251	-0.469	0.889	*-0.477	0.092
		(0.334)	(0.311)	(0.686)	(0.258)	(0.711)
	Trimester II	-0.409	**-0.645	-0.083	-0.270	-0.246
		(0.322)	(0.296)	(0.651)	(0.236)	(0.655)
	Trimester III	-0.014	-0.199	-0.250	-0.093	-0.101
		(0.310)	(0.295)	(0.617)	(0.232)	(0.630)
Difference in number of soldiers killed for entire country	Trimester I	-0.351	**0.721	-0.383	*0.508	0.509
		(0.380)	(0.306)	(0.685)	(0.285)	(0.822)
	Trimester II	0.169	**0.682	0.569	**0.500	0.414
		(0.364)	(0.283)	(0.653)	(0.242)	(0.735)
	Trimester III	-0.110	0.439	-0.336	-0.169	0.130
		(0.318)	(0.275)	(0.602)	(0.227)	(0.646)
Other control variables[3]		V	V	V	V	V
Trend + constant		V	V	V	V	V
FE for district of residence		V	V	V	V	V
Number of observations		9,514	12,511	2,894	19,124	2,229
Adjusted R^2		0.044	0.031	0.045	0.033	0.044

b. Third newborn relative to second

		Jewish non-ultra-Orthodox	Ultra-Orthodox	Bedouins in the South	Other Arabs
Difference in number of civilians killed in district of residence	Trimester I	-1.710	0.651	21.234	0.441
		(1.553)	(0.643)	(12.976)	(1.421)
	Trimester II	-0.320	-0.018	-1.525	-0.528
		(1.561)	(0.652)	(5.527)	(1.425)
	Trimester III	0.892	0.446	-7.193	-0.704
		(1.536)	(0.615)	(4.376)	(1.446)
Difference in number of civilians killed outside of district of residence	Trimester I	-0.279	-0.279	0.681	0.111
		(0.762)	(0.762)	(0.771)	(0.367)
	Trimester II	0.893	-0.062	-0.281	-0.360
		(0.774)	(0.374)	(0.753)	(0.360)
	Trimester III	**-1.043	0.028	0.564	0.063
		(0.756)	(0.375)	(0.749)	(0.364)
Difference in number of soldiers killed for entire country	Trimester I	0.482	**-0.766	1.181	0.370
		(0.678)	(0.368)	(0.734)	(0.349)
	Trimester II	-0.180	-0.093	**1.522	0.181
		(0.668)	(0.325)	(0.682)	(0.351)
	Trimester III	0.371	0.319	0.564	0.096
		(0.660)	(0.321)	(0.749)	(0.345)
Other control variables[3]		V	V	V	V
Trend + constant		V	V	V	V
FE for district of residence		V	V	V	V
Number of observations		2,277	7,476	2,543	9,511
Adjusted R^2		0.040	0.041	0.044	0.026

Source: see description in text and calculations by the authors.

* significant at a level of confidence of 10 percent; ** significant at a level of confidence of 5 percent; *** significant at a level of confidence of 1 percent.

Standard deviations appear in parentheses.

1) Estimation results are not presented for Bedouin women in northern Israel and Druze women for the third newborn due to the small number of observations.
2) Women married to the same spouse from the beginning of the earlier pregnancy until the later birth and who lived in the same district (or Judea, Samaria and Gaza). Among non-ultra-Orthodox Jews and non-Jews there are almost no births outside of marriage and the phenomenon of internal migration of married couples was limited.
3) The explanatory variables appearing in Table 2 (Model 2) are for married women who did not switch district. In the case of non-Jews, the explanatory variable "New Immigrant" was omitted and in the case of Bedouins in the South an explanatory variable was added for residence in a recognized settlement.

Table 4: The effect of terror on the difference in weight between consecutive Jewish newborns[1]

(grams)

a. Second newborn relative to the first

		Total		Judea, Samaria and Gaza	Jerusalem	
Earlier birth prior to the Intifada			V			V
Later pregnancy during the Intifada			V			V
Difference in number of civilians killed in district of residence	Trimester I	0.353	1.244	-3.373	1.678	-3.303
		(0.461)	(1.227)	(2.063)	(0.927)	(3.943)
	Trimester II	-0.521	-1.283	1.285	0.146	1.030
		(0.456)	(1.161)	(2.020)	(0.900)	(3.508)
	Trimester III	-0.560	-0.284	-1.671	0.492	2.908
		(0.419)	(1.142)	(1.884)	(0.918)	(3.502)
Difference in number of civilians killed outside of district of residence	Trimester I	-0.149	0.167	1.293	0.219	-2.987
		(0.225)	(0.651)	(0.835)	(0.671)	(2.325)
	Trimester II	**-0.549	-0.224	**-1.639	-0.388	-0.940
		(0.216)	(0.699)	(0.804)	(0.653)	(2.989)
	Trimester III	-0.071	-0.653	-1.048	0.002	0.080
		(0.212)	(0.627)	(0.747)	(0.615)	(2.523)
Difference in number of soldiers killed for entire country	Trimester I	0.255	-0.603	0.862	-0.275	4.533
		(0.235)	(0.971)	(0.954)	(0.611)	(3.097)
	Trimester II	**0.465	0.182	1.185	-0.166	1.601
		(0.221)	(1.221)	(0.960)	(0.590)	(4.055)
	Trimester III	0.178	0.364	1.123	0.176	1.292
		(0.205)	(0.978)	(0.723)	(0.548)	(3.285)
Other control variables[3]		V	V	V	V	V
Trend + constant		V	V	V	V	V
FE for district of residence		V	V			
Number of observations		22,025	6,851	2,150	4,102	903
Adjusted R^2		0.034	0.044	0.034	0.025	0.020

b. Third newborn relative to the second

		Total		Judea, Samaria and Gaza	Jerusalem
Earlier birth prior to the Intifada			V		
Later pregnancy during the Intifada			V		
Difference in number of civilians killed in district of residence	Trimester I	0.162	-0.641	-3.064	1.403
		(0.596)	(2.909)	(2.187)	(1.213)
	Trimester II	-0.050	2.830	1.272	1.569
		(0.604)	(2.830)	(2.278)	(1.184)
	Trimester III	0.433	0.913	-1.018	1.175
		(0.573)	(2.572)	(2.149)	(1.183)
Difference in number of civilians killed outside of district of residence	Trimester I	-0.155	0.669	0.832	0.106
		(0.335)	(1.700)	(0.881)	(0.936)
	Trimester II	0.122	2.155	0.429	-1.114
		(0.337)	(1.806)	(0.879)	(0.942)
	Trimester III	***-0.890	-1.355	-0.491	-1.253
		(0.330)	(1.525)	(0.821)	(0.907)
Difference in number of soldiers killed for entire country	Trimester I	0.099	0.207	-0.155	-0.048
		(0.298)	(2.476)	(0.867)	(0.781)
	Trimester II	-0.067	-3.869	-0.509	-0.663
		(0.291)	(3.160)	(0.928)	(0.787)
	Trimester III	0.351	0.383	-0.176	-0.154
		(0.288)	(2.393)	(0.714)	(0.749)
Other control variables[2]			V	V	V
Trend + constant			V	V	V
FE for district of residence			V		
Number of observations			1,275	1,508	2,095
Adjusted R^2			0.066	0.031	0.032

Source: see description in text and calculations by the authors.

* significant at a level of confidence of 10 percent; ** significant at a level of confidence of 5 percent; *** significant at a level of confidence of 1 percent.

Standard deviations appear in parentheses.

1) Women married to the same spouse from the beginning of the earlier pregnancy until the later birth and living in the same district (or Judea, Samaria and Gaza). Results are not presented for estimations restricted to the early birth being prior to the Intifada and the later pregnancy during the Intifada for mothers living in Judea, Samaria and Gaza and women living in Jerusalem who gave birth to a newborn of third order, due to the small number of observations.
2) The explanatory variables appearing in Table 2 (Model 2) are for married women who did not switch district and also include a dummy variable for the ultra-Orthodox.

Table 5: The effect of terror in the city of residence on the difference in weight between consecutive Jewish newborns:[1] women living in Israel proper (grams)

		Second newborn relative to the first		Third newborn relative to the second	
Earlier birth prior to the Intifada			V		V
Later pregnancy during the Intifada			V		V
Difference in number of civilians killed **in city of residence**	Trimester I	0.679	2.105	0.323	-0.318
		(0.546)	(1.470)	(0.742)	(3.678)
	Trimester II	-0.585	-0.202	-0.088	4.873
		(0.546)	(1.412)	(0.761)	(3.522)
	Trimester III	-0.311	1.941	0.404	0.170
		(0.501)	(1.384)	(0.711)	(3.132)
Difference in number of civilians killed in the district of residence, outside the city of residence	Trimester I	0.345	1.833	0.134	-0.532
		(0.913)	(1.905)	(1.150)	(4.800)
	Trimester II	-0.838	-1.956	-1.077	5.204
		(0.907)	(1.846)	(1.159)	(4.547)
	Trimester III	-0.672	-0.976	0.607	4.973
		(0.817)	(1.650)	(1.068)	(4.137)
Difference in number of civilians killed outside the district	Trimester I	-0.321	-0.138	-0.269	0.953
		(0.237)	(0.678)	(0.369)	(1.877)
	Trimester II	**-0.475	-0.219	0.100	2.892
		(0.226)	(0.733)	(0.371)	(1.988)
	Trimester III	-0.008	-0.512	**-0.902	-1.805
		(0.217)	(0.654)	(0.362)	(1.664)
Difference in number of soldiers killed for the entire country	Trimester I	0.253	-0.345	0.176	-0.250
		(0.248)	1.016)	(0.332)	(2.725)
	Trimester II	**0.464	0.153	0.086	-4.081
		(0.233)	(1.276)	(0.322)	(3.442)
	Trimester III	0.085	0.100	0.463	-0.138
		(0.215)	(1.021)	(0.318)	(2.643)
Other control variables[2]		V	V	V	V
Trend + constant		V	V	V	V
FE for district of residence		V	V		
Number of observations		19,875	6,264	8,245	1,057
Adjusted R^2		0.035	0.045	0.035	0.074

Source: see description in text and calculations by the authors.

* significant at a level of confidence of 10 percent; ** significant at a level of confidence of 5 percent;

*** significant at a level of confidence of 1 percent.

Standard deviations appear in parentheses.

1) Women married to the same spouse from the beginning of the earlier pregnancy until the later birth and who lived in the same city.
2) The explanatory variables appearing in Table 2 (Model 2) are for married women that did not switch district and also include a dummy variable for the ultra-Orthodox.

Table 6: The effect of the husband's reserve duty on the difference in weight between the second non-ultra-Orthodox newborn and the first:[1] spouse in active reserve duty[2] (grams)

		Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Difference in number of days of reserve duty	Trimester I	1.419	1.403	1.437	2.148	2.131	2.157
		(1.170)	(1.172)	(1.174)	(2.235)	(2.240)	(2.243)
	Trimester II	-0.843	-0.881	-0.890	-1.042	-1.053	-1.000
		(1.306)	(1.311)	(1.311)	(2.606)	(2.609)	(2.611)
	Trimester III	-1.333	-1.338	-1.365	-0.518	-0.475	-0.556
		(1.680)	(1.682)	(1.682)	(3.475)	(3.479)	(3.480)
Number of days of reserve duty during the second pregnancy	Trimester I				-0.984	-0.984	-0.971
					(2.592)	(2.598)	(2.600)
	Trimester II				0.301	0.264	0.182
					(2.982)	(2.986)	(2.988)
	Trimester III				-1.064	-1.125	-1.055
					(3.934)	(3.940)	(3.941)
Difference in number of civilians killed in the district of residence	Trimester I		0.683	0.400		0.676	0.988
			(1.142)	(1.182)		(1.142)	(1.183)
	Trimester II		-0.127	-0.324		-0.125	-0.325
			(1.228)	(1.126)		(1.228)	(1.262)
	Trimester III		-0.102	-0.233		-0.097	-0.230
			(1.142)	(1.182)		(1.143)	(1.182)
Difference in number of civilians killed outside the district of residence	Trimester I		0.000	0.283		0.009	0.289
			(0.441)	(0.400)		(0.441)	(0.511)
	Trimester II		0.315	0.093		0.320	0.097
			(0.474)	(0.527)		(0.475)	(0.528)
	Trimester III		-0.052	-0.123		-0.051	-0.123
			(0.467)	(0.512)		(0.467)	(0.512)
Difference in number of soldiers killed in the entire country	Trimester I			-0.614			-0.608
				(0.563)			(0.564)
	Trimester II			0.576			0.579
				(0.537)			(0.537)
	Trimester III			-0.143			-0.140
				(0.477)			(0.478)
Other control variables[3]		V	V	V	V	V	V
Trend + constant		V	V	V	V	V	V
FE for district of residence		V	V	V	V	V	V
Number of observations		..	..	..	..	..	..
Adjusted R^2		0.052	0.053	0.053	0.053	0.053	0.053

Source: see description in text and calculations by the authors.

* significant at a level of confidence of 10 percent; ** significant at a level of confidence of 5 percent; *** significant at a level of confidence of 1 percent.

Standard deviations appear in parentheses.

1) Women married to the same spouse from the beginning of the earlier pregnancy until the later birth and living in the same district (or Judea, Samaria and Gaza). The estimations do not include 1998 since there was no available data on reserve duty for that year.
2) Served at least one day during the period 1999-2007.
3) The explanatory variables appearing in Table 2 (Model 2) are for married women who did not switch district of residence.

6. Conclusion and discussion

Studies have shown that low birth weight adversely affects a variety of lifetime outcome variables and that stress and anxiety experienced by a pregnant woman will likely reduce birth weight. The current study examined the effect of Palestinian terror during the Second Intifada, which broke out towards the end of 2000, on the weight of Israeli newborns of second and third order, whose mothers were pregnant during the period 1998-2004. Identification relied on the variation over time and space in the intensity of terror and use was made of panel estimations for the change in the weight of consecutive newborns of the same mother.

Terror attacks were not found to have any effect on birth weight or the probability of a low-weight newborn during any stage of pregnancy. The results remained unchanged whether fatal terror attacks occurred in the woman's city of residence or a broader geographical unit (and even in Judea, Samaria and Gaza, which were particularly hard-hit by terror attacks) and whether those killed were civilians or soldiers. The length of a husband's reserve duty during a pregnancy (and during the Second Intifada in particular), which can make day-to-day functioning more difficult for a pregnant women and thus increase her level of anxiety, did not have any effect on birth weight, a result not previously documented in the literature.

The few studies done on this subject in other countries have generally found a negative relationship between terror (or natural disasters) and birth weight and therefore the question arises as to why the results for Israel differ.

One of the likely explanations is the resilience of Israelis, who have had to live with terror attacks for many years. With the outbreak of the Second Intifada, there was a noticeable increase in the level of fear among Israelis of being hurt in a terror attack and as a result there was a deterioration in their mood and a general decline in how they perceived their situation. However, the relevant indices returned to their pre-Intifada levels already during 2003 (Elran, 2006). Another indicator of the rapid acclimatization to the Intifada can be seen in the number of telephone requests for emotional assistance related to the security situation (received by Eran – Emotional First Aid organization), which rose only moderately following the outbreak of the Second Intifada (Gilat, 2006). However, they quickly fell to previous levels, apart from short-lived upticks following exceptionally large attacks (see also Zussman and Romanov, 2006).

Studies carried out during the Intifada indicate that the psychological reactions to terror attacks, such as post-traumatic stress disorder, were relatively moderate (for a survey, see Romanov et al., 2012). Furthermore, no relationship was found between the intensity of terror and indications of emotional

stress (such as tension, anxiety and lack of sleep) and the effect of terror on Israelis' level of satisfaction with their lives did not last beyond the first few days following an attack (Romanov et al., 2012).

The relatively moderate psychological reactions of Israeli citizens to terror attacks and their rapid adjustment to events can be attributed not only to living for long periods in a state of insecurity, which among other things led to the development of extensive support systems, but also to changes in behavior patterns, such as traveling less on public transportation and preferring secure public places (see Kirshenbaum, 2005). It is interesting to note that only a very small proportion of the population sought psychological/psychiatric assistance or took sedatives.

It can be assumed that terror's lack of effect on birth weight for mothers living in Judea, Samaria and Gaza and in Jerusalem, which suffered a disproportionate number of terrorist attacks during the Second Intifada, is also related to the fact that a significant proportion of residents there are religious and live in homogenous communities, factors that are known to contribute to the ability to cope with difficult situations (Dunkel Schetter, 2011).

The research has several limitations which need to be addressed. Thus, due to the lack of available data, it was not possible to identify the variety of channels through which the Second Intifada affected birth weight and in particular the mechanism through which stress and anxiety are elevated in each individual pregnant woman. It may be that the monitoring of pregnant women by the medical system changed as a result of the increased security needs. To the same extent, changes in lifestyle among the population as a result of the terror attacks may have had a direct effect on birth weight. The information on the start of a pregnancy was not available to us and instead was calculated backwards from the date of birth. Therefore, the degree of exposure to terror attacks during the first trimester (and therefore the other trimesters as well) is not known with certainty; This problem is exacerbated to the extent that terror leads to a shortening of pregnancies, such that some of the terror attacks in fact occurred prior to the pregnancy. The research did not look at other outcome variables, which are likely to be affected by terror attacks, such as miscarriages, stillbirths, the newborn's medical situation, etc.[35]

Finally, there would be benefit in investigating other large-scale extreme events on birth weight, such as the evacuation of Gaza and Northern Samaria as part of the Disengagement Plan, the ongoing missile and mortar attacks on the population in Southern Israel, the Second Lebanese War, etc.

35 Thus, for example, Malaspina et al. (2008) found that newborns, and primarily girls, of mothers who were in their second or third month of pregnancy in Jerusalem during the Six Day War, suffered from schizophrenia at relatively high rates. In contrast, Selten et al. (2003) did not find any such effect among newborns of women living throughout the country who were pregnant during the Six Day War or the Yom Kippur War.

References

Beydoun, H. and Saftlas, A.F. (2008), "Physical and Mental Health Outcomes of Prenatal Maternal Stress in Human and Animal Studies: A Review of Recent Evidence", *Paediatric and Perinatal Epidemiology*, Vol. 22, No. 5, pp. 438-466.

Berkowitz, G.S. and others (2003), "The World Trade Center Disaster and Intrauterine Growth Restriction", *Journal of the American Medical Association*, Vol. 290, pp. 595-596.

Burgh, H.T. and others (2011), "The Impact of Deployment to Iraq or Afghanistan on Partners and Wives of Military Personnel", *International Review of Psychiatry*, Vol. 23, No. 2, pp. 192-200.

Camacho, A. (2008), "Stress and Birth Weight: Evidence from Terrorist Attacks", *American Economic Review (Paper & Proceedings)*, Vol. 98, No. 2, pp. 511-515.

Catalano, R. and Hartig, T. (2001), "Communal Bereavement and the Incidence of Very Low Birthweight in Sweden", *Journal of Health and Social Behavior*, Vol. 42, No. 4, pp. 333-341.

Central Bureau of Statistics (various years), *Statistical Abstract of Israel*. (Hebrew)

Currie, J. and Rossin-Slater, M. (2012), *Weathering the Storm: Hurricanes and Birth Outcomes*, NBER WP 18070.

Dunkel Schetter, C. (2011), "Psychological Science on Pregnancy: Stress Processes, Biopsychosocial Models, and Emerging Research Issues", *The Annual Review of Psychology*, Vol. 62, pp. 531-558.

Eccleston, M. (2011), *In Utero Exposure to Maternal Stress: Effects of the September 11th Terrorist Attacks in New York City on Birth and Early Schooling Outcomes*, Harvard University, memo, October.

Elran, M. (2006), *Israel's National Resilience: The influence of the Second Intifada on Israeli Society*, Jaffee Center For Strategic Studies, Memo 81. (Hebrew)

Endra, S.M. and others (2009), "Does Acute Maternal Stress in Pregnancy Affect Infant Health Outcomes? Examination of a Large Cohort of Infants Born After the Terrorist Attacks of September 11, 2001", *BMC Public Health*, Vol. 9, No. 252 http://www.biomedcentral.com/1471-2458/9/252.

Eskenazi, B. and others (2007), "Low Birthweight in New York City and Upstate New York Following the Events of September 11th", *Human Reproduction*, Vol. 22, No. 11, pp. 3013-3020.

Feniger, Y. and Yuchtman-Yaar, E. (2010), "Risk Groups in Exposure to Terror: The Case of Israel's Citizens", *Social Forces*, Vol. 88, No. 3, pp. 1451-1462.

Gilat, Y. (2006), “Requests for Emotional Assistance by Telephone during the Intifada Period”, *Megamot*, Volume 44, No. 2, pp. 316-332. (Hebrew)

Glynn, L.M. and others (2001), "When Stress Happens Matters: Effects of Earthquake Timing on Stress Responsivity in Pregnancy", *American Journal of Obstetrics and Gynecology*, Vol. 185, No. 4, pp. 637-642.

Hass, D.M. and Pazdernik, L.A. (2006), "A Cross Survey of Postpartum Women During Wartime in a

Military Medical Facility", *Military Medicine*, Vol. 171, No. 10, pp. 1020-1023.

Hobel, C.J. (2004), "Stress and Preterm Birth", *Clinical Obstetrics and Gynecology*, Vol. 47, No. 4, pp. 856-880.

Hobel, C.J., Goldstein, A. and Barrett, E.S. (2008), "Psychosocial Stress and Pregnancy Outcomes", *Clinical Obstetrics and Gynecology*, Vol. 51, No. 2, pp. 333-348.

Kirshenbaum, A. (2005), "Adapting Behaviors of Israeli Civilians to Palestinian Terror", In: *The Concept of Social Resilience*, Samuel Neaman Institute, The Forum of National Security, The Society & National Security Program (SNS), pp. 37-82.

Kramer, M.S. (1987), "Determinants of Low Birth Weight: Methodological Assessment and Meta-Analysis", *Bulletin of the World Health Organization*, Vol. 65, No. 5, pp. 663-737.

Lauderdale, D.S. (2006), "Birth Outcomes for Arabic-Named Women in California Before and After September 11", *Demography*, Vol. 43, No. 1, pp. 185-201.

Lederman, S.A. and others (2004), "The Effects of the World Trade Center Events on Birth Outcomes among Term Deliveries at Three Lower Manhattan Hospitals", *Environmental Health Perspectives*, Vol. 112, No. 17, pp. 1772-1778.

Lipkind H.S. and others (2010), "Birth Outcomes Among Offspring of Women Exposed to the September 11, 2001, Terrorist Attacks", *Obstetrics & Gynecology*, Vol. 116, No. 4, pp. 917-925.

Miaari, S., Zussman, A. and Zussman, N. (2012), "Ethnic Conflict and Job Separations", *Journal of Population Economics*, Vol. 25, No. 2, pp. 419-437.

Malaspina, D. and others (2008), "Acute Maternal Stress in Pregnancy and Schizophrenia in Offspring: A Cohort Prospective Study", *BMC Psychiatry*, Vol. 8, No. 71, http://www.biomedcentral.com/1471-244X/8/71/.

Milgram, N. and Bar, K. (1993), “Women under Pressure due to the Absence or Danger of Husband Reserve Duty”, *Psychology*, Volume 3, No. 2, pp. 180-190. (Hebrew)

Omer, H. and others (1986), "Life Stresses and Premature Labor: Real Connection or Artifactual Findings?", *Psychosomatic Medicine*, Vol. 48, No. 5, pp.362-369.

Rees, D.I. and Mansour, H. (2011), *The Effect of Prenatal Stress on Birth Weight: Evidence from the Al-Aqsa Intifada*, IZA DP No. 5535.

Rich-Edwards, J.W. and others (2005), "Preterm Delivery in Boston Before and After September 11th, 2001", *Epidemiology*, Vol. 16, No. 3, pp. 323-327.

Romanov, D., Zussman, A. and Zussman, N. (2012), "Does Terrorism Demoralize? Evidence from Israel", *Economica*, Vol. 79, No. 313, pp. 183-198.

Schenker, E. and Mor-Yosef, S. (1993), "Did Anxiety During the Gulf War Causes Premature Delivery?", *Military Medicine*, Vol. 156, No. 2, pp. 789-791.

Selten, J.P. and others (2003), "No Relationship Between Risk of Schizophrenia and Prenatal Exposure to Stress During the Six-Day War or Yom Kippur War in Israel", *Schizophrenia Research*, Vol. 63, No. 1-2, pp. 131-135.

Simeonova, E. (2009), *Out of Sight, Out of Mind? The Impact of Natural Disasters on Pregnancy Outcomes*, CESifo Working Paper, No. 2814.

Smith, L. and others (2006), "Lower Birth Weight of Dutch Neonates Who Where in Utero at the 9/11 Attacks", *Journal of Psychosomatic Research*, Vol. 61, No. 5, 715-717.

Tan, C.E. and others (2009), "The Impact of the Wenchuan Earthquake on Birth Outcomes", *PLoS ONE*, Vol. 4, No. 12: e8200. doi:10.1371/journal.pone.0008200.

Toledano, A., Zussman, N., Frisch, R. and Gottleib, D. (2010), "The Effect of Child Allowances on Fertility", *Israel Quarterly Review*, Volume 57, No. 2/3, pp. 159-203. (Hebrew)

--- (2010a), *Family Income and Birth Weight*, Bank of Israel, Research Department, Discussion Paper 2010.17. (Hebrew)

Torche, F. (2011), "The Effect of Maternal Stress on Birth Outcomes: Exploiting a Natural Experiment", *Demography*, Vol. 48, No. 4, pp. 1473-1491.

Wadhwa, P.D. and Others (1993), "The Association between Prenatal Stress and Infant Birth Weight and Gestational Age at Birth: A Prospective Investigation", *American Journal of Obstetrics and Gynecology*, Vol. 169, No. 4, pp. 858-865.

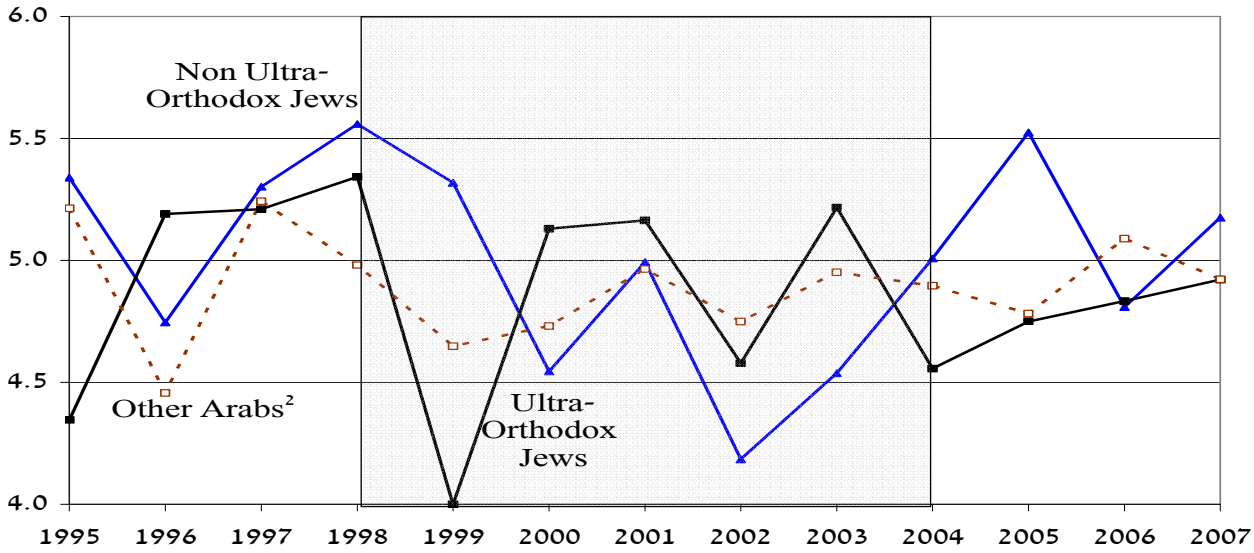
Yarhi, M. and Tsafti, Y. (2009), "Media Coverage of Terror Attacks in the Israeli Press: Center vs. Periphery", *Megamot*, Volume 50, No. 1-2, pp. 38-61. (Hebrew)

Zussman, N. and Romanov, R. (2006), "Terror and its Effects on Israelis: Evidence of Psychic Costs of of the Intifada", *Israel Quarterly Review*, Volume 53, No. 2, pp. 272-289. (Hebrew)

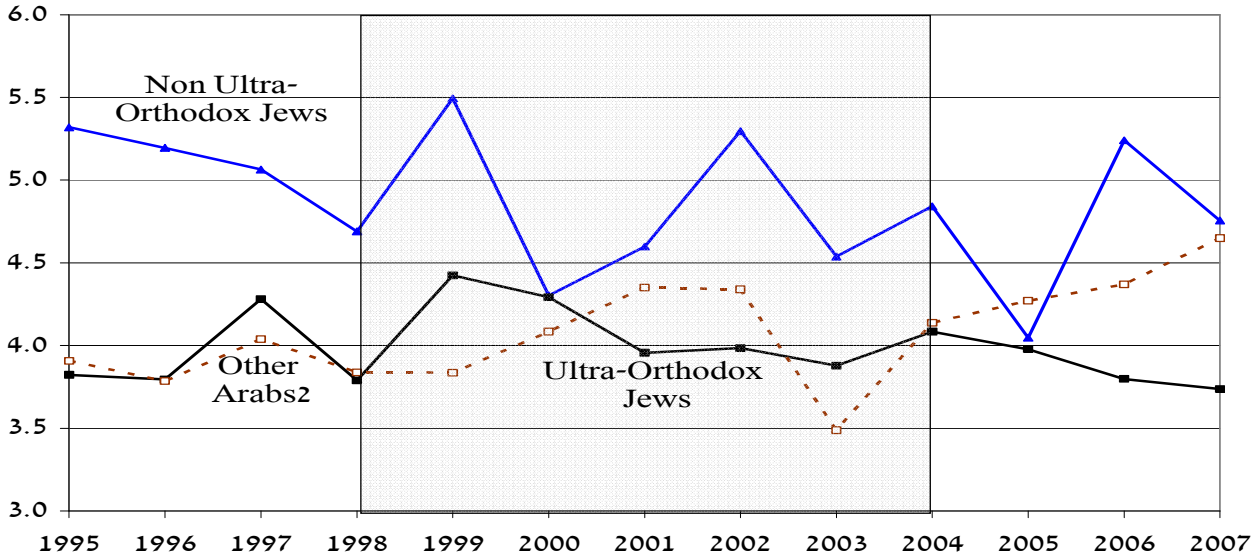
Appendix

Figure A1: The proportion of underweight newborns in single births according to ethnic group and birth order, 1995-2007 (percent)

a. Birth of second order



b. Birth of third order



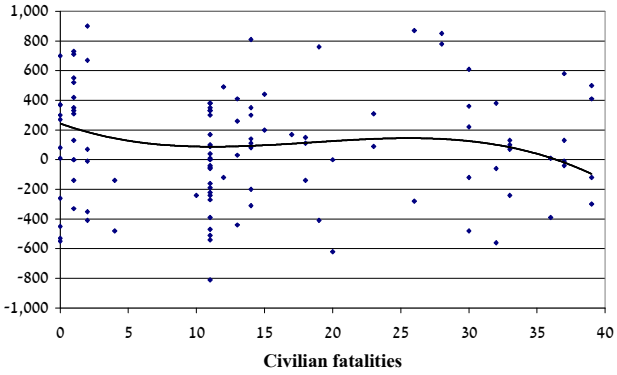
Source: Ministry of Health, National Insurance Institute and calculations by the authors.

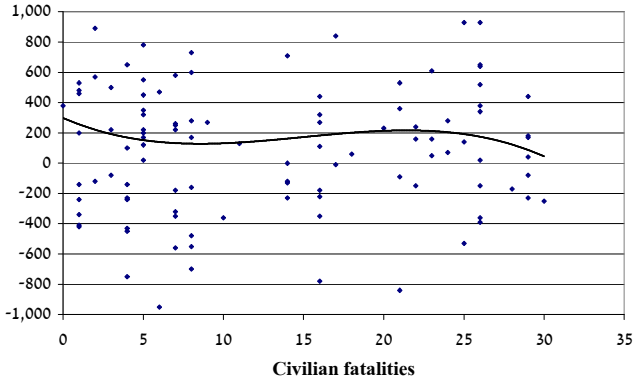
1) Weight less than 2,500 grams.
2) Arabs who are not Bedouins or residents of Jerusalem (also not including Druze). It was not possible to include Bedouins in the South and Druze due to the small number of observations.

Figure A2: Number of Israeli civilians fatalities during the Second Intifada and the change in weight of Jewish newborns: second birth after the outbreak of the Intifada relative to a first birth prior to it (grams)[1,2]

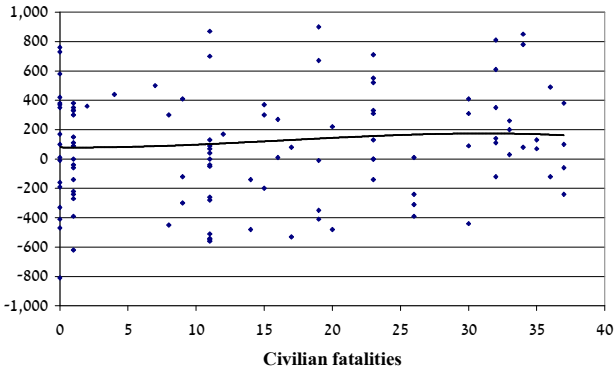
Newborn mothers living in Jerusalem | **Newborn mothers living in Judea, Samaria and Gaza area**

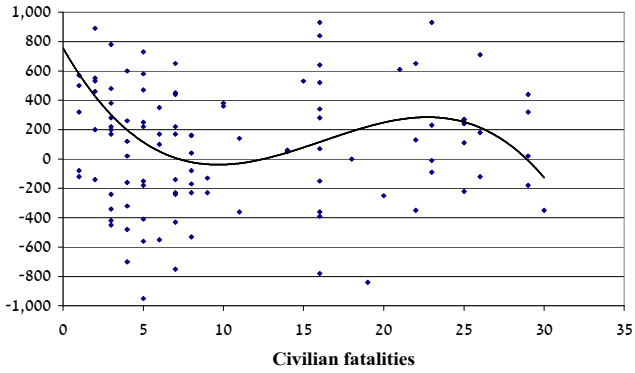
First trimester



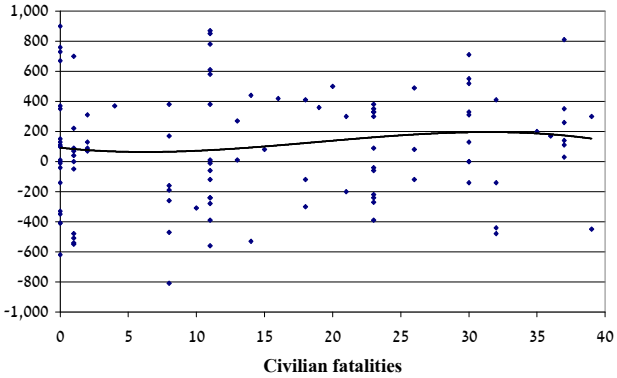


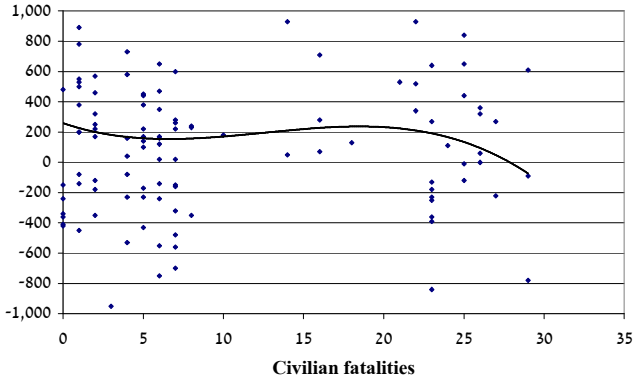
Second trimester





Third trimester





Source: see the description in the text.

1) Pregnancy of the first newborn started from January 1st, 1998 and onward and the birth was not later than the outbreak of the Second Intifada The beginning of the pregnancy of the second newborn was subsequent to the outbreak of the Intifada and the birth was not later than December 31st, 2004. The time period between the first birth and the beginning of the second pregnancy is not less than two years. The first and second newborns are of the same gender and are born in single births.
2) Trend line: polynomial of third degree.

Table A1: Effect of terror on internal migration by Jews:[1] Switching district of residence between a birth and the following pregnancy

Area of residence during the earlier birth:	National	National	Jerusalem[2]	Judea, Samaria and Gaza
Population group:	Non-ultra-Orthodox	Ultra-Orthodox	Jews	Jews
Number of civilians killed per month in district of residence[3] between a birth and the following pregnancy	2.3 E-4 (4.4 E-4)	-3.0 E-4 (4.2 E-4)	***-5.0 E-3 (8.8 E-4)	-6.0 E-4 (6.3 E-4)
Number of months between birth and following pregnancy	***1.8 E-3 (1.9 E-4)	***1.9 E-3 (1.6 E-4)	***-4.4 E-3 (3.5 E-4)	4.7 E-4 (2.9 E-4)
Change in family income[4] (thousands of 2007 NIS)	***7.2 E-5 (2 E-5)	1.3 E-4 (4 E-5)	***2.5 E-4 (5 E-5)	*8.6 E-5 (5 E-5)
Change in regional rate of unemployment[5] (percentage points)	-2.1 E-4 (2.6 E-3)	**-3.9 E-3 (1.7 E-3)	***7.1 E-2 (4.3 E-3)	***4.4 E-2 (2.6 E-3)
Age of woman[3]	***2.6 E-2 (4.9 E-3)	***2.4 E-2 (5.3 E-3)	***2.8 E-2 (9.3 E-3)	***2.5 E-2 (9.4 E-3)
Age of woman squared[3]	***-4.2 E-4 (8.9 E-5)	***-4.7 E-4 (1.1 E-4)	**-3.6 E-4 (1.8 E-4)	***-5.3 E-4 (1.9 E-4)
New immigrant[6]	***-1.8 E-2 (6.7 E-3)	***-2.0 E-2 (6.7 E-3)	-1.5 E-2 (1.2 E-2)	5.3 E-3 (1.1 E-2)
Family income[3,4] (thousands of 2007 NIS)	***9.5 E-5 (2 E-5)	***1.5 E-4 (4 E-5)	**1.8 E-4 (5 E-5)	***3.3 E-4 (6 E-5)
Regional rate of unemployment[3,6] (percentage points)	-1.2 E-3 (3.4 E-3)	**-4.8 E-3 (2.3 E-3)	***8.0 E-2 (1.3 E-2)	**2.8 E-2 (1.1 E-2)
Second-order newborn	***2.1 E-2 (5.5 E-3)	***1.9 E-2 (4.1 E-3)	***-8.6 E-2 (9.0 E-3)	***3.2 E-2 (7.5 E-3)
Ultra-Orthodox			***-4.1 E-2 (1.2 E-2)	*1.8 E-2 (9.5 E-3)
Trend + constant	V	V	V	V
FE for district of residence	V	V		
Number of observations	16,144	25,920	7,974	4,572
Adjusted R^2	0.038	0.026	0.197	0.085
Proportion leaving the district (percent)	8.36	8.39	20.57	5.86

Source: see description in text and calculations by the authors.

* significant at a level of confidence of 10 percent; ** significant at a level of confidence of 5 percent; *** significant at a level of confidence of 1 percent.

Standard deviations appear in parentheses.

1) Women married to the same spouse from the beginning of the earlier pregnancy until the later birth.
2) Moved away from Jerusalem (as opposed to out of the district).
3) At the time of the later birth.
4) Income of the woman and her spouse from labor (salaried and self-employed), child allowance, guarantee income allowance, general disability allowance, alimony and survivors benefits.
5) Rate of unemployment in the district of residence at the time of the earlier birth.
6) Arrived in1989 and onward.

Table A2: Effect of number of wounded in terror attacks on the difference in weight between newborns of first and second order[1] (grams)

		Non-ultra-Orthodox Jews	Ultra-Orthodox Jews	Jews in Judea, Samaria and Gaza	Non-ultra-Orthodox Jews	Ultra-Orthodox Jews	Jews in Jerusalem
Difference in number of civilians wounded in the district of residence	Trimester I	-0.031 (0.108)	0.016 (0.057)	0.913 (1.072)			
	Trimester II	-0.017 (0.124)	0.076 (0.063)	0.279 (0.462)			
	Trimester III	0.026 (0.098)	-0.034 (0.052)	0.702 (0.487)			
Difference in number of civilians killed in district of residence	Trimester I	1.001 (0.961)	0.192 (0.686)	-3.633 (2.645)			
	Trimester II	-0.071 (0.961)	-1.064 (0.660)	1.218 (2.260)			
	Trimester III	-0.022 (0.925)	-0.737 (0.626)	-2.355 (2.357)			
Difference in number of civilians killed outside the district of residence	Trimester I	0.523 (0.350)	-0.097 (0.314)	-0.104 (1.391)			
	Trimester II	0.068 (0.330)	-0.086 (0.292)	-0.687 (1.113)			
	Trimester III	-0.037 (0.298)	0.058 (0.277)	0.257 (0.960)			
Difference in number of civilian wounded in the city of residence	Trimester I				-0.070 (0.144)	0.084 (0.075)	0.124 (0.116)
	Trimester II				-0.022 (0.152)	**0.152 (0.076)	0.125 (0.120)
	Trimester III				-0.062 (0.119)	0.013 (0.060)	-0.000 (0.076)
Difference in number of civilians killed in **city of residence**	Trimester I				1.050 (1.506)	-0.389 (0.958)	0.427 (1.189)
	Trimester II				0.505 (0.236)	***-2.762 (0.968)	-1.265 (1.300)
	Trimester III				1.215 (1.455)	*-1.622 (0.905)	0.135 (1.207)
Difference in number of civilians killed in the district, outside the city of residence	Trimester I				0.989 (1.178)	-1.081 (0.980)	6.576 (6.245)
	Trimester II				-1.030 (1.211)	0.474 (0.999)	1.804 (1.500)
	Trimester III				-0.434 (1.132)	-1.202 (0.875)	-2.652 (3.615)
Difference in number of civilians killed outside of district	Trimester I				0.273 (0.335)	-0.505 (0.314)	0.270 (0.688)
	Trimester II				-0.398 (0.322)	**-0.675 (0.297)	-0.640 (0.639)
	Trimester III				-0.005 (0.310)	-0.204 (0.296)	0.180 (0.603)
Difference in number of soldiers killed in the entire country	Trimester I	-0.865 (0.554)	0.552 (0.478)	1.407 (1.732)	-0.368 (0.382)	**0.767 (0.313)	-0.352 (0.732)
	Trimester II	-0.289 (0.562)	0.458 (0.497)	0.665 (1.933)	0.169 (0.366)	*0.544 (0.294)	-0.936 (0.876)
	Trimester III	-0.256 (0.466)	0.054 (0.406)	0.176 (1.282)	-0.103 (0.320)	0.346 (0.281)	-0.217 (0.703)
Other control variables[2]		V	V	V	V	V	V
Trend + constant		V	V	V	V	V	V
FE for district of residence		V	V		V	V	
Number of observations		9,514	12,511	2,150	9,514	12,511	4,102
Adjusted R^2		0.044	0.031	0.049	0.044	0.032	0.038

Source: see description in text and calculations by the authors.

* significant at a level of confidence of 10 percent; ** significant at a level of confidence of 5 percent; *** significant at a level of confidence of 1 percent.

Standard deviations appear in parentheses.

1) Women married to the same spouse from the beginning of the earlier pregnancy until the later birth and living in the same city of residence.
2) The explanatory variables appearing in Table 2 (Model 2) are for married women who did not switch districts of residence and also include a dummy for the ultra-Orthodox.