War and the changing timing of fertility in Iraq

[Preliminary and incomplete draft]

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Abstract

Iraq's fertility transition is largely undocumented. This paper provides a detailed account of recent fertility trends in the country, with a particular focus on the changes resulting from the 2003-2011 war and the factors underlying them. The study is based on retrospective birth history data from the 2006 and 2011 Iraq Multiple Indicator Cluster Surveys (I-MICS). Estimates from the two surveys indicate that total fertility remained stable from 1997 to 2010 at a rate of about 4.5 children per woman. However, an examination of the age patterns of fertility reveals an abrupt shift in the timing of births, with adolescent fertility rising by over 30% soon after the onset of the war. A decomposition analysis shows that the rise in early childbearing is due to an increased prevalence of early marriage among the less educated. These findings have serious implications for women's health and empowerment in Iraq and similar war-affected settings.

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Introduction

The increasing concern about the consequences of warfare for civilian populations has led to a growing body of demographic research. This research has been crucial in providing estimates of war-induced excess mortality, a primary indicator by which to assess the intensity of wars and the adequacy of humanitarian responses.[1] Research on war-induced changes in fertility is much scarcer, although the need to monitor women's status and reproductive health in warzones has been widely acknowledged (Palmer *et al.* 1999; McGinn 2000; McGinn and Purdin 2004; Austin *et al.* 2008; McGinn 2009; Patel *et al.* 2009). This is especially evident in the case of the 2003-2011 Iraq War. Several studies have sought to quantify the impact of this war on mortality, producing a wide range of estimates. See among others Roberts *et al.* (2004), Burnham *et al.* (2006), Iraq Family Health Survey Study Group (2008) and Hagopian *et al.* (2013). By contrast, virtually nothing is known about the effect of this war on fertility. This is of concern because fertility changes during wartime typically reflect wider societal changes, which may have long-term implications for postwar development (Hill 2004; Guha-Sapir and D'Aoust 2010).

This paper provides a detailed account of recent fertility trends in Iraq, with a particular focus on the changes resulting from the war and the factors underlying them. The analysis is based on retrospective birth history data from the 2006 and 2011 Iraq Multiple Indicator Cluster Surveys (I-MICS). To assess the quality of the data, I calculate retrospective fertility rates from each survey by single calendar year and compare fertility estimates from one survey with the estimates for the same period from the subsequent survey. I then pool the data to reconstruct annual fertility trends from 1997 to 2010, allowing for comparisons over a period spanning before and after the onset of the war. Using standard decomposition techniques, I quantify how much of the changes in fertility rates during wartime were accounted for by changes in the proportion of married women and how much by changes in the prevalence of birth control within marriage. Findings have important implications for women's health and empowerment in Iraq and similar war-affected settings.

[1] Since the early 2000s, a large number of studies on mortality in war-affected countries have been conducted. See for example Spiegel and Salama (2000) for Kosovo; Grein *et al.* (2003) for Angola; Tabeau and Bijak (2005) for Bosnia and Herzegovina; Roberts *et al.* (2001), Roberts *et al.* (2003) and Coghlan *et al.* (2006) for the Democratic Republic of Congo; Depoortere *et al.* (2004), Hagan and Palloni (2006) and Degomme and Guha-Sapir (2010) for Darfur; Roberts *et al.* (2004), Burnham *et al.* (2006), Iraq Family Health Survey Study Group (2008), and Hagopian *et al.* (2013) for Iraq.

Background

The number of studies assessing fertility changes during war in low and middle-income countries is scant[2] (Hill 2004; Guha-Sapir and D'Aoust 2010). The limited existing evidence suggests that these changes vary not only in magnitude but even in direction, depending on the nature of the war and the pre-existing characteristics of the affected population.

War-induced fertility declines have been documented in a few sub-Saharan African countries during the 1980s and 1990s. These decline have been attributed to involuntary spousal separation and postponement of new marriages due to military mobilisation, accompanied in some cases by voluntary efforts to delay or avoid childbearing as a response to economic hardship. See Lindstrom and Berhanu (1999) for the Ethiopian civil war; Agadjianian and Prata (2002) for the Angolan civil war; Blanc (2004) and Woldemicael (2008) for Eritrea's border war against Ethiopia.

On the other hand, war-induced fertility increases have been observed in some Middle Eastern countries also during the 1980s and 1990s. These increases have been accounted for by a rise in the proportion of young women married due to security concerns and lack of alternatives, and from limited birth control within marriage due to war-induced pronatalist ideologies and disruption of family planning services. See Khawaja (2000) for the first Palestinian Intifada; Abbasi-Shavazi *et al.* (2002) for Iran's war against Iraq; Yucesahin and Ozgugu (2008) for the Kurdish guerrilla in southeastern Turkey.

There is no study assessing changes in fertility that may have resulted from more recent wars affecting the Middle Eastern region since the early 2000s, including the 2003-2011 Iraq War. Fertility trends in Iraq during this war, as well as during the preceding period, have remained largely undocumented (Tabutin and Schoumaker 2005; Casterline 2009). There is little doubt, however, that these trends have been affected by the country's turbulent history and associated population policies.

Saddam Hussein's regime embraced a strong pronatalist ideology since its inception in 1979. High fertility was encouraged with various economic incentives,

[2] Fertility declines in European countries during the First and Second World Wars are well-known. These declines were largely attributable to spousal separation and drop in the number of new marriages due to conscription. See among others Vincent (1946), Hajnal (1947), Henry (1966), Winter (1982), Festy (1984) and Chesnais (1992).

including childbirth cash bonuses and family allowances (Faour 1989). The 1981-1988 war against Iran and the Iranian superiority in population size led Saddam Hussein to further intensify the regime's pronatalist approach, with the aim of accelerating population growth. Major restrictions on access to contraception were put in place, and penalties for performing illegal abortions were increased. Family planning services were provided by the Iraqi Family Planning Association and the private sector exclusively for medical reasons (United Nations 1987; Efrati 1999). Only in the aftermath of the 1990-1991 Gulf War did the regime finally issue a decree allowing the provision of family planning services to all women. During the 1990s and early 2000s, the Iraqi Family Planning Association received international assistance under a special dispensation from the UN embargo, but a contraceptive shortage persisted (United Nations 2001).

The conditions prevailing during the 2003-2011 Iraq War are likely to have altered the preceding fertility trends in multiple, and possibly countervailing, ways. On the one hand, the regime change marked a turning point in the country's population policy. In the post-2003 period, family planning services have been actively supported by the government (United Nations 2011). The wider availability of birth control methods may have fostered a decline in the average number of children per woman. However, the post-2003 period has witnessed a deterioration in women's status due to an exacerbation of sectarian-religious conservatism and an increase in both the real and perceived level of danger outside the home (UNICEF 2010; 2011). Physical insecurity and movement restrictions, combined with wide-scale poverty and unemployment, may have reinforced traditional gender roles and induced women to enter marriage and childbearing earlier than would have been the case in the absence of war.

The following analysis reveals how fertility changed during wartime and identifies the factors underlying these changes. The analysis excludes the autonomous Kurdistan region because it experienced very different conditions. This region, which accounts for about 15% of the Iraqi population, became autonomous following the 1991 Kurdish uprising and has remained relatively safe and prosperous from 2003 onwards. A brief analysis of fertility in this region is provided in appendix.

Data

This study is based on retrospective birth history data from the 2006 and 2011 I-MICS. These nationally representative surveys were conducted by the Iraqi Central Organisation for Statistics and Information Technology and the Kurdistan Regional Statistics Office, in cooperation with the Ministry of Health and with financial and technical support from UNICEF (Iraq Central Organisation for Statistics and Information Technology and Kurdistan Regional Statistics Office 2007; 2013). In this section, I describe survey designs, implementations and response rates excluding the sample from the Kurdistan region.

For the 2006 I-MICS, the country was divided into 47 domains, and 54 clusters were drawn from each domain with linear systematic probability proportional to size. A linear systematic sample of six households was selected within each cluster. Fieldwork took place between February and March 2006 and the household questionnaire was successfully administrated to 15,085 of selected households, yielding a response rate of 99.2% (Iraq Central Organisation for Statistics and Information Technology and Kurdistan Regional Statistics Office 2007). For the 2011 I-MICS, 31 clusters were selected within each of the 85 Iraqi districts with linear systematic probability proportional to size and ten households were drawn from each cluster by systematic random sampling. Fieldwork was carried out between March and May 2011, reaching 25,984 households for a response rate of 99.7% (Iraq Central Organisation for Statistics and Information Technology and Kurdistan Regional Statistics Office 2013).

In both surveys, the household questionnaire was administered to the head of each household for, among other purposes, gathering information regarding the age and sex of all household members. All women between the ages of 15 and 49 who were members of the selected households were eligible for the individual interview. Women's response rate was 99.1% in the 2006 I-MICS and 98.7% in the 2011 I-MICS. Retrospective birth histories were collected for all interviewed women who were ever-married at the date of the interview.

Complete and accurate information regarding the birth date of women and the date of each live birth they had are crucial for a correct estimation of fertility trends. In countries with flawed vital registration systems like Iraq, surveys collecting birth histories from a nationally representative sample of women are the most reliable sources with this respect. Nevertheless, reporting errors are critical problems of many of these surveys (Potter 1977; Goldman *et al.* 1985; Arnold 1990; Marckwardt and Rutstein 1996; Pullum 2006; Schoumaker 2011; Pullum *et al.* 2013). Since these errors can distort fertility estimates, it is important to determine the quality of the data.

Both the 2006 and 2011 I-MICS are of good quality in terms of birth date completeness. Information regarding month and year of birth is complete for 95.6% of interviewed women and 97.2% of their reported live births in the 2006 I-MICS, and for 99.6% of women and 99.5% of reported live births in the 2011 I-MICS. However, complete reporting does not necessarily imply accurate reporting.

The two most widely mentioned and potentially serious problems of birth history data are omission and displacement of births (Pullum 2006; Sullivan *et al.* 2008; Schoumaker 2011; Pullum *et al.* 2013). A common error is the omission of births that occurred many years before the survey, especially in case of deceased children (Sullivan *et al.* 2008). For this reason, it is not advisable to use birth history data to compute retrospective fertility rates for period longer than 10 years. Omission of recent births is also common and related to the design of the survey questionnaires. Like many similar surveys, the 2006 and 2011 I-MICS contained a maternal and child health module only for those women with children born up to five years before the survey. Previous research has found that interviewers are inclined to omit some recent births to avoid administering the lengthy health module (Schoumaker 2011). The same reason encourages interviewers to displace some recent births backward in time, particularly from the fifth year before the survey, which is the last year of eligibility for the health module, to the sixth year (Pullum 2006). These phenomena tend to cause an underestimation of fertility in the five years preceding the surveys and an overestimation in the sixth year.

When two consecutive surveys are available, an effective approach to detect omission and displacement of births and assess the overall reliability of the birth history data is to reconstruct retrospective fertility trends from each survey and compare fertility estimates from one survey with the estimates for the same period from the subsequent survey. In the absence of distortions due to data errors, I expect the 95% confidence intervals of the estimated fertility rates from the 2006 and 2011 I-MICS to overlap. For a similar approach, see Garanne (2008), Schoumaker (2008), Machiyama (2010) and Pullum *et al.* (2013).

Reconstructing fertility trends

Birth history data from the 2006 and 2011 I-MICS can be used to reconstruct annual fertility rates from 1997 to 2010. This makes it possible is to depict trends for a period spanning before and after the onset of the war. The fertility rate of women aged x in calendar year t is calculated as follows:

$$f_{x,t} = b_{x,t} / e_{x,t} \quad (1)$$

where $b_{x,t}$ is the number of births observed in calendar year t to women aged x at time of birth and $e_{x,t}$ is the number of women-years of exposure to risk at age x during year t. The 95% confidence intervals are derived from standard errors computed using the delta method (Pullum 2008; Schoumaker 2013). Due to truncation of the data on older women, the analysis of retrospective fertility rates is restricted to women between 15 and 39 years. Since very few births occur to Iraqi women at age 40 and older, the downward bias of fertility due to the omission of this small fraction of births is negligible.

Figure 1 displays trends in total fertility rate (TFR) for women aged 15-39 as estimated from the two surveys. Estimates from the 2011 I-MICS cover the period 2002-2010. The reason is that the oldest women whose birth histories were collected in the 2011 I-MICS were aged 49 at the date of the interview, and were therefore aged 39 ten years earlier. Birth histories from the 2006 I-MICS cover the period 1997-2005. Estimates from the two surveys agree closely with each other. Only for the year 2005, the 95% confidence intervals do not overlap. The difference between the two TFRs in 2005 may result from both a mild underestimation of fertility in the year before the 2006 I-MICS, due to omission of births, and an overestimation of fertility in the sixth year before the 2011 I-MICS, due to displacement of births from the earlier period. Although the estimated TFR for this year must be taken with some caution, the difference between the two rates is not serious enough to distort the overall fertility trend, which is consistent between the two surveys. Figure 2 shows the estimated trend in TFR pooling together data on births and women-years of exposure from the 2006 and 2011 I-MICS. Two noteworthy points emerge from this figure. First, total fertility in 2010 was still around 4.5 children per woman, which is fairly high compared to Iraq's neighbouring countries.[3] Second, the TFR remained remarkably stable, with apparently no change after the onset of the war. Total fertility in 2010 was exactly the same as in 1997, and annual fluctuations remained below 10% over the entire period.

Figure 1. *Estimated TFRs (15-39) from 2006 and 2011 I-MICS data*

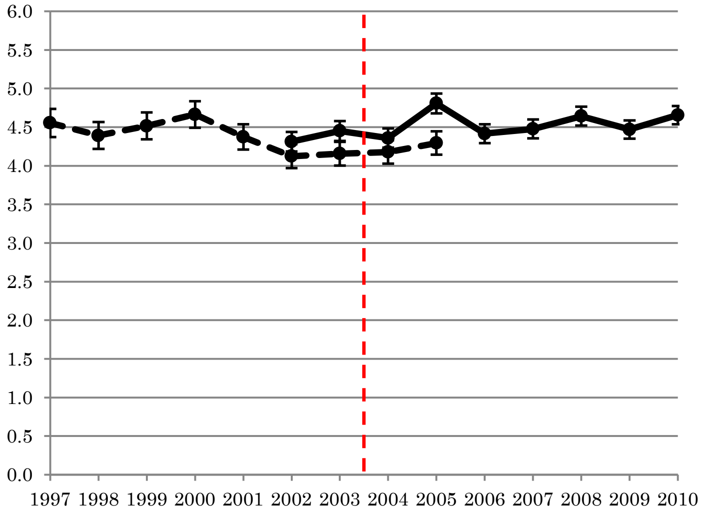
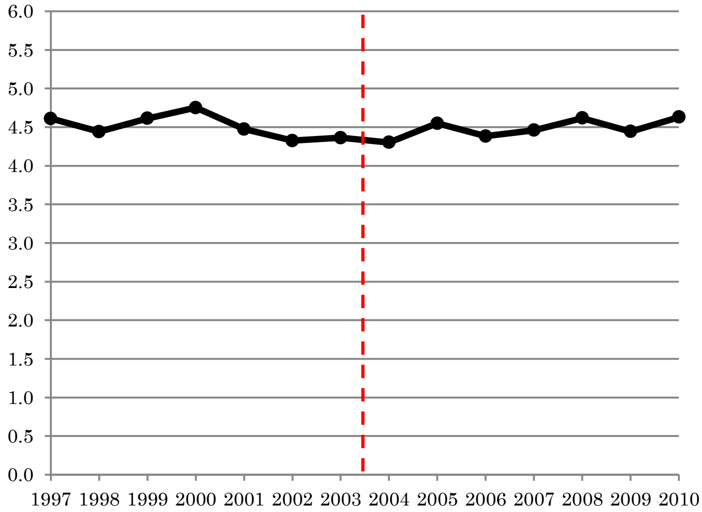


Figure 2. *Estimated TFRs (15-39) pooling 2006 and 2011 I-MICS data*



However, the TFR reflects both the level and timing of fertility and its stability over time can conceal underlying changes in the age patterns of childbearing. In order to uncover possible variations in fertility trends among women of different age groups, figures 3 to 7 display age-specific fertility rates (ASFRs) from the 2006 and 2011 I-MICS. Birth histories from the 2011 I-MICS can be used to calculate retrospective fertility rates back to 1997 for the age groups 15-19, 20-24, 25-29 and 30-34. This means that, for these groups of women, the estimated ASFRs from the two surveys can be compared for 9 years. Also over this longer time period and at this less aggregate level, fertility trends are consistent. In fact, the 95% confidence intervals of fertility estimates do not overlap in 2005 only for the age groups 20-24 and 30-34. For all other age groups of women, and in particular for those aged 15-19, estimates from the two surveys agree remarkably well for all 9 years.

[3] During the late 2000s, in Iraq's neighbouring countries total fertility ranged from about 2 to 3.5 children per women. See for example Abbasi-Shavazi *et al.* (2009) for fertility in Iran; Adbul Salam (2013) for Saudi Arabia; Al-Kandari (2007) for Kuwait; Cetorelli and Leone (2012) for Jordan; Yavuz (2005) for Turkey; Youssef (2012) for Syria.

Figure 8 presents the estimated ASFRs pooling data from the two surveys. This figure reveals that the stability of TFR before and after the onset of the war was the result of countervailing fertility trends among young and older women. To examine these trends in more detail, figure 9 displays the annual changes in ASFRs relative to the 1997 rates. The figure shows an abrupt shift in the timing of births toward younger ages. From 1997 to 2003, adolescent fertility was stable just below 70 births per 1,000 girls aged 15-19. However, soon after the beginning of the war, adolescent fertility rose by more than 30% reaching over 95 births per 1,000 girls in 2010. This increase is striking not only because it moved Iraq from a moderate to a high adolescent fertility country[4], but also because a similar increase in adolescent fertility over such a short period has rarely been observed before.[5]

The fertility rate of women aged 20-24 also increased after the onset of the war by about 15%, from 200 to 230 births per 1,000 women in that age group. Only the fertility of women aged 25-29 remained virtually unchanged around 250 births per 1,000. The increase in early fertility was counterbalanced by a 15% decline in the fertility of women aged 30-34, from 230 to 200 births per 1,000, and a 30% decline among those aged 35-39, from 170 to 130 births per 1,000. It is noteworthy that the fertility rates of young women rose suddenly in the post-2003 period, whereas the declining fertility trends among older women was already underway a few years before the beginning of the war.

[4] According to the United Nations, a country is classified as having a high rate of adolescent fertility if it exhibits over 80 births per 1,000 girls aged 15-19 (United Nations 2013).
[5] A substantial increase in adolescent fertility has been documented in the Palestinian Territories during the years of the first Intifada (see Khawaja 2000).

Figure 3. *Estimated ASFRs (15-19) from 2006 and 2011 I-MICS data*

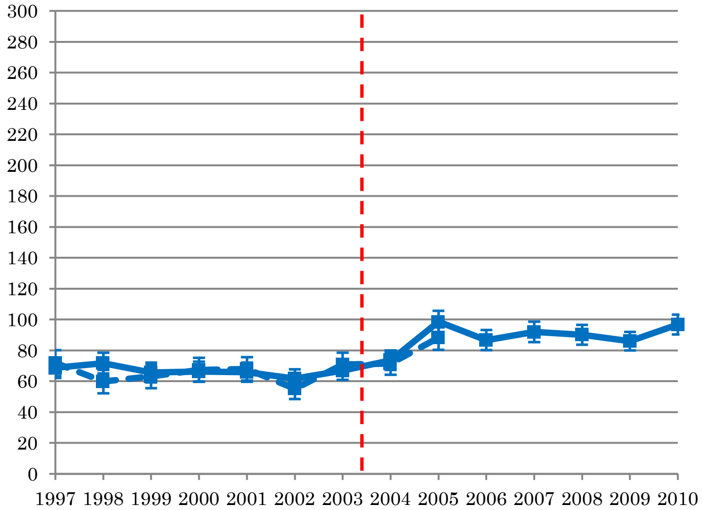


Figure 4. *Estimated ASFRs (20-24) from 2006 and 2011 I-MICS data*

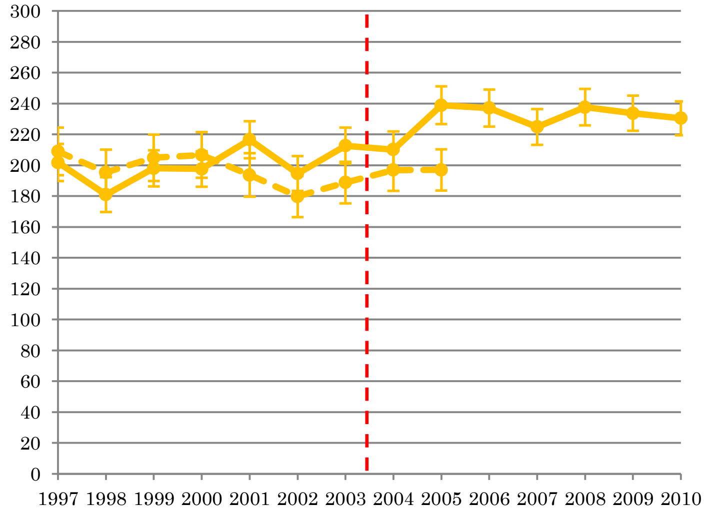


Figure 5. *Estimated ASFRs (25-29) from 2006 and 2011 I-MICS data*

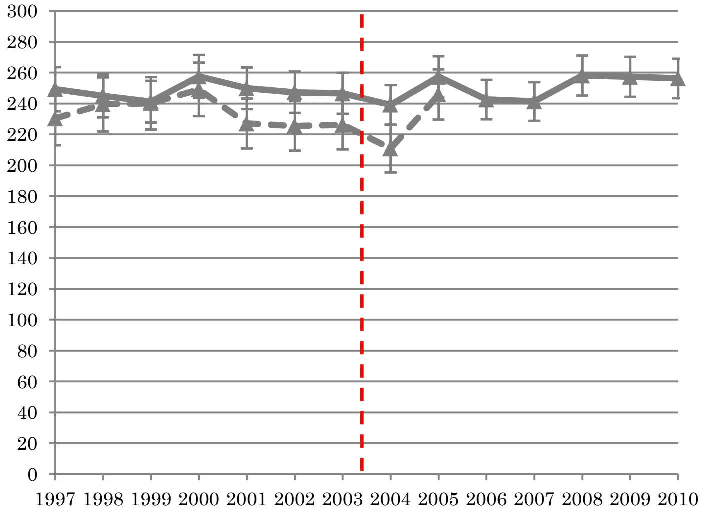


Figure 6. *Estimated ASFRs (30-34) from 2006 and 2011 I-MICS data*

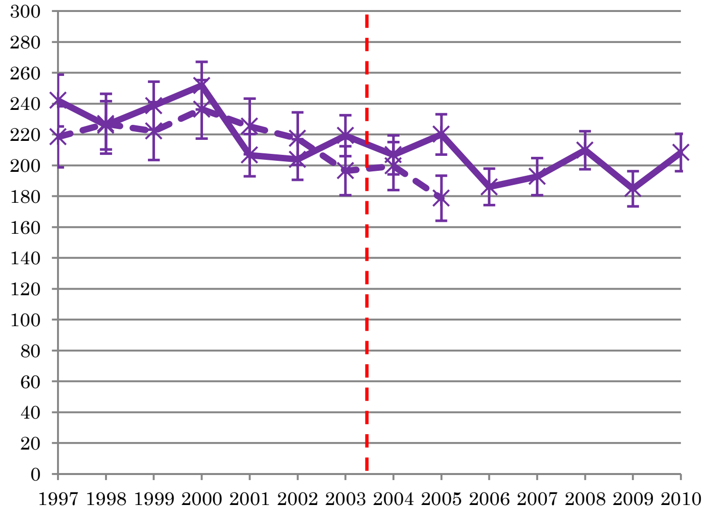


Figure 7. *Estimated ASFRs (35-39) from from 2006 and 2011 I-MICS data*

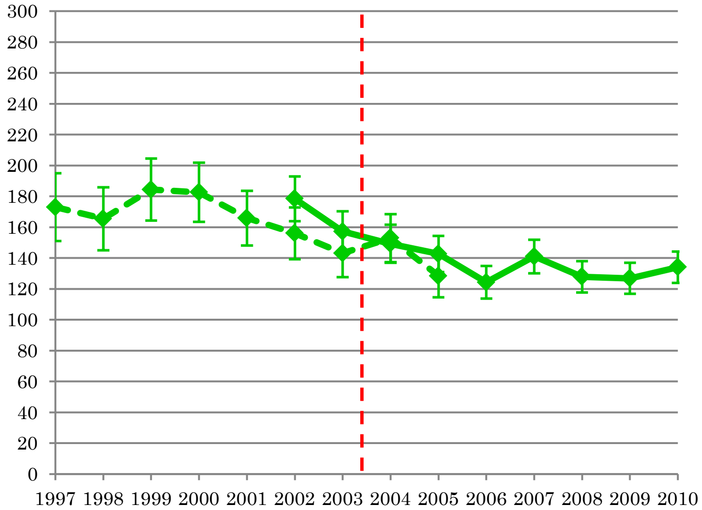


Figure 8. *Estimated ASFRs (15-39) pooling 2006 and 2011 I-MICS data*

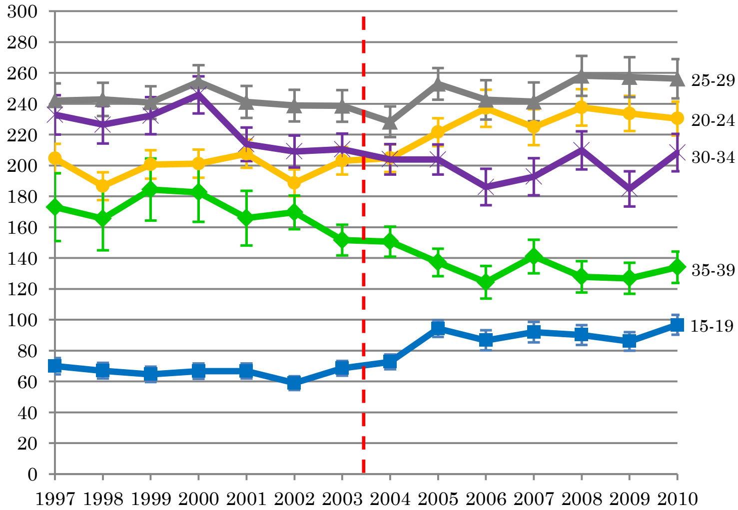
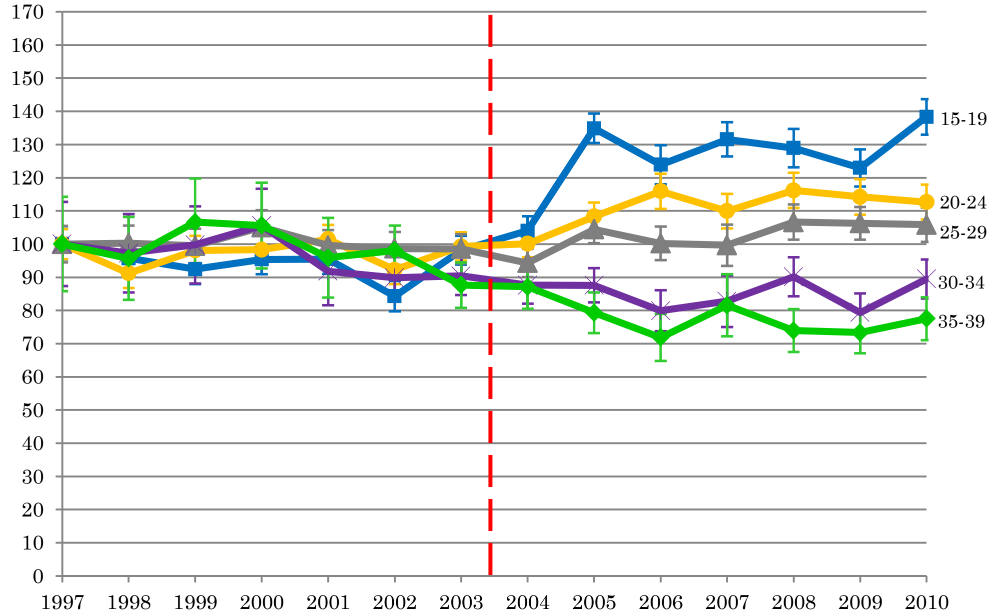


Figure 9. *Change in ASFRs (15-39) relative to 1997 rates pooling 2006 and 2011 I-MICS data*



Disentangling fertility trends by education

The abrupt rise in early fertility is most likely related to an increase in early marriage during the war. In Iraq virtually all births occur within marriage, since extra-marital childbearing is subject to strong cultural and religious sanctions. Once married, women are generally under social pressure to have children as soon as possible.[6]

Previous research has found that women's education is the most important predictor of age at marriage and first birth. Secondary education specifically is the factor most strongly associated with reduced prevalence of adolescent marriage and childbearing (Lloyd 2005; USAID 2007; Myers and Harvey 2011). In what follows, I therefore examine fertility differentials between women with no education or only primary schooling versus those who attended (but not necessarily completed) secondary or higher education. The aim is to ascertain whether there was a change in the age pattern of childbearing in one or both educational groups. The percentage of women with less than secondary education in Iraq was around 55% during the study period, with little variation across age groups.

[6] Both the 2006 and 2011 I-MICS confirm that only 1% of married women were using contraception before having at least one child.

Figure 10 shows annual trends in the education-specific TFR as estimated from the 2006 and 2011 I-MICS. Estimates are consistent between the two surveys, with overlapping confidence intervals except for the year 2005. Trends using pooled data are reported in figure 11. This figure reveals a significant educational gap in TFR, with low educated women having on average 1.5 children more than highly educated women. The gap in total fertility between the two educational groups remained relatively constant over the entire period.

Figure 10. *Education-specific TFRs (15-39) From 2006 and 2011 I-MICS data*

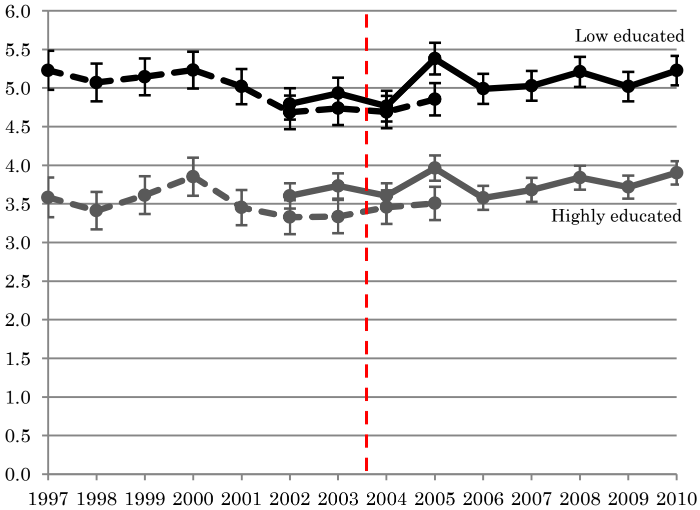
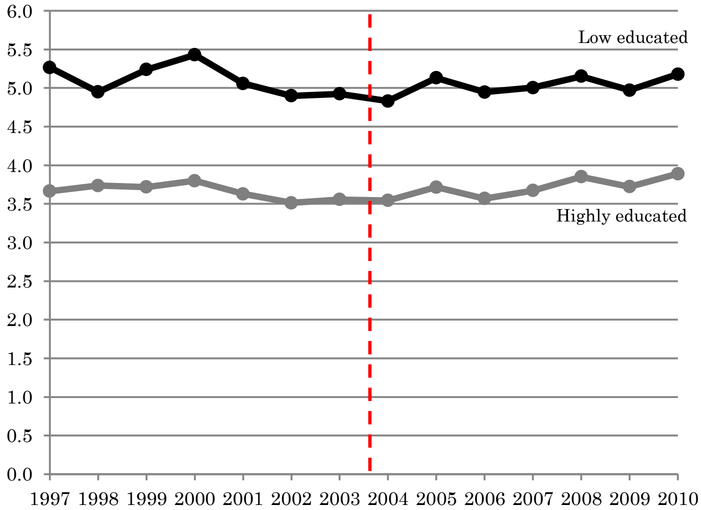


Figure 11. *Education-specific TFRs (15-39) pooling 2006 and 2011 I-MICS data*



However, once again this overall stability conceals very different trends in the age patterns of fertility between low and highly educated women. Figures 12 to 16 provide ASFRs by survey for the less educated. Estimates from the two surveys agree closely with each other. The 95% confidence intervals of these estimates do not overlap in the year 2005 only for women aged 30-34. Figure 17 shows estimates using pooled data, and figure 18 uses these estimates to display the annual changes in ASFRs relative to the 1997 rates. The shift in the timing of fertility towards younger ages was much more pronounced among women with less than secondary education than it appeared at the aggregate level.

Soon after the onset of the war, adolescent fertility rose by over 50%, from about 85 to 135 births per 1,000 girls. Fertility increased by over 15% among young adult women aged 20-24, from 230 to 270 births per 1,000, and stayed stable among women aged 25-29 at around 270 births per 1,000. The fertility decline at older ages was also more pronounced among the less educated than at the aggregate level. Fertility dropped by 20% among women aged 30-34, from 260 to 220 births per 1,000 and by 40% among those aged 35-39, from 190 to 135 births per 1,000.

The ASFRs for women with secondary or higher education by survey are reported in figures 19 to 23. Fertility estimates for this educational group are somewhat more erratic due to the smaller number of births. Yet, the 95% confidence intervals of these estimates overlap for all age groups over the entire period, except in the years 2000 and 2005 for women aged 20-24. Figure 24 shows the estimated ASFRs using pooled data and figure 25 displays the relative changes in ASFRs compared to the 1997 rates. Before the beginning of the war, highly educated women exhibited lower fertility than less educated women in all age groups. During the war, these women did not experience any significant fertility change. Fertility fluctuated around 45 births per 1,000 among adolescents, 160 births per 1,000 among young adult women aged 20-24, 210 births per 1,000 among women aged 25-29, 180 births per 1,000 among those aged 30-34 and 130 births per 1,000 among those ages 35-39.

The shift towards early childbearing that only occurred among low educated women led to an exacerbation of fertility differentials by education among the youngest age groups, especially adolescents. In 2010, the relative contribution of adolescent fertility to the TFR among low educated women was over 90% higher than among highly educated women, whereas it was only just over 30% higher in 1997. On the other hand, the educational gap in fertility at older ages gradually narrowed, and in 2010 low educated women aged 35-39 exhibited the same fertility rate as highly educated women in that age group.

Thus, a number of questions arise. What were the factors underlying the observed fertility changes among less educated women? Was the sudden rise in fertility at younger ages determined by a wider prevalence of early marriage during the war? And what was the role of birth control use on falling fertility at older ages? The remainder of the paper seeks to answer these questions.

Figure 12. *ASFRs (15-19) for low educated from 2006 and 2011 I-MICS data*

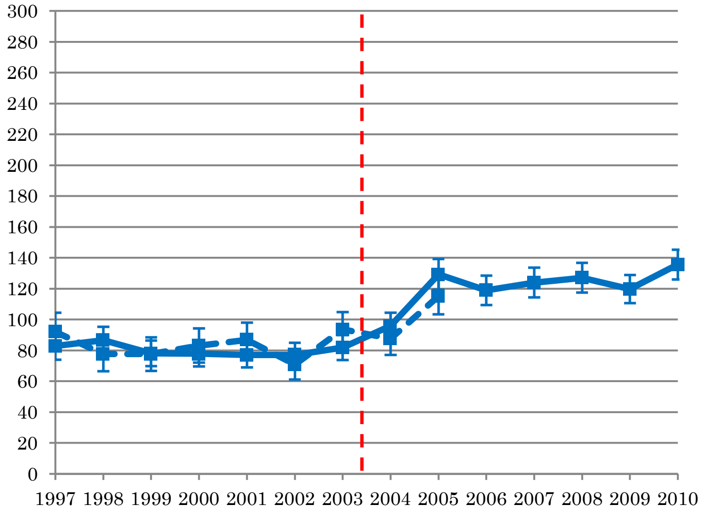


Figure 13. *ASFRs (20-24) for low educated from 2006 and 2011 I-MICS data*

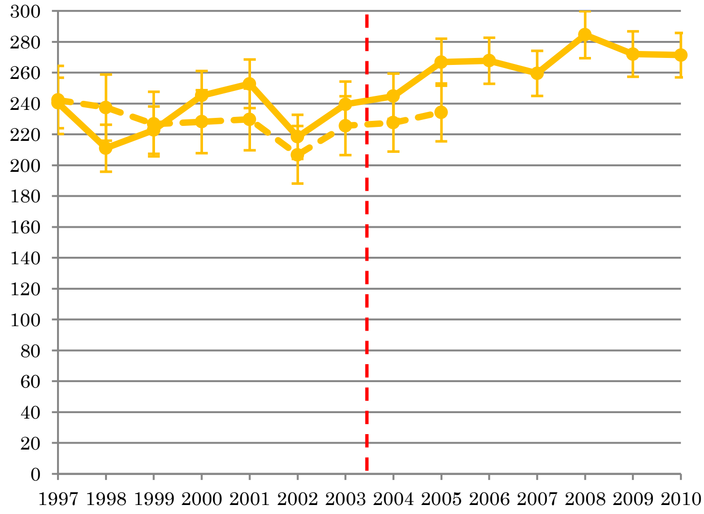


Figure 14. *ASFRs (25-29) for low educated from 2006 and 2011 I-MICS data*

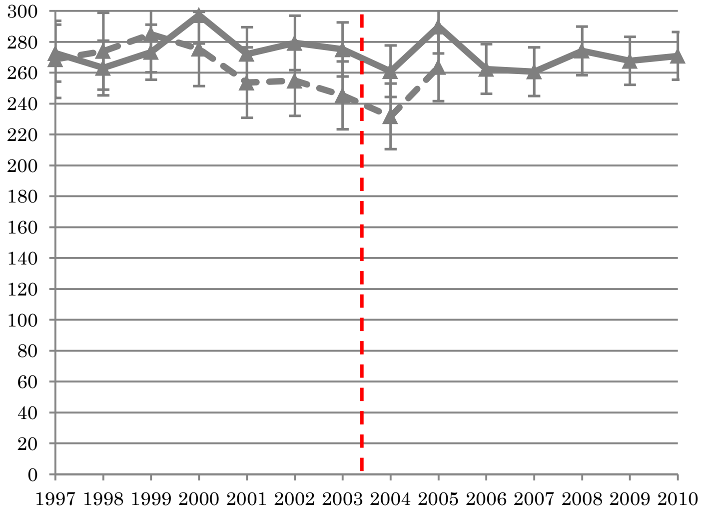


Figure 15. *ASFRs (30-34) for low educated from 2006 and 2011 I-MICS data*

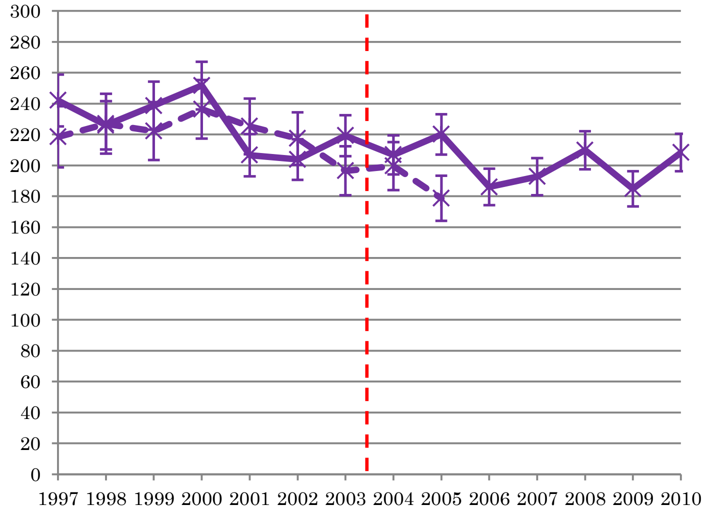


Figure 16. *ASFRs (35-39) for low educated from 2006 and 2011 I-MICS data*

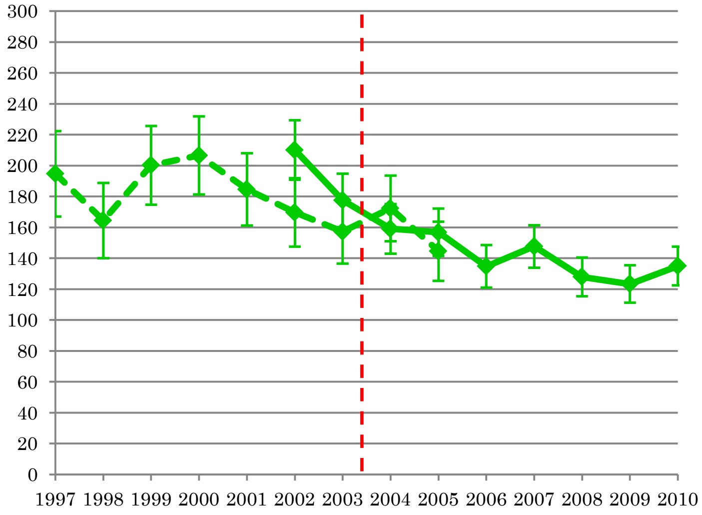


Figure 17. *ASFRs (15-39) for low educated pooling 2006 and 2011 I-MICS data*

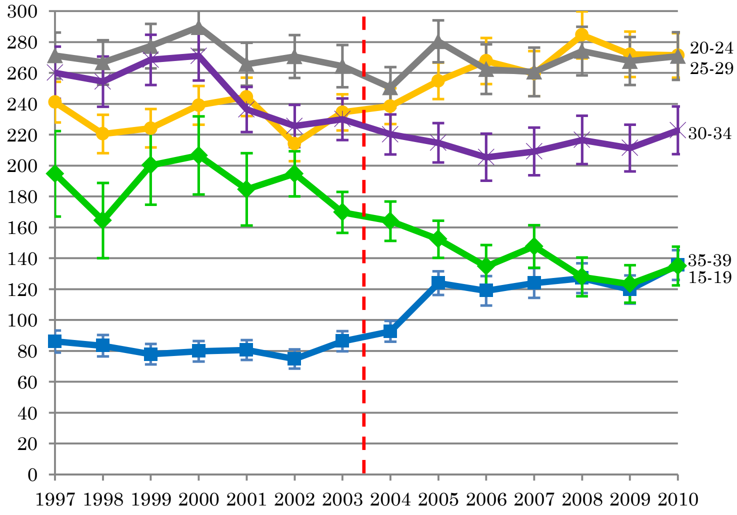


Figure 19. *ASFRs (15-19) for highly educated from 2006 and 2011 I-MICS data*

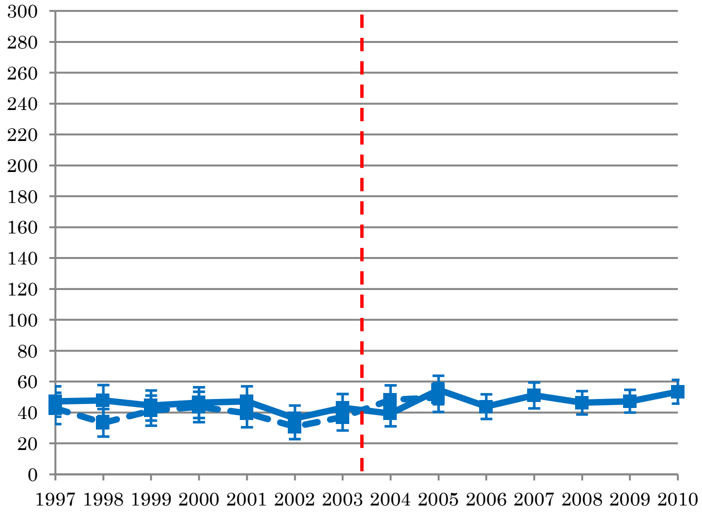


Figure 20. *ASFRs (20-24) for highly educated from 2006 and 2011 I-MICS data*

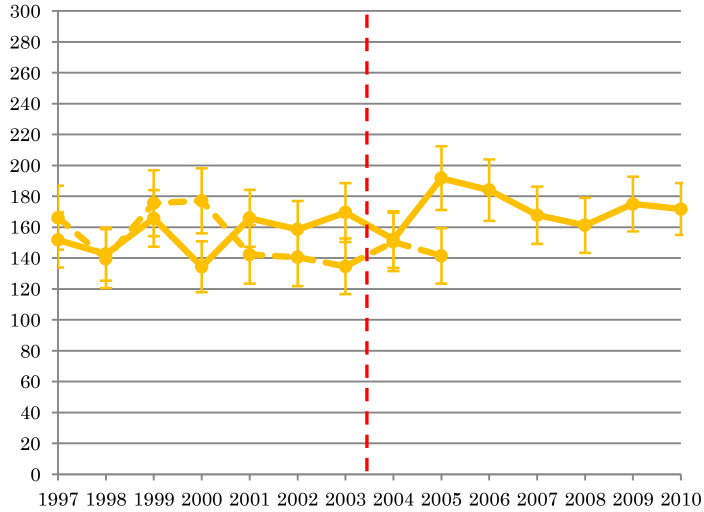


Figure 21. *ASFRs (25-29) for highly educated from 2006 and 2011 I-MICS data*

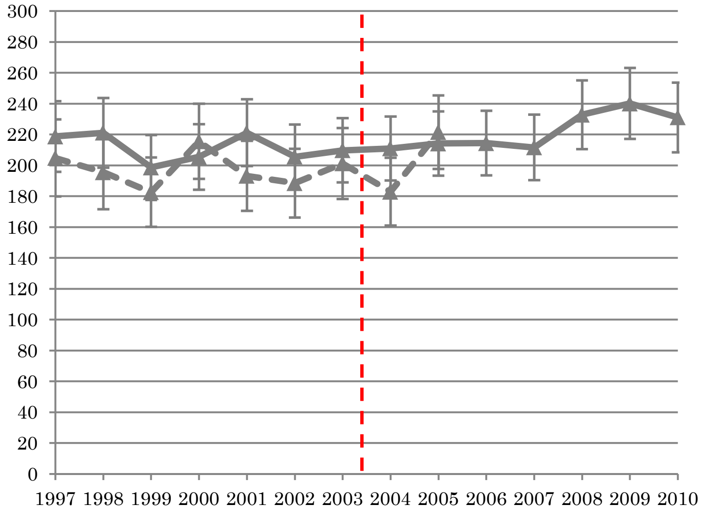


Figure 22. *ASFRs (30-34) for highly educated from 2006 and 2011 I-MICS data*

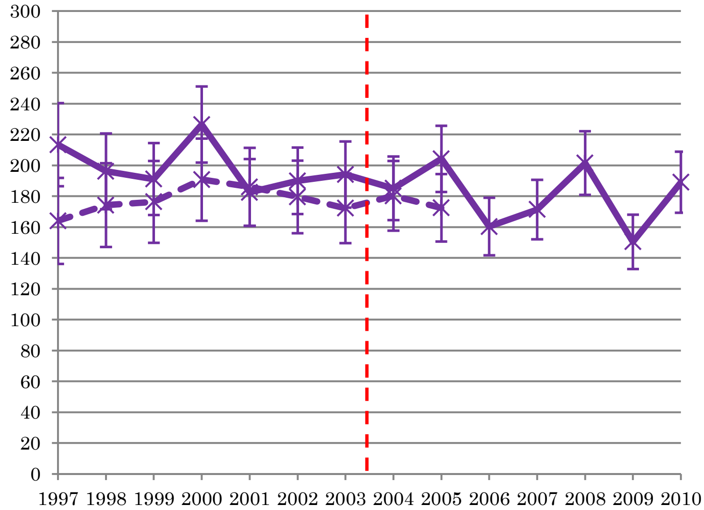


Figure 23. *ASFRs (35-39) for highly educated from 2006 and 2011 I-MICS data*

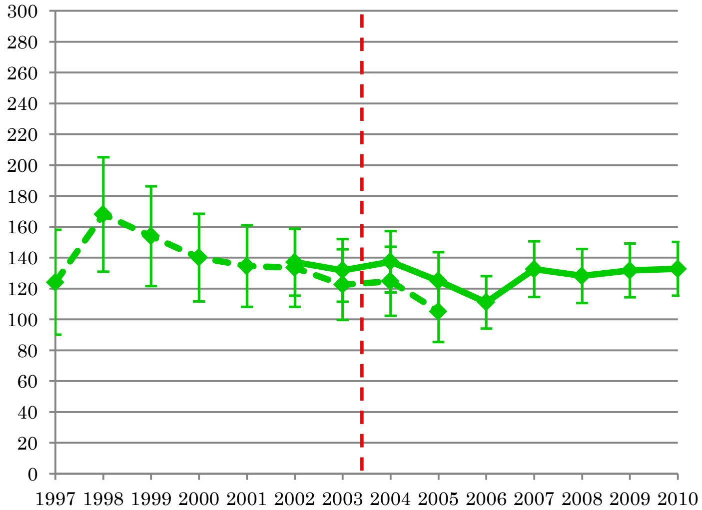


Figure 24. *ASFRs (15-39) for highly educated pooling 2006 and 2011 I-MICS data*

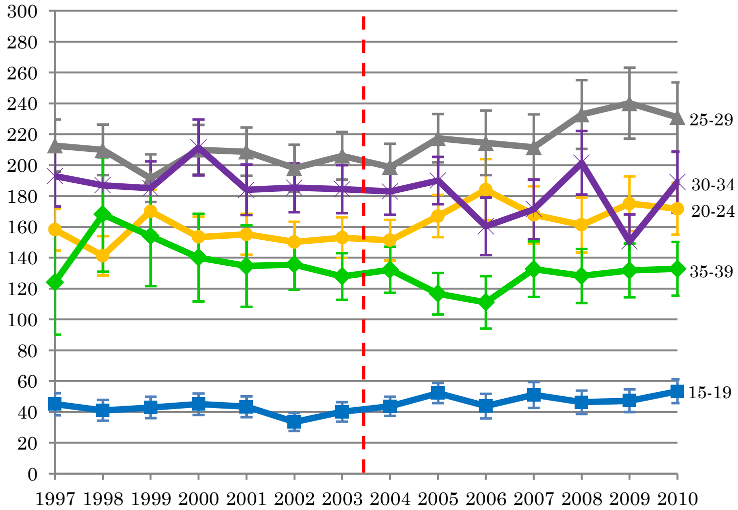


Figure 18. *Change in ASFRs (15-39) for low educated relative to 1997 rates pooling 2006 and 2011 I-MICS data*

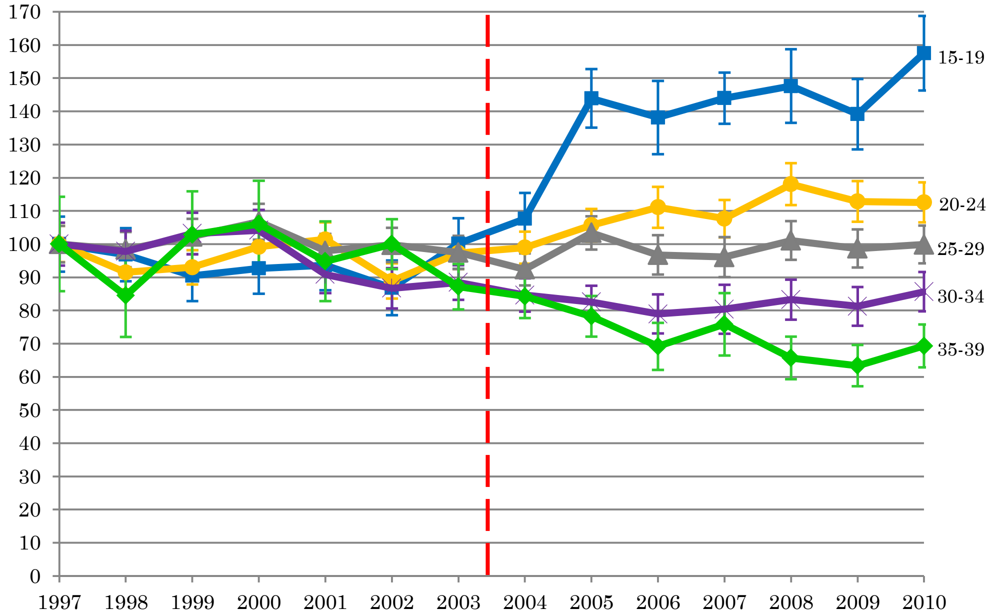
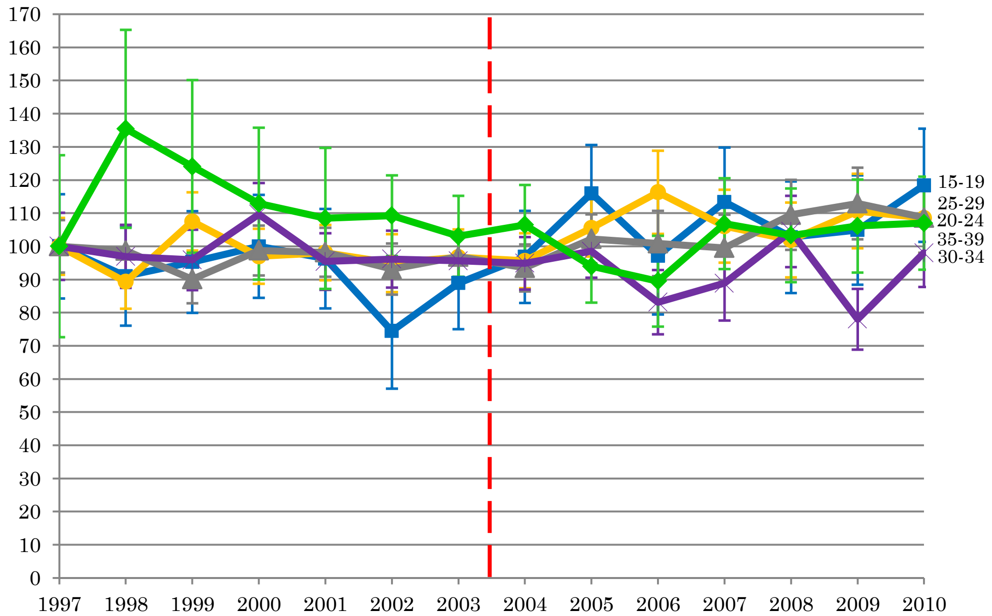


Figure 25. *Change in ASFRs (15-39) for highly educated relative to 1997 rates pooling 2006 and 2011 I-MICS data*



Decomposing fertility changes

In this section, I quantify the relative contribution of marital composition and prevalence of birth control to the observed fertility changes among low educated women before and after the onset of the war. Under the assumption that all births occur within marriage (a reasonable assumption in the case of Iraq), eq. 1 can be rewritten as:

$$f_{x,t} = (b_{x,t} / e_{m,x,t}) * [e_{m,x,t} / (e_{s,x,t} + e_{m,x,t})] \quad (2)$$

where $e_{m,x,t}$ are the number of women-years of exposure at age x during calendar year t that are spent married and $e_{s,x,t}$ are the number of women-years that are spent single, the sum of the two being equal to the total number of women-years $e_{x,t}$. This means that the fertility rate of women of a given age in a given year is the product of the age-year-specific marital fertility rate $f_{m,x,t}$ and the age-year-specific proportion of women-years of exposure spent within marriage $p_{m,x,t}$:

$$f_{x,t} = f_{m,x,t} * p_{m,x,t} \quad (3)$$

Accordingly, the change in fertility rate from year t to $t+n$ can be decomposed as:

$$f_{x,t+n} - f_{x,t} = [½(f_{m,x,t+n} + f_{m,x,t}) * (p_{m,x,t+n} - p_{m,x,t})] + [(f_{m,x,t+n} - f_{m,x,t}) * ½(p_{m,x,t+n} + p_{m,x,t})] \quad (4)$$

where the first of the two main components on the right side of eq. 4 gives the proportion of the change in fertility rate stemming from change in marital composition, while the second component gives the proportion stemming from change in marital fertility.

This decomposition method was firstly introduced by Kitagawa (1955) to decompose changes in crude birth rates and extended to fertility rates by Retherford and Cho (1973), Retherford and Ogawa (1978) and Reterford and Rele (1989). Since then, this method, with various adaptations, has been used extensively to analyse fertility changes over time in diverse populations. See for example Khawaja (2000); Lidstrom and Woubalem (2000); Retherford *et al.* (2005); Abbasi-Shavazi *et al.* (2009); Gubhaju *et al.* (2013). I use eq. 4 to decompose the observed fertility changes among low educated women comparing the pre- and post-2003 period. Since fertility changed very little among highly educated women, the fertility decomposition analysis for these women is briefly discussed in appendix.

Table 1 displays trends in age-specific percentages ever-married and marital fertility rates for low educated women in the years 1997, 2003 and 2010. Estimates are based on pooled data from the 2006 and 2011 I-MICS. The use of ever-married rather than currently-married women in a specific calendar year is dictated by data availability. The 2006 and 2011 I-MICS collected information regarding the age at first marriage for all ever-married women, but did not ask about the duration of marriage for those who were divorced or widowed at the date of the interview.

From 1997 to 2003, marital exposure to fertility remained virtually identical for adolescents and young adult women. The percentages ever-married were around 21% among those aged 15-19 in both years, and 57% in 1997 and 56% in 2003 for those aged 20-24. Among older age groups, the percentages ever-married declined slightly during this period, from around 79% to 76% among women aged 25-29, from 90% to 84% among those aged 30-34 and from 94% to 92% among those aged 35-39.

Meanwhile, marital fertility remained relatively stable among the youngest age groups, whereas it exhibited a clear declining trend at older ages. The fertility of married women aged 30-34 dropped from about 291 births per 1,000 in 1997 to 273 in 2003. The decline was more pronounced among those aged 35-39, from 207 to 184 births per 1,000. The fact that in 2003 married women were stopping childbearing earlier compared to 1997 means that the fertility transition was underway, despite the prolonged pronatalist ideology of Saddam Hussein's regime and the contraceptive shortage in the country. Given the deterioration of living conditions during the embargo in the 1990s and early 2000s, it may well be that this decline in the marital fertility of low educated women was poverty-driven (Baram 2000).

The period 2003-2010 saw an impressive rise in marital exposure among the youngest age groups, with only little change at older ages. The percentages ever-married increased from about 21% to 32% among adolescents, from 56% to 70% among women aged 20-24 and from 76% to 85% among those aged 25-29. The fact that the percentage ever-married at ages 35-39 stayed relatively stable around 90% indicates that during the war women, who would have instead married later in life, entered marriage at a much younger age. As mentioned at the beginning of this paper, women's activities and possible roles outside the home were severely restricted after 2003 by insecurity and increased sectarian-religious conservatism (UNICEF 2010; 2011). The wider prevalence of early marriage compared to the pre-2003 period may therefore be essentially due to a paucity of alternatives for low educated adolescents and young adult women.

The increase in marriage during the war was accompanied by a substantial drop in marital fertility across all age groups, except adolescents. This suggests that a larger number of married women were using contraception to space births as well as to stop childbearing. The increase birth control within marriage was almost certainly favoured by a wider availability of family planning information and services following the regime change in 2003. Nevertheless, it is likely that the reasons for falling marital fertility among the low educated were still largely related to economic hardship. It is also possible that a fraction of this decline was due to an increase in widowhood and divorce rates during the war.

Findings of the fertility decomposition analysis are provided in table 2. The first column of the table summarises fertility changes among low educated women during the period 1997-2003. Total fertility declined only slightly during this period from 5.27 children per woman in 1997 to 4.92 in 2003. Almost 90% of this decline was accounted for by falling fertility among women aged 30-34 and 35-39. Fertility remained virtually unchanged at younger ages, especially among adolescents. The second and third columns shows that about half of the fertility decline among women aged 30-34 was accounted for by a reduction in marital exposure and about half by an increased birth control within marriage. For the age group 35-39, over 80% of the decline was attributable to increased birth control within marriage.

During the period 2003-2010, total fertility changed from 4.92 to 5.17 children per woman. This change was the result of two countervailing fertility trends, specifically a fertility increase at younger ages and a continuation of fertility decline at older ages. Fertility in the age group 15-19 increased by 0.25 children per woman, with about 90% of the increase resulting from a wider prevalence of adolescent marriage. In the age group 20-24 fertility increased by 0.18 children per woman. This increase was over-determined by a wider prevalence of marriage. Other things being equal, the rise in marriage among these women would have increased fertility by 0.28 children. However, the rise in marital exposure was partially offset by wider birth control within marriage. The relative stability of fertility among women aged 25-29 was also the result of a combination of increase marital exposure and reduced marital fertility. On the other hand, the fertility decline in the age group 30-34 was over-determined by falling marital fertility, and the decline in the age group 35-39 was accounted for almost completely by falling marital fertility.

Table 1. *Marital composition and marital fertility among low educated women*

	Percentages ever-married			Marital fertility rates		
Age groups	**1997**	**2003**	**2010**	**1997**	**2003**	**2010**
15-19	21.37	21.37	32.04	402.84	403.51	423.26
20-24	57.24	56.14	70.31	421.07	417.72	385.91
25-29	78.78	76.00	84.83	344.33	347.90	319.34
30-34	89.54	84.40	87.85	290.53	272.55	253.65
35-39	93.83	92.14	89.89	207.46	184.17	150.07
Total	63.21	60.58	67.59	8.33	8.13	7.66

Table 2. *Decomposition of fertility changes among low educated women into marital composition and marital fertility*

	1997-2003			2003-2010		
Age groups	**Overall change**	**Marital composition**	**Marital fertility**	**Overall change**	**Marital composition**	**Marital fertility**
15-19	0.00	0.00	0.00	0.25	0.22	0.03
20-24	-0.03	-0.02	-0.01	0.18	0.28	-0.10
25-29	-0.04	-0.05	0.01	0.03	0.14	-0.11
30-34	-0.15	-0.07	-0.08	-0.04	0.05	-0.08
35-39	-0.13	-0.02	-0.11	-0.17	-0.02	-0.16
Total	-0.35	-0.16	-0.19	0.25	0.67	-0.42

Conclusion

This study is the first detailed account of fertility changes in Iraq during recent years. Findings have shown that the 2003-2011 Iraq War altered previous fertility trends in multiple, countervailing ways. On the one hand, the wider availability of family planning services has accelerated the decline in marital fertility, which was already underway well before 2003. However, the prevalence of early marriage and childbearing increased dramatically during the war, most likely as a response to the dire security situation and sectarian strife. The relevance of these findings is not limited to Iraq. Anecdotal evidence suggests that a similar war-induced shift towards early marriage may also be occurring in Syria (Thomson Reuters Foundation 2014).

This is worrisome for several reasons. A large body of literature has demonstrated that women who marry when still adolescents tend to have a lower status in the home, less ability to influence decisions about their own lives, including the choice of using contraception, and higher risk of experiencing domestic violence (Jenson and Thornton 2003; Mathur et al. 2003; UNICEF 2005). Additionally, women who bear children when still adolescents face higher risks of maternal mortality and morbidity as well as poorer health outcomes for their children (Kurz 1997; Mathur *et al.* 2003; United Nations 2004; Save the Children 2013).

The analysis has shown that the prevalence of early marriage and childbearing among women with secondary or higher education was low and did not increase during the war, unlike among those with no education or only primary schooling. It follows that strategies to protect and empower women in Iraq should focus first and foremost on expanding access to secondary education.

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