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# Effects of violent conflict on women and children

Sexual behaviour, fertility, and infant mortality in Rwanda and  
the Democratic Republic of Congo

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Elina E. Lindskog

Stockholm, May 2, 2016.

*Where there is light there can be no darkness.*



# List of studies

- Study 1    Lindskog E Elina. 2014. Violent Conflict and Sexual Behavior in Rwanda. Population Space and Place. Doi: 10.1002/psp.1881.
- Study 2    Lindskog E Elina. 2016. War effect on fertility behavior in the Democratic Republic of Congo. Stockholm Research Report in Demography, 2016:4. Stockholm: Stockholm University.
- Study 3    Lindskog E Elina. 2015. War effect on infant mortality in the Democratic Republic of Congo. Submitted to journal.



# Sammanfattning

Denna avhandling undersöker sambandet mellan krig och sexuellt och reproduktivt beteende i hjärtat av Afrika. Avhandlingen är indelad i tre separata studier men som utgår från samma konfliktområde nämligen inbördeskriget och folkmordet i Rwanda som sedan kom att påverka utvecklingen av det Kongolesiska kriget samt den konfliktsituation som fortfarande råder i östra Demokratiska Republiken Kongo (Kongo). Den första studien analyserar risken för den sexuella debuten innan äktenskapet i relation till inbördeskriget och folkmordet i Rwanda. Den andra studien rör hur kriget påverkade barnafödande i Kongo. Den sista studien studerar hur kriget påverkade spädbarnsdödlighet i Kongo. Studierna använder sig av 'Demographic Health Survey' data från Rwanda och Kongo samt konfliktdata som mäter intensiteten av konflikten för region och över år.

Resultaten visar att krig har en påverkan på dessa demografiska utfall. Risken för sexuell debut innan äktenskapet ökade under konfliktåren 1993 och 1994 i Rwanda och det kongolesiska kriget bidrog till en fördröjning av fertilitetstransationen i Kongo. Den tredje artikeln visade på att risken för spädbarnsdödlighet var högre under det Kongolesiska kriget jämfört med perioder innan och efter kriget. Dödligheten är som högst under människans först levnadsmånad, men under det Kongolesiska kriget visar analyserna på att spädbarn mellan 1-11 månader hade en högre dödlighet, vilket anses vara kopplad till svält och infektionssjukdomar som ökade under kriget.

Forskning på hur krig påverkar sexuellt och reproduktive hälsa är ett spännande forskningsområde som är under utveckling. Det finns fortfarande rela-

tivt lite skrivet om hur krig påverkar beteende hos civil befolkningen i relation till sex, barnafödande och spädbarnsdödlighet. Det finns mer skrivet om hur icke fungerande infrastruktur under krig påverkar tillgång till sjukvård, mödravård och sjukvårdspersonal. Kvinnor och barn drabbas hårt direkt men även indirekt av krig genom krigets alla bieffekter så som svält, infektionssjukdomar, sexuellt våld och brist på sjukvård. Min avhandling bidrar till forskningsområdet genom att jag kopplar kvinnors sexuella och reproduktiva livshistoria till konfliktdata så att jag kan analysera riskerna över tid och plats.

# Introduction

This thesis deals with the relationship between violent conflict and sexual and reproductive behavior in Rwanda and the Democratic Republic of Congo (DRC). The aim of the thesis is to contribute to the literature on how war affects demographic outcomes across individual life courses. The analyses link data measuring the intensity and frequency of violent conflict with women's sexual and birth histories and infant deaths across time and place.

The thesis is set in the context of tropical Africa, Rwanda and the DRC, countries that are characterized by social and economic upheaval and war. There are similarities in the characteristics of the violent conflicts in Rwanda and the DRC as the war spilled over from Rwanda into the DRC and Rwanda has a long history of close ties to the DRC, especially East DRC. Both of these countries are furthermore characterized by poverty, high fertility, high infant and maternal mortality that were intensified during the war period, as well as by war-rape.

The thesis consists of three studies and this introductory chapter that describes the setting of the three studies, how they are connected and their contribution to the research field. The effect of war on sexual behavior, fertility and infant mortality depends on when the event occurs in the life course. The first study analyses the effect of violent conflict on the risk of women's premarital first sexual intercourse in Rwanda. It concludes that in times of intense conflict the risk of premarital first sex increased. The second study explores the link between war and fertility in the DRC, where the war seems to have delayed the transition to lower fertility. The third paper investigates

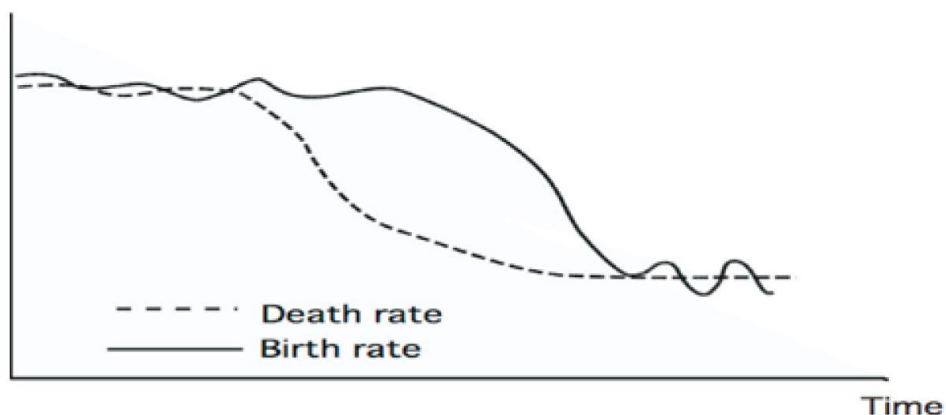
the relationship between war and infant mortality in the DRC. The study shows that the greater the intensity of conflict events or deaths during the Congolese war the higher was infant mortality, but only during the post-neonatal period.

# Demographic transition in sub-Saharan Africa

To better understand war effects on reproductive health and behavior and infant mortality in Rwanda and the DRC, the thesis must be situated in the context of general trends and differentials in sub-Saharan Africa.

Notestein (1945) developed a more formal theory of the demographic transition, drawing on Thompson's (1929) interpretation of demographic history. The theory explains movements over time from high mortality and fertility to low mortality and fertility (see figure 1). The demographic transition relates to changes in reproductive behavior at the societal level that transform a traditional pre-industrial state to a highly developed and modernized society.

Figure 1. The demographic transition.

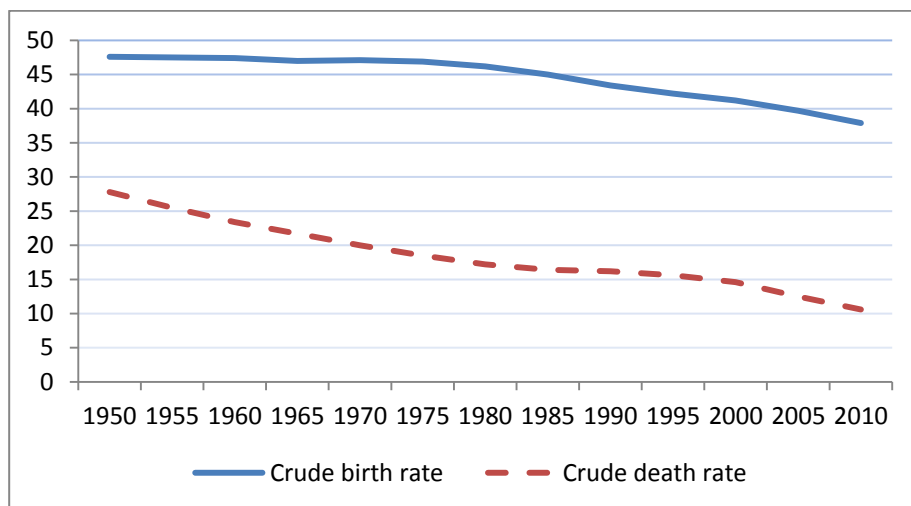


Source: Malmberg, 2008:7.

Notestein offers two explanations for fertility decline. First, in pre-modern societies fertility is kept high by the maintenance of a series of props such as religion, education, community customs, marriage habits etc. High fertility was essential for societal survival as mortality levels were persistently high. However, when mortality began to fall in these countries the props were not needed to the same extent as earlier and social adjustments were made in response to the changes (Caldwell, 1976). The lag effect of high fertility with declining mortality causes rapid population growth that stabilizes once fertility starts to decline.

It is difficult to determine when mortality rates started to decline in sub-Saharan Africa due to lack of data, but by the early 1950s mortality had definitely started to decline and sub-Saharan Africa had thereby entered into the initial phase of the demographic transition (Malmberg, 2008). Figure 2 shows a gradual decline in the mortality rate since the 1950s, whereas the birth rate remained stable until the 1980s when it started to decline. The divergence in birth and death rates enhanced population growth with a peak in the 1980s, when African women gave birth on average to 7 children during their reproductive years (Ibid). The total fertility rate has then declined and in the mid-2000s, sub-Saharan African women gave birth on average to 5.1 children, still very high (Ibid).

Figure 2. Demographic transition in sub-Saharan Africa (1950-2015\*).

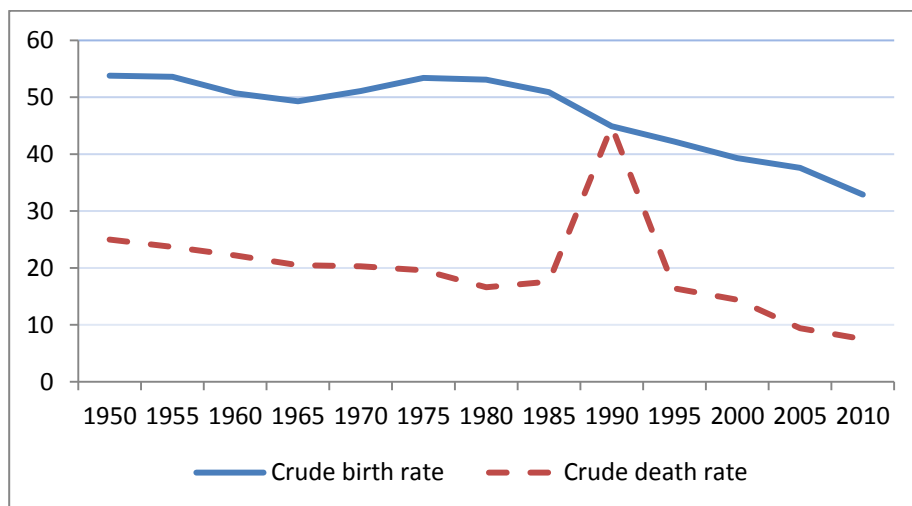


Source: United Nations, Population Division (2016). <http://esa.un.org/unpd/wpp/DataQuery/>

\* The calendar years represent five year intervals, ending in 2015.

The timing and the speed of mortality and fertility decline varied across countries due to diversity in traditions, level of political and economic development and government support of family planning services and activities (Kirk & Pillet, 1998). Figure 3 shows that the mortality rate in Rwanda had begun to gradually decline after the 1950s. The figure also shows a clear increase in the mortality rate during the civil war and the genocide (1990-1994). The birth rate remained high, but fluctuated around levels at the time of independence in 1960. This period was marked by violence and migration across the borders by Tutsi to mainly East DRC and Uganda.

Figure 3. Demographic transition in Rwanda (1950-2015\*).

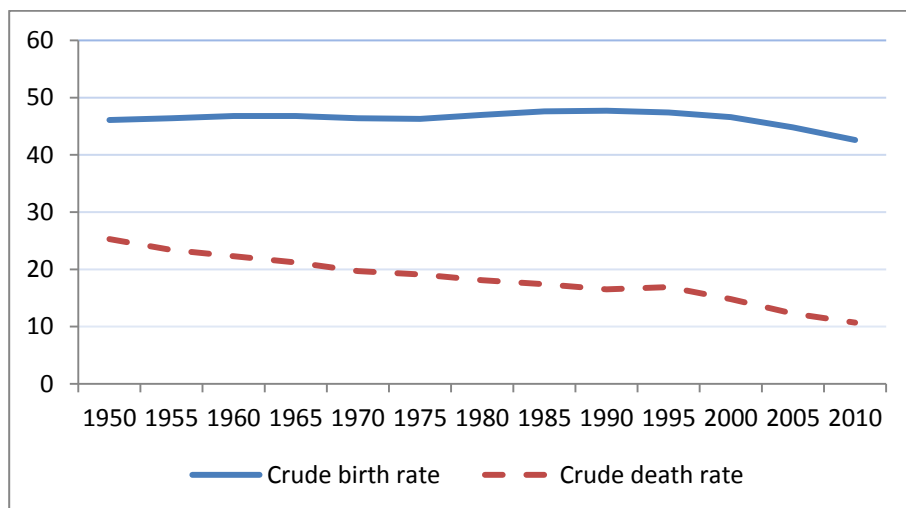


Source: United Nations, Population Division (2016). <http://esa.un.org/unpd/wpp/DataQuery/>

\* The calendar years represent five year intervals, ending in 2015.

The onset of the fertility decline was estimated to be in 1981 in urban areas and 4 years later (1985) in rural areas (Garenne & Joseph, 2002). Figure 4 shows that the DRC deviates from the general pattern of the demographic transition, being one of the last countries in sub-Saharan Africa to have embarked on the fertility transition (Shapiro & Tambashe, 2001). Mortality rates have only gradually declined since the 1950s, with a small bump during the Congolese War (1996-2003), while fertility levels have remained high and stable during the twentieth century. Figure 4 shows that fertility started to decline just after the turn of the century.

Figure 4. Demographic transition in the DRC (1950-2015\*).



Source: United Nations, Population Division (2016). <http://esa.un.org/unpd/wpp/DataQuery/>

\* The calendar years are presented with a five year interval, ending in 2015.

## Reproductive health and behavior in sub-Saharan Africa

During the last 20 years the proportion of young women who marry at an early age has declined in sub-Saharan Africa (Mensch et al., 2006). The benefits of delayed marriage are argued to be a trade-off for an increase in premarital sex (Ibid). Premarital sexual activity is high and increasing throughout the region (Meekers 1994; Mensch et al. 2006). It is not clear whether the increase in premarital sex relates to an extended period of exposure between puberty and marriage or to higher rates of sexual experience while unmarried. Meekers (1994) argues for changes in norms, as there is much greater tolerance nowadays towards premarital sexual intercourse in societies in which it was earlier condemned. Another report published by the Alan Guttmacher Institute also argue that there has been a change over the last several decades in developing countries related to norms and values regarding premarital sexual activity and delayed marriage (AGI, 1998). Mensch

and colleagues (2006) conducted a study in 27 sub-Saharan African countries and found that the proportion of young women who are sexually active has indeed increased but the cause is dichotomized. In some countries the increase is due to greater exposure and in other countries the increase is due to a higher rate of premarital sex. In six of the countries (Rwanda being one of them), increased premarital sexual activity was attributed to both increased exposure and increased rates of premarital sex (Ibid). The DRC was not included in the study.

The level of premarital sexual activity varies considerably between countries and socio-economic groups (Meekers, 1994; Mensch et al., 2006). In matrilineal societies, for example, lineage is more important than marriage agreements. Thus, children are generally considered a welcome addition to a woman's lineage regardless whether or not a woman is married at the time of the birth. The more predominant patrilineal societies are less tolerant of premarital sexual relations for women (Gage-Brandon & Meekers, 1993).

Within countries, premarital sex varies by gender, urban/rural residence and education. Tolerance is greater for men's sexual behavior than for women's. The 1998 Rwandan Sexual Behavior and Condom Use Survey found that 40% of men were sexually active by the age of 18 years compared to 29% of the women, and men were furthermore more likely to have multiple partners (Calvés, 1998). A study based on 24 countries in sub-Saharan Africa found that never-married men and women in urban areas were more likely than those in rural areas to report sex in the past year, and urban women were more likely to report age-disparate relationships and multiple partnerships compared to rural women (Doyle et al., 2012). Early sexual debut, marriage and childbearing were found to be more common among youth with low education level compared to youth with higher education (Ibid). On the other

hand, having multiple or age-disparate partners was more common among youth with relatively high education (Doyle et al., 2012).

Premarital sex is often unprotected by contraception, thus resulting in an increase in sexually transmitted infections and premarital childbearing, which may result in abortion or infanticide. Because abortion is restricted in most sub-Saharan countries, many young women seek illegal procedures, which increase the risk of adverse health effects (Meekers, 1994). Across 24 sub-Saharan African countries, never-married women age 15-19 who used a condom at last sex varied greatly; the highest use was observed in Southern Africa and the lowest in West and Central Africa, followed by East Africa (Doyle et al., 2012). Among Rwandan youth aged 15-24 years who reported ever having sex only 16% of the boys reported ever using a condom compared to 12% of the girls (Babalola et al., 2002).

The main determinant of fertility decline in sub-Saharan Africa is argued to be the use of modern contraceptives (Kirk & Pillet, 1998). In the DRC the use of modern contraceptives is low and only 6.7% of women aged 15-49 use modern contraceptives (DRC DHS 2007). The use of modern contraceptives in the DRC falls into a geographical pattern. West DRC is characterized by a matrilineal culture and women have more opportunity and better access to contraceptives, whereas East DRC is marked by continuous conflict and must rely on aid from NGOs to improve access to contraception (Kandala et al., 2015). The mining provinces on the other hand do not have access to NGOs and are characterized by a persistence of a pronatalist culture, which is associated with low levels of education and gender inequality and many women lack access to family planning and health care (Ibid). Traditional means of birth control -- withdrawal, breastfeeding and post-partum sexual abstinence -- have a long history of practice in Africa. Withdrawal

was recently found to still be the most frequently used method among HIV-negative women in Rwanda (Elul et al. 2009).

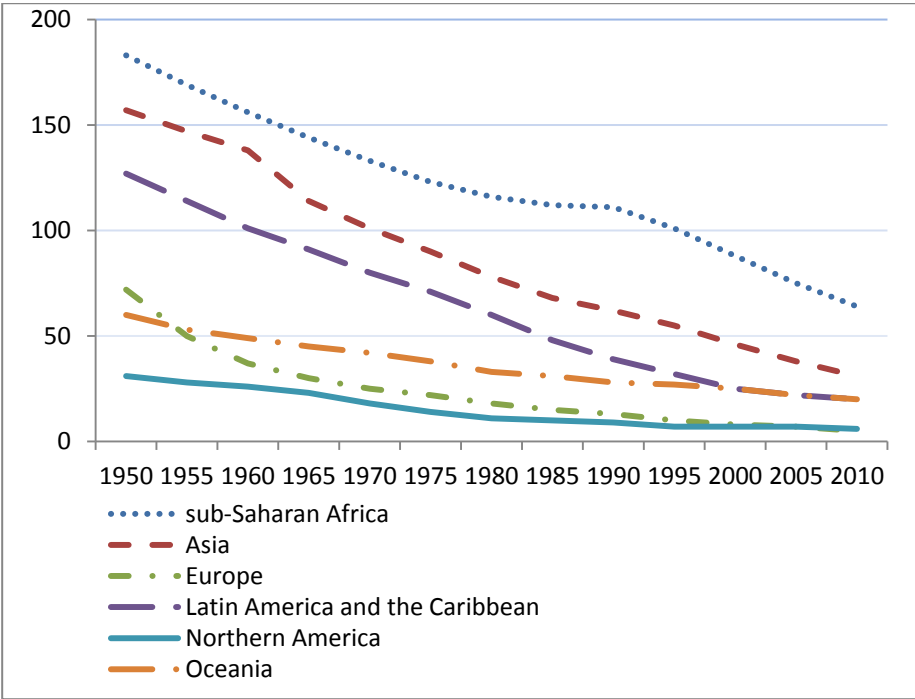
Fertility declines when first births are delayed, birth spacing is increased, and childbearing is terminated at an earlier age. In sub-Saharan Africa, some delay has been observed in first births among adolescents through increased schooling (Gupta & Mahy, 2003). Birth spacing is negatively influenced by substituting bottle-feeding for breast milk because the length of post-partum sexual abstinence is reduced as well as the length of lactational amenorrhea (Romaniuk, 1980). Changes in these practices will therefore have a negative effect on birth spacing if not compensated by contraceptive use (Romaniuk, 2011; Lesthaeghe, 2014). There will be little effect of contraception on completed fertility if contraceptives simply replace traditional forms of birth spacing (van de Walle & Foster, 1990). Terminating childbearing requires the use of effective contraceptive methods after the last wanted birth. The real breakthrough for the fertility transition in sub-Saharan Africa will come about once women stop having additional births after they have reached the desired family size (Lesthaeghe, 2014; Romaniuk, 2011). Contraception demand must be met and sub-Saharan Africa has the highest unmet need compared to Latin America, Asia and North Africa (Bongaarts & Casterline, 2012).

## Infant mortality in sub-Saharan Africa

Infant mortality has dropped worldwide since the 1950s, but sub-Saharan Africa still has the highest infant mortality rates (Rajaratnam et al., 2010). The decline starting in the 1950s stalled during the 1980s and 1990s, which

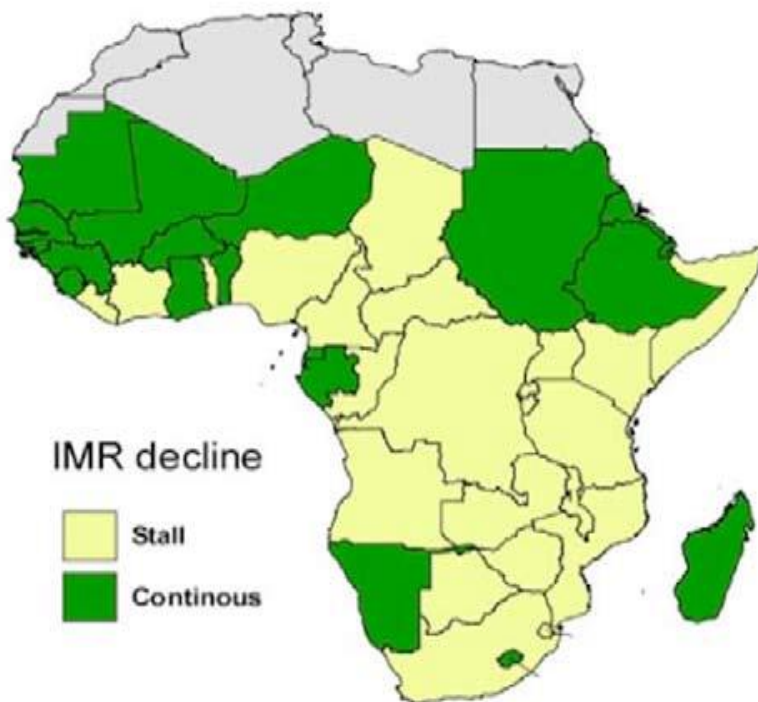
may very possibly relate to the many ongoing civil wars in sub-Saharan Africa at this time period.

Figure 5. Infant mortality in the world, 1950-2015\* (infant deaths per 1,000 live births, both sexes).



Source: United Nations, Population Division (2016). <http://esa.un.org/unpd/wpp/DataQuery/>  
\* The calendar years represent five year intervals, ending in 2015.

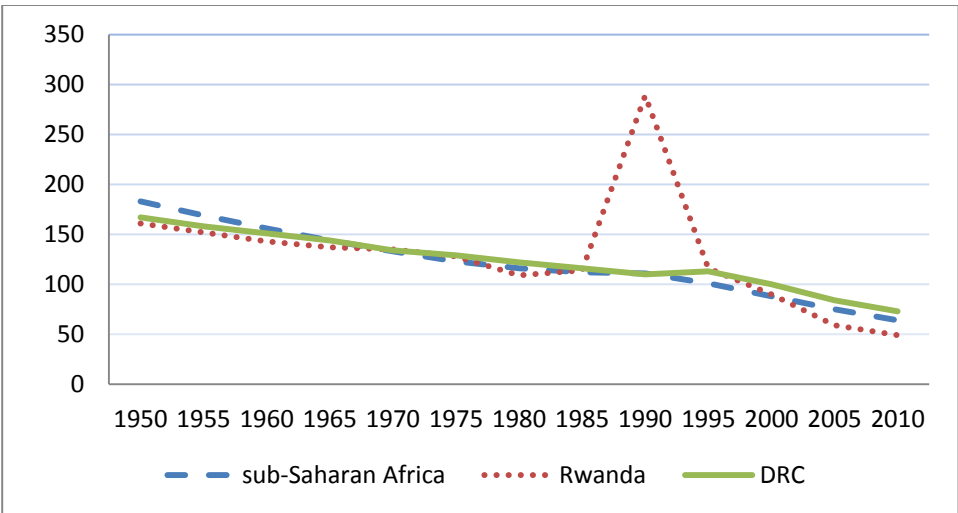
The map below (Malmberg 2008:11) indicates that the reduction in infant mortality has been continuous in about half of the countries in sub-Saharan Africa. These countries had an infant mortality rate of above 150 per thousand births in the early 1950s, but then declined to under 100 per thousand births (Ibid). In the countries marked as “stalling” infant mortality declined until the 1980s, but was then reversed or halted with infant mortality rates remaining above 100 per thousand births (Ibid).



Source: Malmberg 2008:11.

Rwanda and the DRC are among the countries with stalling infant mortality decline. Figure 6 clearly shows that the stall occurred during the conflict periods in both countries. However, in the aftermath of the conflict infant mortality began to again decline and is now below 100 per thousand births. Infant mortality is lower in Rwanda compared to the DRC, where infant mortality is among the highest in sub-Saharan Africa. Risk factors associated with child mortality are unhygienic and unsafe environments combined with inadequate nutrition and infectious diseases (Jones et al. 2003).

Figure 6. Infant mortality, 1950-2015\* (infant deaths per 1,000 live births, both sexes).



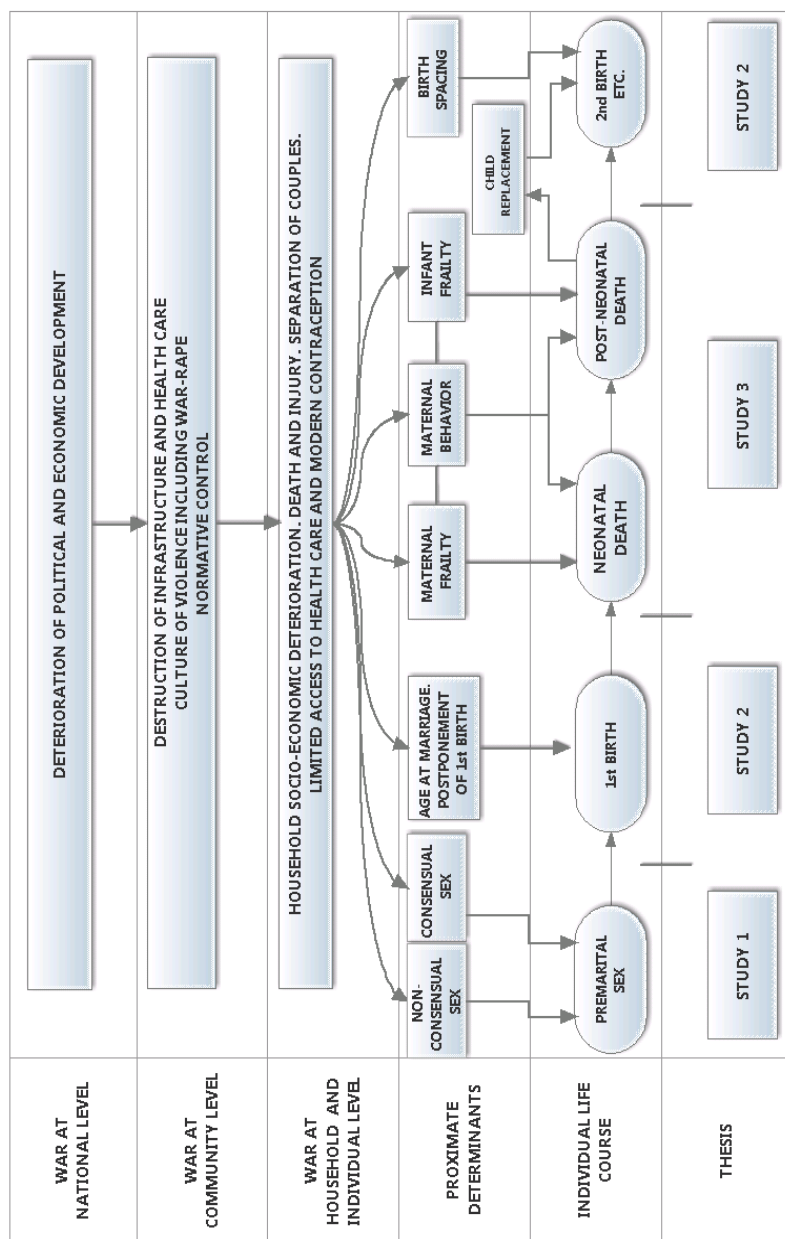
Source: United Nations, Population Division (2016).<http://esa.un.org/unpd/wpp/DataQuery>  
\* The calendar years represent five year intervals, ending in 2015.

## War and women’s reproductive lives

Many developing and traditional societies are characterized by poor health particularly women’s reproductive health, and high infant and maternal mortality, which makes childbearing responsibilities more difficult (Khan & Shirmeen, 2006). These indicators are a function of demographic and social structures as well as the political and economic environment (Mock et al., 2004; Muhwezi et al., 2011). War and violent conflict poses a life-threatening situation in which the demographic and social structures as well as the economic and political order are disrupted (Mock et al., 2004; Iqbal, 2006; Muhwezi et al., 2011).

Figure 7 illustrates pathways through which war may influence women's reproductive lives. At the national level war undermines sustainable development as military expenses are prioritized, relocating government resources from social services to finance the army (Kiros & Hogan, 2001). At the community level, war has a negative effect on the physical infrastructure such as railroads, roads, water systems, etc, which affects the organization of food production and increases the risk of malnutrition and starvation (Kiros & Hogan, 2001; van Herp, 2003). The destruction of health care facilities and the loss of health staff through migration and casualties limit access to health care, including modern contraception. War disrupts everyday life and the consequences can be severe through the loss of livestock, crops, death and trauma (Mock et al., 2004). War may also separate couples when seeking refuge.

Figure 7. Theoretical pathways from war to life course events.



These disruptions in the fabric of daily life directly influence the proximate determinants of premarital sex, fertility and infant mortality. Sexual violence, war rape and sexual slavery may result in unplanned and unwanted pregnancies and sexually transmitted infections. Social disruption and disruption of families may weaken parental and community monitoring and protection. This places, especially, young women who are dependent on men outside the immediate family for physical protection and financial support, in a more vulnerable position. Women may be forced into sexual acts in return for protection (HRW, 2004; Milillo, 2006). Consensual sex can also be linked to the disruption of families, because physical closeness to a trusted person is comforting when facing danger (Cohan & Cole, 2002).

War may delay age at marriage as young men and women are drawn into the military or militias. The genocide in Cambodia and Rwanda both provide evidence that men were targeted to a higher extent than women. This resulted in a skewed gender ratio after the genocides, which affected the marriage market negatively (de Walque, 2006; Jayaraman, 2009). However, in Cambodia the age-discrepancy was reduced to meet the shortage of men (de Walque, 2006). Economic shocks have been found to have a negative effect on fertility (Caldwell, 2004) and as war disrupts the economy at the national level it is possible that an outbreak of war may have similar effects on fertility (Urdal & Che, 2013). Reduced economic status of the household and uncertainty of the future may therefore lead to postponement of first births (Lindstrom & Berhanu, 1999).

The proximate determinants for the second and higher birth order are linked to previous life course experiences at the individual level. Marital fertility may be reduced through longer birth spacing related to uncertainty of the future and economic hardship, but also through the separation of couples due to migration, temporary displacement, enrollment in the military or militias

or death. However, marital fertility may also operate in the opposite direction during war as parents may choose the short-term benefits from having many children compared to the long-term benefits of fewer children. The death of a child may lead to a child replacement effect and increase fertility.

Proximate determinants of infant mortality are maternal behavior and maternal and infant frailty. Maternal behavior affects both maternal and infant frailty and can be linked to the socio-economic status of the household, housing conditions, means of transportation, access to information and health care. Neonatal deaths are more closely linked to the health of the mother during pregnancy and at delivery while post-neonatal deaths are more closely linked to the health of the infant. Infants that are exclusively breastfed have a much better protection against infections, diarrhoea and pneumonia compared to weaned infants (Victora et al., 1989). Malnutrition is more associated with weaned post-neonatal infants who are also more exposed to unclean drinking water.

The last row in figure 7 brings us to the life course dimension of the thesis. Each of the studies in the thesis captures life course events at different time periods in their life. War will have different effects depending on when it happens in the life course of a woman.

The potential pathways from war to sexual and fertility behavior and infant mortality will depend on the societal context in which war develops and the nature of the conflict across time. For example, where contraceptive use is already low the destruction of the health sector and limited access to modern contraceptives will not have the same impact as where contraceptive use is relatively high or increasing. The same is true for accessibility of health care; rural populations living in war-torn areas may not have had higher access to health care in the pre-war period compared to the war period.

# Historical background to the conflicts in Rwanda and the DRC

## Rwanda

After independence in 1962, the new Rwandan government managed to avoid international debt and the level of corruption was low. More than 90% of Rwandans lived in rural areas but they had access to drinking water, electricity, primary education, basic health care and a network of roads in all regions (Hintjens, 1999). In 1986-1987 the situation deteriorated when coffee prices fell and the coffee sales fell as well from 14 billion to 5 billion Rwanda francs in a single year (Prunier, 1995), leading to an increase in external debt. The Rwandan Patriotic Front (RPF) invaded the north part of Rwanda from Uganda in 1990, coinciding with the start of structural adjustment policies demanded by the World Bank/IMF. The national currency was devalued by two-thirds and the coffee farmers' income was further eroded. Health services could not be maintained and both infant and maternal mortality increased sharply during the civil war. Living conditions for Rwandans worsened just before the outbreak of the genocide due to severe food shortage combined with an influx of refugees from Burundi and a dramatic increase in malaria. At the beginning of 1994 Rwanda was in a severe crisis, agricultural production declined and food imports increased, and a trade gap arose with the devalued currency.

Rwanda is a small and densely populated country consisting of two major tribes, Tutsi and Hutu. The Tutsi tribe is the minority group but both tribes

speak the same language, have the same religious beliefs and cultural background (Hintjens, 1999). In 1933, to gain administrative control of the population, the Belgians reinforced ethnic identity through the male line (Ibid). Before the colonial period the Rwandan view of ethnicity was more flexible and not important in everyday life. Hardened identity boundaries resulted in changes in attitudes that were reinforced by the extremist Hutu government that gained power after the Hutu revolution in 1962, leading to killings of Tutsi and the exile of Tutsi to Uganda and the DRC and other neighboring countries.

Communities in Rwanda were closely knit with a high degree of social control from top to bottom (Prunier, 1995). The new government exercised an ‘almost monstrous degree of social control’ (Prunier, 1995:3) over almost every aspect of people’s lives. Participation of civilians in the genocide is argued to be partly due to social conformism and the respect for authority that was incorporated into the planning and design of community-level development activities (Hitjens, 1999).

The genocide was a hundred days of mass killings of mostly Tutsi and moderate Hutu with an estimated death toll of 800,000 (Prunier, 1995). In the process 114,000 children were orphaned and 150,000 houses were destroyed (Stearns, 2012). The new government in Kigali was left penniless and there were no cars, running water or electricity. The civil war and the genocide disrupted families and communities, weakening parental and community control and protection of youth. Many young people faced the prospect of not knowing if they would survive tomorrow. Almost all children and youth had witnessed violence, had family members who died and believed that they themselves would die. It is estimated that one-fourth of all Rwandans suffered from post-traumatic stress syndrome. They called these people *ihahamuka*, ‘without lungs or breathless with fear’ (Kinzer, 2008:254).

The genocide caused a massive flow of mostly Hutu refugees to camps in East DRC. Among the Hutu refugees were ex-FAR (Rwandan Armed Forces) and Interahamwe (militia active in the killing and raping of mostly Tutsi) who remobilized under the protection of the DRC's President Mobutu and started to attack Rwanda from East DRC.

## The Democratic Republic of Congo

The DRC is one of the largest countries in Africa with an estimated population of nearly 70 million distributed across 11 provinces and 250 ethnic groups, of which the majority is Bantu (Chirwa et al., 2014). President Mobutu came to power through a military coup in 1965 and the military became the centerpiece of his administration with strong support from the West. France, Israel and Belgium provided military aid to the former Zaire. Between 1960 and 1991 the United States provided \$190 million in military assistance and trained 1,356 soldiers (Stearns, 2012). Because Mobutu was afraid of a military coup, he began to balkanize the army, creating a great number of military units and intelligence services answering to different military unit commanders with overlapping mandates (Ibid). Real incomes declined or stagnated during the leadership of president Mobutu, a period marked by corruption and inflation. As Mobutu's hold on political and economic power declined in the 1980s, his army fell apart. Soldiers were not paid and Mobutu was reported to have declared, "You have guns; you don't need a salary" (Ibid:116). The political, economic and military state of Zaire prior to the war had created a situation of chronic crisis for the Congolese people and a high base-line for infant and child mortality (Van Herp et al, 2003).

A major stimulus for the Congolese War, 1996-2003, was the tension in the border areas of the DRC and Rwanda with attacks on the new Rwandan government. Most of the fighting in the beginning of the war along the eastern border was carried out by Rwandan army troops and Congolese Tutsi. The Congolese War resulted in an estimated death toll of some 5.4 million people (IRC, 2008). The war threw the DRC deeper into socio-economic and political misery as natural resources were plundered and society disrupted, especially in the border regions between Rwanda and the DRC, and between

Uganda and the DRC, and in the principal city, Kinshasa. Lack of leadership and corruption generated falling prices of mineral resources on which the national economy is dependent (Kandala et al, 2011). This has resulted in massive loss of employment.

# Data

All three empirical studies in this thesis use Demographic Health Survey (DHS) and the Uppsala Conflict Data Program 2013 (UCDP GED). The DHS are cross sectional surveys funded by the USAID (US Agency for International Development) Bureau for Global Health. They are designed to provide data for monitoring the population and health situation in the survey countries. The surveys are representative at the national level, for urban and rural residence and for each province. In every selected household, all women of age 15-49 years who were residing in the household or were present in the household on the night before the interview were eligible for interviewing. The DHS data is structured in modules covering demographic characteristics and household affluence; reproductive health, fertility, maternal and child health; nutrition and knowledge and practice related to HIV/AIDS. All three studies used data on women aged 15-49 years who provided information on age at first sexual intercourse and the births and deaths of their children. DHS is an incredibly rich and high quality data source with a high response rate and an elaborate sample design. More detailed information on the sample design and questionnaires used in the surveys is described in the DHS reports<sup>1</sup>.

The Uppsala Conflict Data Program 2013 (UCDP GED) is an event based and geo-based dataset. The data provider collects information from various sources, such as BBC Monitoring Service, Reuters, Monthly Human Rights Assessments, Amnesty International, Red Cross etc. covering a large number

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<sup>1</sup> <http://www.dhsprogram.com/publications/publication-search.cfm>

of aspects of armed violence. The database is one of the most accurate and well-used sources on global armed conflicts. Conflict events resulting in at least 1 direct death are measured by number of conflict deaths and number of conflict events at a given time and place. The UCDP GED codebook<sup>2</sup> provides more detailed information on the data structure. The conflict data are matched to women's histories by province and calendar year.

The DHS does not provide information on migration histories and it is well established that war causes migration flows, both internal and across borders. The lack of migration histories limits the scope of the analysis as I cannot follow movements of women across time and place in relation to their life course events. The studies deal with the lack of migration histories differently depending on the DHS data available at the country level. The study of premarital sex used the Rwandan DHS that includes a report of years lived at current place of residence. This allows for an analysis limited to women who had lived at their current residence since age 12 (when they become under risk)<sup>3</sup>. However, the second study on fertility in the DRC used the DHS from 2013/2014 that did not include a report on years lived at current place of residence, excluding the possibility of limiting the analysis to non-migrant women. The third study on infant mortality used DHS from 2007 and 2013/2014. Here I compare bivariate models for the full sample of births observed in DHS 2007 with the sample of births to mothers who had not moved or who had moved before the birth and remained in the location at interview.

There are two possible migration scenarios related to the analysis. First, women may have moved from high conflict regions to low conflict regions and were still living in low conflict regions at the time of the interview. For

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<sup>2</sup> <http://www.ucdp.uu.se/ged/>

<sup>3</sup> The study also includes robustness checks for migrant women, which is thoroughly discussed in the study.

these women, exposure to conflict is underestimated. Second, women may have moved from high conflict regions to low conflict regions but returned to origin place of residence by the time of the interview. For these women, exposure to conflict is overestimated. The association between conflict and the studied outcome will be attenuated, that is lower, than it really is if the measures of place of residence have these types of errors.

It is important to note as well that the most vulnerable women are not included in the data, i.e. women who died during war or women who fled to refugee camps and had not returned by the time of the interview. It is possible, for example, that the fertility study would indicate a fertility drop among women living in refugee camps if they had been included. The infant mortality study may have indicated an even higher risk of mortality during the war period if these women were included. My analyses therefore reflect the lowest impact of war (a floor effect) on premarital sex, fertility and infant mortality.

# Summary of the empirical studies

## Study 1 – Violent Conflict and Sexual Behavior in Rwanda

**Background:** Early and premarital sexual intercourse can be linked to a host of problems in the sub-Saharan African context including unwanted pregnancies and exposure to sexually transmitted infections. This study explores the relationship between violent conflict and premarital first sexual intercourse in Rwanda, a country that experienced violent conflicts leading up to the genocide in 1994, alongside high HIV prevalence.

**Methods:** The RDHS from 1992, 2000 and 2005 provides information on sexual histories for 27,773 women aged 15-49 years. Response rates for the surveys were 94.3%, 98.1%, and 98%, respectively. The UCDP GED conflict data is matched to the RDHS on region and year and provides annual data on violent conflicts in Rwanda. I estimate piece-wise constant proportional-hazard models for the risk of premarital first sexual intercourse from age 12 years.

**Results:** Analyses show an increased risk of premarital first sexual intercourse during the conflict years of 1993 and 1994. The conflict indicators provide strong evidence of a conflict effect on premarital sex in Rwanda.

**Conclusion:** The results are consistent with social disruption and weak community and parental control during the period of violent conflict that may otherwise inhibit young women's experience of first premarital sex.

## **Study 2 – War effect on fertility behavior in the Democratic Republic of Congo**

**Background:** Wartime fertility decline and post-war rebound in fertility have been observed in both Western societies after the World Wars and in war-affected areas of developing countries. The Democratic Republic of Congo (DRC) seems to deviate from this pattern, maintaining a high total fertility rate despite the Congolese wars of 1996-2003 and lingering conflict in East DRC. This study explores the relationship between war and fertility by linking individual reproductive life courses to the occurrence and intensity of conflict.

**Methods:** The study uses piece-wise constant proportional hazard models to estimate effects on fertility of violent conflict. The DHS survey is nationally representative and includes 18,827 women between ages 15-49 and the response rate was 98.6%. The DHS data was matched with conflict data from the Uppsala Conflict Data program Geo-referenced Event Dataset on region and year. Measures of violent conflict are linked in time and place to women's reproductive histories reported in the DHS.

**Results:** The first birth risk increased during the Congolese war and in the period immediately following. Higher-order birth risks plateaued during the war but decreased thereafter. Taken together, the results are consistent with a postponement and eventual onset of a fertility transition in the DRC.

**Conclusion:** The study deepens the understanding of how war affects parity-specific births in a high fertility context encompassing the live birth histories of Congolese women across time. Additional research including refined

measures of migration and behavioral factors associated with fertility across time would allow for more nuanced assessments of demographic consequences and implications of war.

### **Study 3 – The effect of war on infant mortality in the Democratic Republic of Congo**

**Background:** The Democratic Republic of Congo (DRC) has suffered from war and lingering conflicts in East DRC and has one of the highest infant mortality rates in the world. Prior research has documented increases in infant and child mortality associated with war, but the empirical evidence is limited in several respects. Measures of conflict are quite crude or conflict is not tightly linked to periods of exposure to infant death. Few studies have distinguished between the effects of war on neonatal versus post-neonatal infants. No study has considered possible differences between women who give birth during wartime and those who do not that may be related to greater infant mortality.

**Methods:** The analysis used the nationally representative sample of 15,103 mothers and 53,768 children from the 2007 and 2013/2014 Demographic Health Survey in the DRC and indicators of conflict events and conflict deaths from the 2013 Uppsala Conflict Data. To account for unobserved heterogeneity across women, a multi-level modeling approach was followed by grouping all births for each woman and estimating random intercepts in discrete time event history models.

**Results:** Post-neonatal mortality increased during the Congolese wars, and was highest where conflict events and deaths were extreme. Neonatal mortality was not associated with conflict levels. Infant mortality was not higher in East DRC, where conflicts continued during the post Congolese war peri-

od. Models specifying unobserved differences between mothers who give birth during war and those who have children in peacetime did not reduce the estimated effect of war, i.e., no support was found for selectivity in the sample of births during war.

**Conclusion:** Differences in effects of the Congolese war on neonatal versus post-neonatal mortality suggest that conflict influences the conditions of infants' lives more than the aspects of mothers' pregnancy conditions and delivery that are relevant for infant mortality. These differences may, however, be specific to the nature of conflict and prior conditions in the DRC. Because of continued political instability, violent conflict may be expected to continue in contexts such as the DRC; we must therefore continue to document, analyze and monitor the mechanisms through which war influences infant mortality.

# Concluding discussion

Verwimp and colleagues argue that “conflict originates from individuals’ behavior and their repeated interactions with their surroundings, from its micro-foundations” (2009:307). This thesis validates the claim that war also has an effect on demographic outcomes as it shapes the lives and behavior of individuals, households, communities and governments. Furthermore, conflict changes risk perception and affects property rights, welfare levels and educational trajectories. Entire regimes and institutions are altered by conflicts, which affect “the overt and covert incentives and constraints that people face in their daily lives” (Verwimp et al., 2009:308).

During the fall of 2014, I worked as an intern at UN Women in Kigali, Rwanda. The chance to observe and talk to Rwandans and representatives from aid organizations and non-government organizations (NGOs) increased my understanding of the historical, political and cultural background of the conflicts and the current political situation. The stories that I was told by survivors of the genocide made a lasting impression. I will here below give a short account of a few observations I made during these months that relate to the possibility of future conflict.

The Rwandan infrastructure has improved immensely since the genocide. I was told that six years prior to my stay in Kigali there were hardly any paved roads and the streets had no names. Just during the months that I spent there, roads were paved and restaurants and coffee places opened up all around the city. Although Rwanda has made momentous progress in stabilizing and

rebuilding its economy, Sida<sup>4</sup> (2004) reports that the growth has mainly been limited to urban areas and to the construction sector (new hotels, offices and tourism), having little bearing on the situation of the majority of the population. Rwanda lacks significant natural resources and the level of education and health care is still very poor. Yet, Rwanda struck me as very tidy and organized. The parks were beautifully maintained, not legal to walk in, but beautiful nonetheless. Armed police officers guarded street crossings throughout the country, giving a sense of order but also control. At one point we crossed over the northern border into Uganda and the contrast was clearly visible in terms of quality of paved roads and the non-presence of police officers in Uganda. We had some problems with the documentation of our rented car and were stopped at the border until nightfall. Driving in the dark is not recommended in this region, especially not in Uganda and East DRC. A few weeks earlier there had been an ambush at the very place that we were heading to. A tourist couple was fired at by a criminal gang using semi-automatic weapons, but both survived. We were therefore asked by the hotel owner to first drive to the police station in the nearest town where she had arranged for a guarded escort to the hotel. Armed ambushes in the border region of East DRC and Uganda are not uncommon due to the large amount of weapons on the market after the wars. Criminal gangs are often made up of men who participated in the fighting either as rebels/militias or as soldiers who now find it difficult to make a living.

The government in Rwanda has been heavily criticized for its involvement in the exploitation of the natural resources in the DRC and for supporting the conflict in East DRC. A UN report provided evidence that the Rwandan government together with the Ugandan government had provided military support to the rebel group M23 in East DRC. Documentation regarding

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<sup>4</sup> Sida is according to their homepage a “government agency working on behalf of the Swedish parliament and government, with the mission to reduce poverty in the world”. [www.sida.se](http://www.sida.se)

Rwanda's engagement in the M23 occupation of the town Goma in North Kivu near the border to Rwanda and Uganda in November 2012 leaked to the international media. Many feared that the region was on the verge of renewed large-scaled violent conflicts. I was told by Sida representatives in Kigali that the Swedish government had already withdrawn base financial support from state to state in 2008 as a reaction to Rwanda's participation in East DRC. The UN report on Rwanda's support of M23 temporarily also stopped project aid support to Rwanda. The Rwandan government denied any involvement in East DRC.

Another observation that struck me was the level of social commitment (viewed with positive emphasis) or social control (viewed with less positive emphasis). An example is the practice of community work 'Umuganda'. On the last Saturday of each month, each community comes together to do a variety of public works, including infrastructure development and environmental protection. Rwandans between the age of 18 and 65 are obliged to participate and expatriates are encouraged to do so. At one time during Umuganda we were out driving with a Rwandan friend and were stopped at least four times by police officers at different location to be asked why we were not participating. Umuganda has been practiced since the time of independence but during the genocide Umuganda came to encompass the ethnic cleansing of Tutsi citizens. Umuganda was reintroduced in 1998 in an effort to reconstruct Rwanda and to nurture a shared national identity. Central to Rwandan politics has been to eradicate the ethnic identities of Hutu, Tutsi and Twa. The new national identity is 'Banyarwanda', which means to originate from Rwanda. Many survivors of horrific events that took place during the genocide report, however that ethnic identity seems to linger within society along with their memories. The official definition of the genocide in Rwanda is 'genocide of Tutsi'. Orphans of Tutsi parents are eligible for financial compensation, whereas orphans of Hutu parents killed by rebel sol-

diers between 1990-1994 are not. The government has furthermore not condemned abuse and killings committed by the rebel soldiers. The prevailing discontent among some Rwandans over the simplified picture presented of the genocide is festering under the surface.

I was appointed the focal person for peace and conflict for UN Women and was elected member of the steering committee for a conference in Kigali on 'Silencing the guns by 2020' organized by the African Union and the Rwandan government. A central theme for the conference was to discuss triggers for conflicts and elections were highlighted as triggers for renewed conflicts. The election in the neighboring country Burundi in May 2015 led to more than 400 deaths and 240 000 refugees, many of whom fled to Rwanda. In February 2016 the UN general secretary Ban Ki-moon and representatives from the African Union visited with president Nkurunziza to push for peace negotiations between the president and the opposition to prevent civil war. Rwanda and the DRC have upcoming elections in 2016/2017 and even though there are great political and historical differences between these countries there are also similarities. The current presidents in both countries seek an additional term, which requires approval of changes to the constitution.

In Rwanda the popular elected government in 2003 officially ended the transition period of 9 years since the genocide. The government has established peace and stability for the first time since the independence. However, one line of critique is that the political power is concentrated to a small group with close ties to president Kagame. Strong political opponents are reported to have left the country voluntarily or by force and journalists have been and still are harassed (Sida, 2004). Rwanda has voted in favor of changing paragraph 101 in the constitution that in practice allows president Kagame to

stay in power until year 2034, a seven-year term followed by two five-year terms, if reelected.

In the DRC the first free and relatively fair multiparty election since the independence took place in 2006 (Riche & Berwouts, 2015). However, the stabilization of large parts of the DRC, especially in east DRC, is slow. North and South Kivu and Katanga provinces still experience violent conflicts (International Crisis Group, 2015). The next elections, held in 2011, took place under completely different conditions with many irregularities and the results were so contested that the country was on the verge of total collapse (Riche & Berwouts, 2015). The DRC is heading into new elections in 2016 and prior to the elections president Kabila will have to decide to either leave office, seek a new mandate (by altering the Constitution), or decide to stay on under his current mandate (by postponing the elections). The population at large feels disconnected from the political scene, as the politicians are seen as creating opportunities for their family, their clan, their ethnic group and their region. Overall living conditions have not improved since the last elections, breeding frustration and anger. Riche and Berwouts (2015) argue that the political stakeholders lack moral authority over the people or the capacity to suppress renewed violent conflicts.. Violent uprising could quickly lead to plundering, chaos and anarchy, which would be devastating for infrastructure and human welfare.

The Great Lake region continues to be a hotbed for renewed violent conflict and the process towards peace building and development is dependent on addressing structural challenges within society. The need to continue to analyze, document and monitor the mechanisms through which conflict affects communities, household and the everyday life of individuals is therefore crucial.

## Future direction

The thesis deals with intimate and personal topics, the timing of first sex, births and possible loss of children. Although DHS is an immensely rich data source it does not include information about the circumstances of experienced life course events. We do not know for example the terms of first sexual intercourse, the health and behavior of the mother, the health of the infant or the socio-economic status of the household at the time of the birth or death of a child. We do know that war matters for family formation and survival of children at the micro level. To advance our understanding of the mechanisms of war I believe that interviews are required with women who survived the civil war and genocide in Rwanda and the Congolese War in the DRC.

# References

Alan Guttmacher Institute (AGI). 1995. *Sexual Relationships and Marriage Worldwide. Women, Families and the Future Series* New York: AGI.

Babalola S, Quenum-Renaud B. 2002. The correlates of safe sex practices among Rwandan youth: a positive deviance approach. *African Journal of AIDS Research* **1**: 11-21.

Caldwell J. 1976. Toward A Restatement of Demographic Transition Theory. *Population and Development Review* **2**(2/4): 321-366.

Caldwell JC. 2004. Social Upheaval and Fertility Decline. *Journal of Family History* **29**(4): 382-406.

Calvés AE. 1998. First Report – 1998 Rwanda Sexual Behavior and Condom Use Survey. Washington DC, Population Services International.

Cohan LC, Cole SW. 2002. Life course transitions and natural disasters: marriage, birth, and divorce following Hurricane Hugo. *Journal of Family Psychology* **16**(1): 14-25.

Doyle AM, Mavedzenge SN, Plummer ML, Ross DA. 2012. The sexual behavior of adolescents in sub-Saharan Africa: patterns and trends from national surveys. *Tropical Medicine and International Health* **17**(7): 796-807.

Elul B, Delvaux T, Munyana E, Lahuerta M, Horowitz D, Ndagije F, Roberfroid D, Mugisha V, Nash D, Asiimwe A. 2009. Pregnancy desires, and contraceptive knowledge and use among prevention of mother-to-child transmission clients in Rwanda. *AIDS* **23**(1): 19-26.

Gage-Brandon AJ, Meekers D. 1993. Sex, contraception and childbearing before marriage in sub-Saharan Africa. *International Family Planning Perspectives* **19**(1):14–18.

Garenne M. Joseph V. 2002. The Timing of the Fertility Transition in Sub-Saharan Africa. *World Development* **30**(10): 1835-1843.

Hintjens HM. 1999. Explaining the 1994 Genocide in Rwanda. *The Journal of Modern African Studies* **37**(2): 241-286.

Human Rights Watch. 2004. Struggling to survive: barriers to justice for rape victims in Rwanda. September. **16**(10A).  
<http://www.hrw.org/reports/2004/09/29/struggling-survive>.

International Crisis Group. 5 May 2015. Congo: Is Democratic Change Possible? Report N°225.

Iqbal Z. 2006. Health and human security: the public health impact of violent conflict. *International Studies Quarterly* **50**: 631–649.

Jayaraman A, Gebreselassie T, Chandrasekhar S. 2009. Effect of Conflict on Age at Marriage and Age at First Birth in Rwanda. *Population Research Policy Review* **28**: 551–567.

Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS and the Bellagio Child Survival Study Group. 2003. How many child deaths can we prevent this year? *Lancet* **362**: 65–71.

Kandala N-B, Lukumu FK, Maniema JN, Kandala JD, Chirwa T. 2015. Disparities in Modern Contraception use Among Women in the Democratic Republic of Congo: A Cross-Sectional Spatial Analysis of Provincial Variations Based on Household Survey Data. *Journal of Biosocial Science* **47**: 345-362. doi:10.1017/S0021932014000212.

Khan M FH, Shirmeen A. 2007. Proximate determinants of fertility and reproductive health. *Ulster Med J* **76**(1): 6-7.

Kinzer s A. 2008. A Thousand Hills: Rwanda's Rebirth and the Man Who Dreamed It, Hoboken, NJ: Wiley & Sons, 254.

Kirk D. Pillet B. 1998. Fertility Levels, Trends and Differentials in sub-Saharan Africa in the 1980s and 1990s. *Studies in family Planning* **29**(1): 1-22.

Kiros GE, Hogan D. 2001. War, famine and excess child mortality in Africa: the role of parental education. *International Journal of Epidemiology* **30**: 447-455.

Lindstrom DP, Berhanu B. 1999. The impact of war, famine, and economic decline on marital fertility in Ethiopia. *Demography* **36**(2): 247-261. doi:10.2307/2648112.

Malmberg B. 2008. Demography and the development potential of sub-Saharan Africa. Nordic Africa Institute.

Mensch BS, Grant MJ, Blanc AB. 2006. The changing context of sexual initiation in sub-Saharan Africa. *Population and Development Review* **32**(4): 699–727.

Milillo D. 2006. Rape as a tactic of war social and psychological perspectives. *Journal of Women and Social Work* **21**(2).

Mock N, Duale S, Brown LF, Mathys E, O'Maonaigh HCO, Abul-Husn NKL, Elliott S. 2004. Conflict and HIV: A framework for risk assessment to prevent HIV in conflict-affected settings in Africa. *Emerging Themes in Epidemiology* **1**(1): 6.

Muhwezi W, Kinyanda E, Mungherera M, Onyango P, Ngabirano E, Muron J, Kagugube J, Kajungu R. 2011. Vulnerability to high risk sexual behavior (HRSB) following exposure to war trauma as seen in post-conflict communities in eastern Uganda: a qualitative study. *Conflict and Health* **5**(22).

Notestein, F.W. 1945. Population: The Long View. In Schultz, T.W. *Food for the World*. Chicago: University of Chicago Press, xiv, 352, [1] p.

Prunier G. 1995. The Rwandan Crisis 1959-1994: History of a genocide. London: Hurst.

Rajaratnam JK, Marcus JR, Flaxman AD, Wang H, Levin-Rector A, Dwyer L, Costa M, Lopez AD, Murray CJ L. 2010. Neonatal, postneonatal, childhood, and under-5 mortality for 187 countries, 1970–2010: a systematic analysis of progress towards Millennium Development Goal 4. *Lancet* **375**: 1988–2008.

Romaniuk A. 2011. Persistence of High Fertility in Tropical Africa: The Case of Democratic Republic of Congo. *Population and Development Review* **37**(1): 1-28.

Romaniuk A. 1980. Increase in natural fertility during the early stages of modernization: Evidence form an African case study, Zaire. *Population Studies* **34**(2): 293-310.

Shapiro D. Tambashe B. O. 2001. Fertility in the Demographic Republic of Congo. Presented at a United Nations workshop on “Prospects for Fertility Decline in High Fertility Countries,” held at the United Nations 9-11 July.

Sida 2004. A Strategic Conflict Analysis for the Great Lakes Region. Division for Eastern and Western Africa.

Stearns JK. 2012. Dancing in the Glory of Monster. Printed in the United States of America by Public Affairs.

The UCDP GED Point Dataset Codebook. 2013. Sundberg R, Melander E: Introducing the UCDP Georeferenced Event Dataset, *Journal of Peace Research* **50**(4): 523-532.

Urdal H, Che C P. 2013. War and Gender Inequalities in Health: The Impact of Armed Conflict on Fertility and Maternal Mortality. *International Interactions: Empirical and Theoretical Research in International Relations* **39**(4): 489-510.

Walque D, de. 2006. The socio-demographic legacy of the Khmer Rouge period in Cambodia. *Populations Studies* **60**(2): 223-231.

Van Herp M, Parqué V, Rackly E, Ford N. 2003. Mortality, Violence and Lack of Access to Health-care in the Democratic Republic of Congo. *Disasters* **27**(2): 141-153.

Verwimp P, Justion P, Brück T. 2009. The Analysis of Conflict: A Micro-Level Perspective. *Journal of Peace Research* **46**(3): 307-314.

Victora CG, Smith PF, Vaughan P, Nobre LC, Lombardi C, Teixeira AMC, Fuchs SC, Moreira LB, Gigante LP, Barros, RC. 1989. Infant feeding and deaths due to diarrhea. A case-control study. *American Journal Epidemiology* **129**(5): 1032-1041.