VIOLENT CONFLICT AND SEXUAL BEHAVIOR IN RWANDA
A POSSIBLE PATHWAY OF HIV TRANSMISSION

Elina Lindskog
Demography Unit, Sociology Department, Stockholm University

Introduction

Premarital sex in Africa has been linked to increased risk of multiple partners that together with low utilization of condoms exposes young people to a host of problems including unwanted pregnancies and transmission of sexually transmitted infections, such as HIV (Babolola 2004; Ntaganira et al. 2012). With dramatic increases of HIV/AIDS epidemic in parts of Africa the negative effect of un-safe sexual practice is transmission of HIV as the main mode of transmission is through heterosexual sexual relationships. Statistical research on timing of first sex and the choice of sexual partners conclude that HIV infection is higher among women who initiate first sex at a young age (Drain e al. 2004; Gregson et al. 2002) and that have multiple sexual partners especially if the partner is older (Gregson et al. 2002; Kelly et al. 2003). The exposure to HIV infection through premarital sex also depends on the prevalence of HIV in a sexual community, but also the sexual networks and circumstances of sexual intercourses. Sexual networks and circumstances are, in turn, a function of the demographic and social structure as well as political and economic environment. An extreme case of environmental context is that of violent conflict in which the demographic and social structure and the political and economic order are disrupted, which can both inhibit but also exacerbate the spreading of HIV (Elbe 2002; Hankins et al 2002; Mock et al. 2004; United States Institute of Peace 2001).

There are at least a few different mechanisms through which violent conflict can produce increased risk of experiencing premarital first sex, these mechanisms are not argued to be mutually exclusive and the data do not provide the opportunity to distinguish between them. Lack of parental and community control and protection as well as rape being used as a weapon of war are possible mechanisms, as is the feeling of hopelessness and lack of future that might loosen social and institutional constraints on premarital first sex. These mechanisms feed into each other and can be seen as possible theoretical pathways of HIV transmission.

This paper will focus on studying whether the conflicts during the 1990s in Rwanda influence d the risk of premarital sexual intercourse at regional level. Rwanda experienced a turbulent last decade of the 20th century with civil war leading up to the genocide in 1994 during which an estimate of 800 000 mostly Tutsi were killed and another 250 000 to 500 000 women were raped. Rwanda is furthermore identified by the WHO as one of the ten countries in Africa most severely affected by HIV/AIDS (WHO 2005). I estimate the influence of violent conflicts on the risk of premarital first sex by using an event-based approach as this study makes use of unique data on violent conflict at regional level that are linked to sexual histories of individual women across time and space. I find that there is an increased risk of premarital first sexual intercourse during years of conflict.

Structural properties influencing premarital first sex

Premarital sexual behavior is influenced by individual characteristics but also environmental factors. Much research has focused on premarital sexual activity by using micro-level approach by studying the social, psychological and physical characteristics on the timing of first sex of young people. The focus of this paper is on conflict effect of premarital first sex whereby the effect of exogenous variables to the individual women is of main interest. Billy, Brewster & Grady (1994) argue that contextual factors can be linked to the onset of young people's first sexual intercourse and subsequent sexual activity. They emphasize on the importance of community characteristics that provides structure of constraints that shape the knowledge and attitudes towards sexual behavior. Their conceptual framework is built on the idea that "structural properties may influence internal processes through two mechanisms: (a) by creating an opportunity structure that affects the costs an

adolescent associates with engaging (or not engaging) in sexual activity, and (b) by given rise to a prevailing normative environment that delimits the boundaries of acceptable behaviors for adolescents" (Billy, Brewster & Grady 1994:388). Community opportunity structures relate to the perceived opportunity costs of premarital sex, the availability of reproductive information and services and the demographic composition of the population in regard to the possibility of finding a partner. The normative environment constitutes norms and values of the community in reference to premarital sexual activity. These norms and values are internalized by the individual's so that the characteristics of the community operated through normative mechanism influencing the sexual behavior through the individual's own value system. The opportunity structure and the normative environment are intertwined in ways that each either shape or are shaped by the other or both. It is therefore probable that community characteristics may influence individuals timing of first sex and subsequent sexual activity through both these mechanisms simultaneously (Billy, Brewster & Grady 1994).

The characteristics of a community are deeply affected by war and bear consequences on premarital sexual behavior through the destruction of society which also needs to be understood at an individual level in terms of vulnerability, exposure and risk. The concepts of vulnerability, exposure and risk are instrumental in the literature on how disasters affect individuals' lives Cannon et al. (1994). Vulnerability implies that an individual or groups of individuals are more likely to experience adverse effects when exposed to hazards, which are unpredicted events such as war. Their ability to withstand hazards is related to the onset and duration of the hazard and to a wide range of characteristics such as gender, age, education, socio-economic position in the community etc. The effect of war, as a specific type of hazard can be seen at national, community and individual level as it hinder economic and human development. At an individual level the consequences can be severe through the loss of loved ones, livestock, crops, home, post-conflict trauma etc. At national and community level the effect of hazard can be seen through the destruction of the health sector, infrastructure, markets, human capital etc. Another consequence of war is that it can be understood as an extreme case of environmental influences on the transmission of HIV. HIV/AIDS is a medical condition, restricted to only a few modes of transmission but needs to be understood as a "consequence of place" (Webb 1997). It is important to emphasize that the influence that violent conflict has on the epidemiology of HIV relates to the onset and duration of the conflict (Mock et al. 2004) as well as the duration of the infectiousness and the interaction structure in the population (Liljeros 2008).

Rwanda

Rwanda is a small but densely populated country with 9.7 million inhabitants (2009). In Rwanda AIDS is a leading cause of death with an adult infection rate of about 9 % in 2001 (UNAIDS 2002). In Rwanda early sexual debuts is not as common as in other East African countries, the median age at first sex among female youth 20-24 years is 18.1 years (UNAIDS 2002). Nevertheless, the Rwanda Demographic Health Survey (RDHS 2000) and the 2000 Behavioral Surveillance Survey (BSS) support the conclusion that many Rwandan youth who are sexual active do not use condoms (Babalola 2003).

The genocide was a three month state-organized attack that left at least half a million of mostly Tutsi people dead. The genocide altered the composition of the population structure as hundreds of thousands died and 3,000,000 were internally or externally displaced (World Bank 2004). Violent conflict is believed to have an indirect effect on the spreading of HIV/AIDS at an individual level through increased interaction among civilians and military/combatants personnel, known for having a high risk behavior. But also through mass migration (refugees) and development of cultures of violence that promote sexual violence and predation (Hankins et al. 2002; Mock et al. 2004). An estimated 250 000 to 500 000 women were raped during the genocide (Hintjens 1999; Mock et al. 2007; Stauss 2000). Population mobility can give rise to epidemics as these mobile groups act as "vectors for disease" (Iqbal 2006). Violent conflict is also believed to have an indirect effect on the spreading of HIV/AIDS at a community level in through the destruction of social and physical

infrastructure that increases the risk of untreated sexually transmitted infections, poor health and malnutrition (Iqbal 2006). Also through the destruction of public health education mechanism (e.g. mass media, health facilities, and formal education), which has a negative effect on public health-related knowledge, attitudes and practices. The health sector might suffer extensive damage during violent conflict through loss of health infrastructure, both in terms of personnel and physical infrastructure. Rwanda was estimated to have lost more than 80% of its health personnel through death or flight during the genocide (Mock et al. 2004).

Data and models

The study makes use of unique data on violent conflict at regional level in Rwanda from Uppsala Conflict Data Program- Georeferenced Event Dataset (UCDP GED) and the Rwandan Demographic Health Survey (RDHS) from 1992, 2000, and 2005. The RDHS provides information on reproductive and sexual histories for 27823 women aged 15-49. Response rates for the surveys were 94.3%, 98,1%, and 98% respectively. Detailed information on sampling design and field work are available in the country reports (RDHS 1992, 2000 and 2005[1]).

The UCDP GED provides annual data from 1989-2010 on violent conflicts throughout the world. Data on conflict events were collected from various sources, such as BBC Monitoring Service, Reuter, Africa Rights, Human Right Watch etc. for more detailed information on sampling design see UCDP GED, codebook 2011[2]. Covariates have been constructed to catch the intensity, location and timing of the conflict. A violent conflict event is defined as: "The incidence of the use of armed force by an organized actor against another organized actor or against civilians, resulting in at least 1 direct death in either the best, low or high estimate categories at a specific location and fro a specific temporal duration" (UCDP GED, codebook 2011).

My unit of analysis is person-months at risk of premarital first sexual intercourse. Women are observed from age 12 until marriage, age 49 or at interview, whichever comes first. I estimate proportional-hazard models for the risk of premarital first sexual intercourse. Proportional-hazard models are useful when describing how the hazard (risk) changes over time at *baseline* level and the baseline duration in my models is the women's age in years, classified as 12-14, 15-17, 18-20, 21-23 and 24-49. The interpretation of the hazard function is to describe the time-dependent risk for an event (Walke 2010) and this study the event is premarital first sex. Calendar year is a time-varying covariate, while other individual-level characteristics, including region of residence, are fixed. Because the RDHS does not include complete information on migration histories, the analysis focuses on women who have lived in the current place of residence since age 12, a selected sample of women (n=11,308). The conflict measures are merged onto the RDHS by the year and region covariates.

The main interest in this study is the effect of violent conflict on the risk of premarital first sexual intercourse. I have included four conflict indictors to see if I can capture regional differences in regards to the event. The first conflict indicator is Rwanda's 12 prefectures. The geographical boundaries have been altered during the observed time period. There were 11 prefectures until year 2000 when the Kibungo prefecture was split into two and Umatara prefecture established, the RDHS 2000 back coded the prefecture to reflect the women's residential location and the RDHS 1992 only included the southern prefectures except for Cyangugu because of the outburst of the civil war in the northern prefectures. The full range of the prefectures was entered into the models as the regional indicators capture other differences such socioeconomic and cultural differences that could influence premarital sex independent of conflict. The second conflict indicator is the place of residence defined as rural and urban.

Calendar year ranges between 1954 and 2005 and is entered into the model as a series of categorical group dummy covariates, except for 1993 and 1994 that are presented as single

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years in the model to capture the hazard risk of the event for this specific time period[3]. The categorical groups before 1990 capture the long term trend of age at premarital first sex and the category after 1999 captures the trend in the after-math period of the conflict. Calendar year between 1990 and 2000 was divided into different categorical groups built on external information on the political-, geographical-, and migration history of Rwanda. Interaction dummies between region and calendar year was created and tested in the models to see if the combination of place and time would capture conflict effects. The combinations represent conflict that is derived from other sources than the direct measures from UCDP GED. The interactions that were statistically significant were included in the model.

The third and fourth conflict indicators are conflict covariates providing information on the intensity of the conflict at each prefecture and year. However, it was only those conflict events that were reported and where the location of the event was known was coded as an event. This result in an underreporting of both number of conflict events and the number of deaths during each conflict event, many conflict events and deaths occurred under the radar as neighbors killed neighbors etc. The conflict data does nevertheless provide the best information there is on the regional distribution of the conflict during the observed time period of this study. The number of conflict events provides information on conflict events per region at any given year during the observed period of time, ranging from no conflict events to 43 conflict events. No conflict events occurred in 82, 6% of the observations, and the remaining 17.4% were divided approximately equally into three categories. The covariate is used as a categorical covariate entered into the model as a series of dummies.

The fourth covariate is a relative estimation on number of deaths per region in 1994 built on the estimated number of deaths per region from the conflict data divided by the estimated number of Tutsis per region corresponding to the 1991 Rwandan census. However, the total number of Tutsi who survived the genocide has been debated and the estimations are depended on the proportion of the Tutsi population in 1994. The relative estimation on number of deaths per region in 1994 is divided into four categorize; no relative number of deaths occurred in 82, 6% of the observations, and the remaining 17.4% were divided approximately equally into three categories. This covariate is also used as a categorical covariate entered into the model as a series of dummies. Even the most thorough and comprehensive data has limitations; a way to deal with this is to implement an alternative strategy for assessing conflict. I have therefore included a measure of the proportion of Tutsi in a prefecture, according to the 1991 census, which may tell us the degree to which a prefecture was likely targeted in the genocide. The vast majority of the deaths were Tutsi deaths meaning that the amount of disruption would vary depending on the proportion of Tutsi in the prefectures. The covariate is entered into the model as a continuous covariate.

The RDHS does not provide information on whether the first sexual intercourse was forced or not, nor does it provide information on migration histories. I have selected women who have lived in current place of residence since age 12, which may cause selection problem. It implies that my sample may under represent women who were directly affected by the conflict through migration or death.

Descriptive results
A first look at the smooth hazard estimation curve of premarital first sexual intercourse for women who have lived at current place of residence since age 12 show a sharp increase and then decrease of the hazard risk in relation to age up until age 20, starting from age 12. The risk of first sex is highest around age 20 and then decreases with two bumps thereafter at around age 25 and age 33.

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[3] Calendar year dummy covariate used in the model produced an equally good fit as when each of the years 1990-2000 was tested separately.

Figure 1. Kaplan-Meier failure estimates the change over time for premarital first sexual intercourse
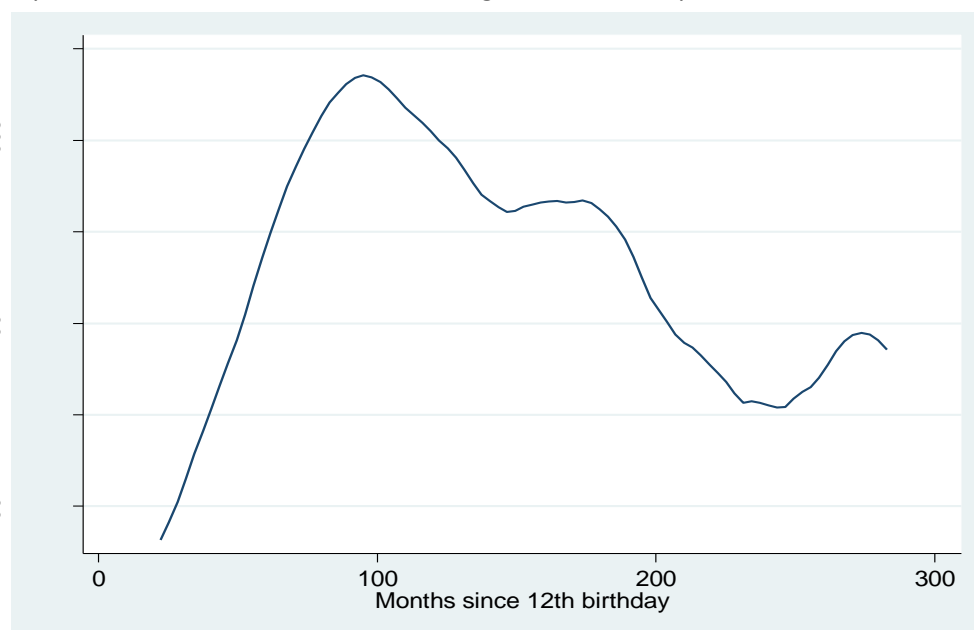
The map of Rwanda illustrates the geographical distribution of the conflict events according to the conflict event- based UCCDP-GED data between 1990-2000. The smaller tags on the map indicate events where at least one person died. As visible on the map the smaller tags are mainly located in the northern part of Rwanda and correlate to the civil war period, whereas the larger tags indicate larger number of deaths during each recorded event and correlates to the genocide period.

Source: http://www.ucdp.uu.se/ged/index.php#
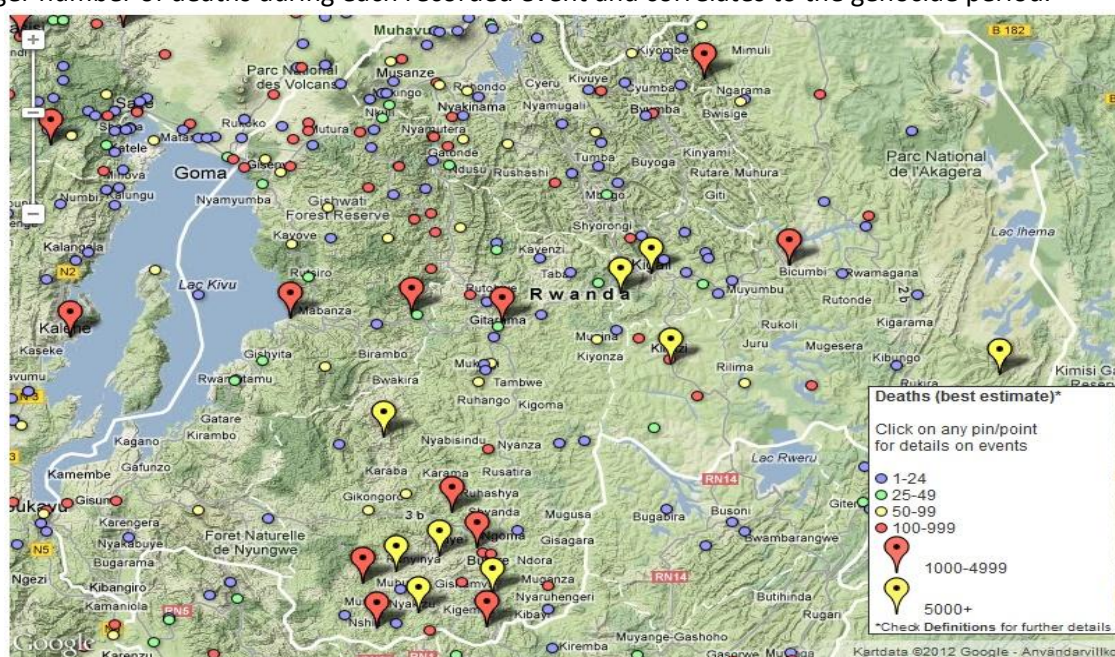
Preliminary results

The main effect hazard regression models in table 1 indicate the risk of premarital first sex for women, who have lived in current place of residence since age 12. This is my entry point into the study where the risk of women having their first sexual experience increased during the conflict years compared to the reference year 1954-1969. The models indicate a higher risk for urban areas

compared to rural areas. Model 4 indicates that the interaction between 1990-1992 and northern region of Rwanda captured a conflict effect of the civil war at this time period.

Table 1. Piece-wise constant baseline intensity model of premarital first sex for women who have lived at current place of residence since age 12.

	Model 1*	Model 2	Model 3	Model 4
Age				
12-14	1	1	1	1
15-17	3.43***	3.55***	3.55***	3.56***
18-20	6.21***	6.46***	6.43***	6.47***
21-23	4.78***	4.90***	4.89***	4.90***
24-49	4.01***	4.14***	4.15***	4.15***
Type of residence				
Urban	1.93***	1.89***	1.94***	1.89***
Rural	1	1	1	1
Calendar year				
1954-1969	1	1	1	1
1970-1979	1.41(*)	1.37	1.37	1.38
1980-1989	1.87**	1.78**	1.78**	1.79**
1990-1992	1.69**	1.60*	1.60*	1.43(*)
1993	2.37***	2.13***	2.13***	2.14***
1994	2.21***	1.98**	1.97**	2.00**
1995-1996	1.86**	1.67*	1.62**	1.69*
1997-1998	1.52*	1.36	1.36(*)	1.37
1999-2005	1.28	1.16	1.16	1.17
Prefectures				
Butare	0.75**	0.89	0.89	0.95
Gikongoro	0.84(*)	1.01	0.97	1.07
Kigali ngali	0.66***	0.81*	0.75*	0.86
Kibuye	0.60***	0.74*	0.72	0.78*
Kibungo	0.85	1.09	omitted	1.14
City of Kigali	1	1	1	1
Gitarama	0.81*	1.00	0.93	1.06
Cyangugu	0.78*	1.00	0.94	1.05
Gisenyi	0.81(*)	1.11	0.98	1.13
Byumba	0.85	1.07	0.94	1.09
Ruhengeri	1.15	1.11	0.93	1.13
Umutara	0.75*	0.93	0.80	0.97
Interaction between %Tutsi and regions	1.00		0.99*	0.98*
Interaction between 1990-1992 and northern prefectures				1.39*

*Model 1 explicitly models the covariates separately against age, but the results are presented in one model.
The log-likelihood ratio test has been used on all the models and they are all significant.

Additional analyses will be done including all the conflict covariates as well as deeper analysis of the regional differences across time.

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