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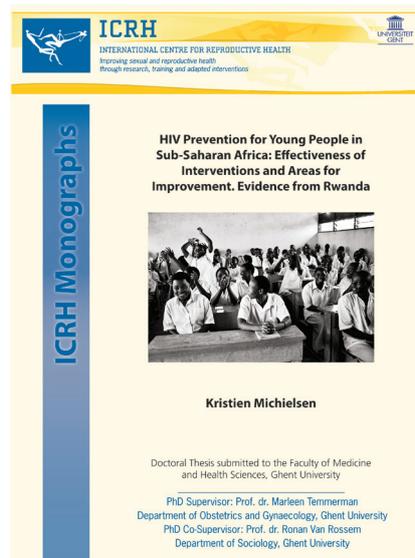
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# Limited effectiveness of HIV prevention for young people in sub-Saharan Africa: studying the role of intervention and evaluation

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## Abstract

On average, 2,500 young people (15-24 years) get infected with HIV every day; 80% of which live in sub-Saharan Africa. Since no cure or vaccine is available, reducing sexual risk behaviour in this group is crucial in tackling the epidemic. The general objective of this doctoral study was to improve the effectiveness of HIV prevention interventions for young people in sub-Saharan Africa. First, we assessed the overall effectiveness of such interventions (systematic literature review, meta-analysis). Secondly, we evaluated a school-based peer-led HIV prevention interventions in Rwanda (longitudinal, non-randomized controlled trial), to get insight into how interventions are developed, implemented and evaluated. While the first two objectives demonstrated limited effectiveness, the third objective aimed to identify reasons for this limited effectiveness: a) baseline characteristics of respondents that predict

participation were identified (using data from objective 2); b) we studied determinants of young people's sexual behavior using a qualitative 'mailbox study' that assessed the spontaneous thoughts of Rwandan adolescents on sexuality; c) we assessed the role of one specific structural factor: education (literature review and analysis of existing datasets); d) we assessed the theoretical underpinnings of existing HIV prevention interventions for young people in sub-Saharan Africa (literature review). Based on these studies, we discuss two main reasons for the observed limited effectiveness: factors associated with the intervention (strong focus on cognitions and moral, and implementation issues), and with evaluation (design, power, indicators). Recommendations for improving interventions, evaluations and for further research are provided.

**Key words:** HIV prevention, effectiveness, sexual behavior, structural factors, Sub-Saharan Africa, young people.

## Introduction/Background

Recent UNAIDS data show that an estimated 34 million people [31.6 million-35.2 million] were living with HIV worldwide in 2010. This means that about 1% of the adult world population is infected with the virus. One region is particularly touched by the HIV epidemic. In 2010, 70% of the new HIV infections occurred in sub-Saharan Africa. This part of the world hosts two thirds of all HIV-positive people, while it is home to only 12% of the world population (UNAIDS, 2011a). Within this region, particularly young people are severely affected by the epidemic; on average, 2,500 young people (15-24 years) get infected with HIV every day of which 80% in sub-Saharan Africa. This is reflected in a regional HIV prevalence of 1.4% [1.1%-1.8%] in young men and 3.3% [2.7%-4.2%] in young women, making young people an essential population for turning the tide of the epidemic. (Marston and King, 2006; Coates et al., 2008).

Only recently more positive news was reported. UNAIDS data indicated that in 22 sub-Saharan African countries, HIV incidence declined by more than 25% between 2001 and 2009, including in some of the world's largest epidemics like Ethiopia, Nigeria, South Africa, Zambia and Zimbabwe. But, even though the epidemic seems to be leveling off, with an HIV incidence of 1.9 million [1.7 million-2.1 million], it remains at an unacceptably high level. (UNAIDS, 2011) The changes in HIV incidence are most marked among young people. HIV incidence declined among young people aged 15 to 24 years in 16 of the 21 countries most affected by HIV. These declines have occurred amid signs of changes in sexual behaviour.

In many sub-Saharan African countries, young people aged 15 to 24 years make up over one third of the population. This means that in this region a large number of people is about to start their sexual lives or have just started it (Wellings et al., 2006). These young people are particularly vulnerable to HIV infection and poor sexual and reproductive health; due to the combination of universal risk-taking behaviours that emerge during adolescence, such as alcohol consumption, sexual initiation, and several individual, social and structural factors, including limited knowledge and skills with regard to sexual and reproductive health issues, poverty and gender imbalance (Unfpa, 2008). The World Health Organization estimated that nearly two thirds of premature deaths and one third of the total disease burden in adults are associated with conditions or behaviours that began in youth, such as drinking, unprotected sex or exposure to violence (WHO, 2008). Hence, as Coates puts it "Nothing should be

more important than a major focus on young people" (Coates et al., 2008).

This doctoral study focusses on prevention of sexual transmission of HIV in young people in sub-Saharan Africa. Figure 1 indicates that focusing on prevention of sexual transmission of HIV among young people is only one of the many ways of managing the HIV/AIDS epidemic.

Over a decade ago, Merson (Merson et al., 2000) concluded a review on the effectiveness of HIV prevention interventions by stating that there is a dearth of evaluated prevention interventions for young people. Since, the number of evaluations and literature reviews is increasing. Literature reviews have assessed the impact of HIV prevention on youth in specific settings, such as schools (Gallant and Maticka-Tyndale, 2004; Paul-Ebhohimhen et al., 2008), or with particular tools like mass media (Bertrand and Anhang, 2006). Others have focused on specific behaviours, for example condom use (Foss et al., 2007), or geographical regions (Merson et al., 2000; Speizer et al., 2003; Magnussen et al., 2004; Kirby et al., 2007), and even others have focused on types of outcomes, e.g. including only evaluations that report on biological outcomes (Ross, 2010).

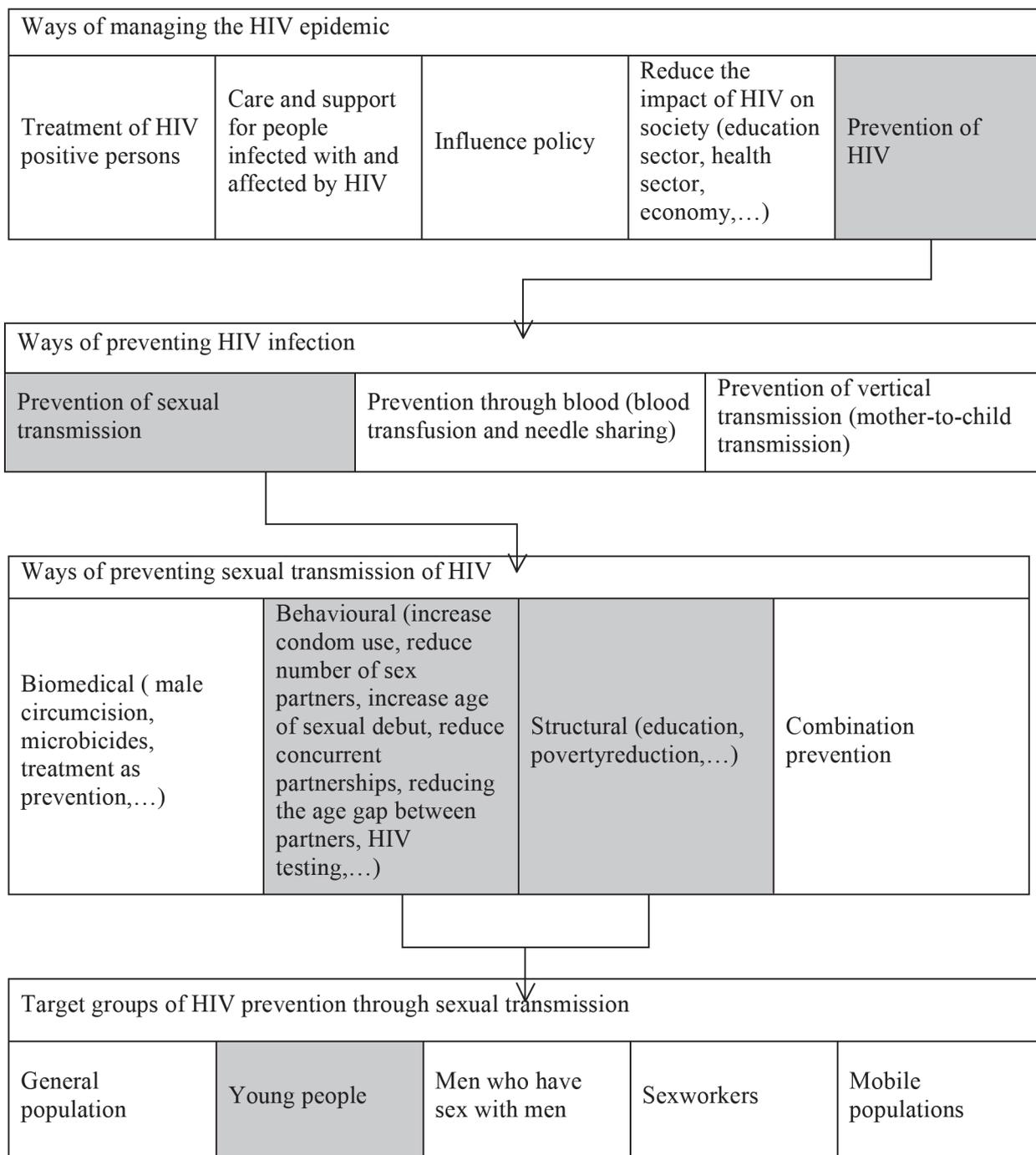
Three common messages dominate these reviews. Firstly, there is a paucity of evaluated HIV prevention interventions for young people, specifically in the severely affected region of sub-Saharan Africa. Secondly, the quality of evaluation designs is relatively low, hence the level of evidence is questionable. Thirdly, the current evidence paints a mixed picture: while interventions generally succeed in increasing knowledge and, to a lesser extent, changing attitudes, the effectiveness on self-reported behaviour is more ambiguous and effectiveness to reduce HIV incidence has not been shown. Given the focus of these reviews (thematically, geographically or methodologically), none of these reviews focused specifically on HIV prevention interventions for young people in sub-Saharan Africa.

## Objectives

Given that young people remain at the centre of the HIV epidemic, the general objective of this study was to improve the effectiveness of HIV prevention interventions for young people in sub-Saharan Africa.

To this end, we identified four specific objectives (see Figure 2):

- To assess the overall effectiveness of HIV prevention interventions for young people in sub-Saharan Africa;



*Fig. 1*

- To assess the effectiveness of a peer-led school-based HIV prevention intervention in Rwanda;
- To identify and study possible reasons for the observed limited effectiveness of HIV prevention interventions for young people in sub-Saharan Africa;
- To formulate recommendations to improve the effectiveness of HIV prevention for young people.

These objectives were reached using a mix of different quantitative and qualitative methodologies. The advantage of combining several research methods is that they can counteract each other's weaknesses while taking advantage of the particular strengths of each method; combining research methods most likely results in a more complete picture of the topic under study.

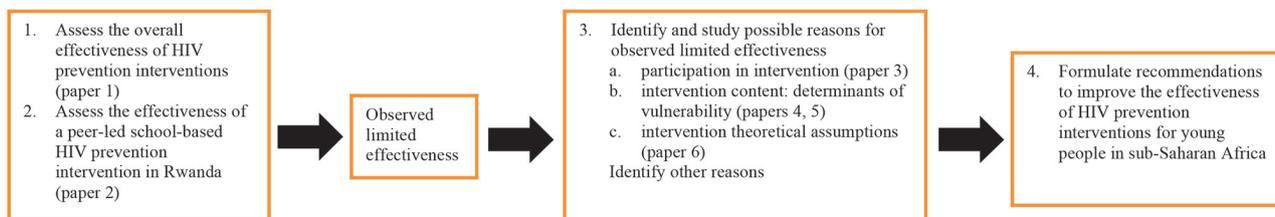


Fig. 2. — Overview of doctoral research objectives

The study was approved by the Ethics Commission of the Ghent University Hospital (2008/485), the Rwanda National Ethical Committee (42/RNEC/2009), the Rwandan Institute for Statistics (130/2009/INSR) and the Rwandan National AIDS Commission (0135/CNLS/2009/S.E). All participants provided informed consent.

## Methods and Results

### 1. To assess the overall effectiveness of HIV prevention interventions for young people in sub-Saharan Africa (Michielsen et al., 2010)

Literature reviews on the effectiveness of particular types of HIV prevention interventions for young people and other populations in sub-Saharan Africa and other regions, suggest a limited effectiveness of such interventions in changing sexual behaviour and reducing HIV incidence. However, a literature study and meta-analysis on the effectiveness of HIV prevention interventions for the specific population of young people in sub-Saharan Africa, that allows drawing overall conclusions on their effectiveness, was missing. Studying evaluations of HIV prevention interventions for young people also provides insights in possible reasons for their success/failure.

Recommendations from the PRISMA statement for conducting and reporting on systematic literature reviews and meta-analyses were followed. Study eligibility and extraction procedures were specified in a systematic review protocol. Using pre-defined search terms, articles were sought in online databases, on websites of relevant international organizations, in reference lists and on Google Scholar. In total, 31 articles met the inclusion criteria (published between January 1990 and December 2008; focus on the general population of young people aged 10-25 years; report on an intervention taking place in sub-Saharan Africa; report an evaluation aiming to reduce sexual risk taking; have a control group), reporting on 28 interventions.

Most interventions were set in schools ( $n = 16$ ). Four interventions combined school and communi-

tylevelactivities, whereas eight were only community-based. The majority were in urban areas ( $n = 15$ ) or in a combination of urban and rural settings ( $n = 10$ ). Duration of intervention ranged from an hour-long reading of an illustration book to intensive sexual health education over 3 years, combining teacher-peer activities in school, with community activities and provision of youth friendly health services. Seventeen contained elements of peer education, of which five relied solely on peer workers. Difficulties with implementing planned activities were reportedly common and differential exposure to intervention was high.

Two hundred and seventeen outcome measures were extracted: 88 early (within 1 year of intervention) and 129 late outcomes (more than 1 year after the end of the intervention). No positive effects on sexual behaviour (being sexually active, recent sexual activity, number of sexual partners) were detected and condom use at last sex only increased among males [relative risk = 1.46; 95% confidence interval = 1.31–1.64], but remained at a low level. One study reported a reduction of herpes simplex virus-2, but not HIV incidence. Effects were larger in males, in highly exposed youth and in younger adolescents.

There is a paucity of qualitatively evaluations of HIV prevention interventions for young people in sub-Saharan Africa. Given the extent of the problem, surprisingly little information was available: only 28 studies were identified with as few as two studies collecting biological endpoints, and many studies had suboptimal study designs. There were very few commonalities in study design and interventions tested, perhaps suggesting that there is little consensus on the optimal approach to these interventions and that few studies have built upon previous knowledge in a linear fashion.

A number of studies ascribed the limited impact of interventions to poor implementation of the interventions (e.g. reluctance of teachers and health professionals to discuss condom use with youth, resource constraints and general disorganization). But limited effectiveness might also stem from flaws in

the assumptions underlying HIV risk reduction interventions. Although the interventions varied markedly in the setting and delivery strategies they adopted, they predominantly focused on HIV/AIDS as a means of changing sexual risk behaviour. However, the existence of a direct causal link between sexual behaviour and HIV infection does not mean that the converse is true. From an ecological perspective, HIV/AIDS is only one factor among a great number of interacting factors which operate on different levels to influence sexual behaviour.

2. *To assess the effectiveness of a peer-led school-based HIV prevention interventions in Rwanda (Michielsen et al., 2012)*

To get more hands-on insight into how such interventions are developed, implemented and evaluated we evaluated a peer-led school-based HIV prevention intervention in Rwanda. The intervention took place in all fifteen secondary schools in the district of Bugesera (Rwanda) and was developed and implemented by the Rwandan Red Cross. The general objective of the peer education program was to reduce sexual risk behavior and to promote sexual and reproductive health in the secondary school communities by activating the anti-AIDS-clubs in the schools. The intervention consisted of an initial six-day training for five students (peer educators) of each participating school, as well as for one teacher per school who was tasked with supporting the peer educators in their daily activities. The training consisted of information on the Red Cross and its main principles, HIV/AIDS, sexually transmitted diseases, family planning and pregnancies, the role of the peer educator (what is expected of a peer educator and what is the deontology of a peer educator?) and teaching methods (how to best approach students and how to transmit messages and counsel?). School principals attended a half-day information session on the program. The peer educators were selected by the disciplinary teacher, who lives in the school and knows the students well, based on a number of predefined criteria (personal characteristics, sex, study year).

We used a longitudinal nonrandomized controlled trial. In fourteen schools (eight intervention and six control schools) 1,950 students completed a standardized questionnaire at baseline. We undertook two additional measurements, six (T1) and twelve months (T2) in the intervention. Statistical analyses were done in Stata and SAS, using propensity score matching, generalized estimation equations and multivariate regression analysis. The overall retention rate was 72%. The effectiveness results are presented in Table I.

The evaluation study in Rwanda confirmed the difficulty of changing young people's sexual behaviour: the intervention did succeed in increasing young people's perception that AIDS is a serious disease and reduced self-reported enacted stigma. However, multivariate analyses showed no significant differences in sexual risk behavior (being sexually active, sex in last six months, condom use at last sex) between intervention and control group. Dose-effect analyses found that active participants had increased knowledge, but did not change their behaviour more than passive participants.

Large proportion of students in the intervention schools did not participate at either point in time (43.4% at T1 and 46.5% at T2). In a supplementary dose-response analysis among students from the intervention schools only, we investigated whether more intensive participation in the peer education program affected any of the seven dependent variables. Only for knowledge of HIV we observed a statistically significant time\*participation score at T2, yet the effects of higher participation on were minimal and not behaviorally meaningful.

The limited effectiveness of this intervention parallels the problems identified in the literature review and meta-analysis. The intervention was confronted with implementation problems: in the second half of the intervention not all activities that were planned took place because of internal organizational problems. Nevertheless, these problems only occurred in the second part of the intervention, not explaining the limited effect at T1.

Analyzing this and other interventions, we identified several reasons for the observed limited effectiveness of peer education. Firstly, intervention activities (spreading information) are not tuned to objectives (changing behavior). The objectives of the intervention are very broad (to reduce sexual risk behavior and to promote sexual and reproductive health in the secondary school communities), as is the case in many other peer education interventions, while the methodologies used are rather limited (informative, sensitizing methodologies such as theatre, songs, counseling). It has been amply demonstrated and discussed that increasing knowledge alone will not change sexual behavior (Kirby et al., 1994; James et al., 2004; Odu et al., 2008), since sexual behavior is also determined by a number of other factors. For example, we cannot expect young people to use more condoms by only talking about condoms and not providing them in the schools. Furthermore, the intervention strongly focussed on individual determinants of sexual behaviour, perhaps neglecting other determinants of sexual behavior on different levels: personal, inter-personal, institutional, socio-cultural, structural

**Table I.** — Results of the Peer Education intervention on sexual behavior, HIV knowledge and attitudes.

	Ever had sexual intercourse OR [95% CI]	Had sex in last 6 months OR [95% CI]	Condom use at last sex OR [95% CI]	Knowledge of HIV protection modes Bèta-coefficient [95% CI]	Perceived susceptibility Bèta-coefficient [95% CI]	Perceived severity Bèta-coefficient [95% CI]	Enacted stigma Bèta-coefficient [95% CI]
Intervention (ref. control group)	1.12 [0.82-1.52]	1.24 [0.80-1.92]	1.22 [0.76-1.94]	-0.11 [-0.23-0.00]	0.57 [0.27-0.86]*	-0.65 [-0.92- -0.38]*	0.18 [0.12-0.25]*
Month (T1) (ref. baseline)	1.84 [1.58-2.14]*	1.46 [1.04-2.05]*	1.28 [0.73-2.26]	0.25 [0.16-0.35]*	-0.21 [-0.44- 0.02]	-2.00 [-2.25- -1.75]*	-0.08 [-0.12- -0.04]*
Month (T2) (ref. baseline)	2.37 [1.99-2.82]*	1.17 [0.79-1.74]	1.31 [0.74-2.32]	2.40 [2.29-2.51]*	-0.35 [-0.58- -0.12]*	-2.14 [-2.39- -1.88]*	-0.07 [-0.11- -0.02]*
Intervention* Month T1	0.97 [0.78-1.20]	0.80 [0.50-1.28]	0.73 [0.35-1.53]	-0.15 [-0.30- -0.01]*	-0.29 [-0.65-0.07]	0.38 [0.00-0.76]	-0.08 [-0.15- -0.02]*
Intervention* Month T2	1.27 [0.98-1.64]	1.21 [0.71-2.05]	0.75 [0.36-1.57]	-0.19 [-0.36- -0.02]*	0.02 [-0.34-0.37]	0.73 [0.36-1.11]*	-0.05 [-0.13- 0.02]
Alcohol – at least once a month (ref. never)	2.17 [1.65-2.84]*	1.68 [1.22-2.31]*	-	-	-	-	-
Alcohol – at least once a week (ref. never)	3.92 [2.59-5.91]*	4.64 [3.09-6.97]*	-	-	-	-	-
Sexual Self-Concept	1.18 [1.12-1.25]*	1.11 [1.05-1.18]*	-	-	-0.12 [-0.16- -0.08]*	-	-0.01 [-0.02- 0.00]*
Locus of control	-	-	-	-	-	0.07 [0.03-0.11]*	-

\*significant at level 0.05, all models controlled for the propensity score variable.

(e.g. the socio-ecological model of Bronfenbrenner (Bronfenbrenner, 1979)).

Secondly, young people prefer receiving HIV information from other sources than peers. In our study students we asked to indicate the two main channels through which they would prefer to receive information on HIV: friends ranked sixth as a preferred source of information, after radio, parents, television, teachers and medical experts (doctors/nurses).

Finally, outcome indicators are not adequate and the context of the relationship in which sex occurs and the context in which sex occurs is ignored. In this and many other evaluation studies, internationally recognized indicators are used: ‘condom use at last sex’ (if this increases the intervention is considered successful), ‘recent sexual activity’ (if this decreases, the intervention is considered successful),

the ‘number of sexual partners in the last 6 months’ (if this decreases the intervention is considered successful). We argue that these indicators might not be adequate to measure the actual risks taken by the respondents. By using these indicators individually and by neglecting the relationships or context in which these sexual activities take place, these indicators ignore that young people can have healthy sexual relationships.

### 3. To identify and study possible reasons for the observed limited effectiveness of HIV prevention interventions for young people in sub-Saharan Africa

While the first two objectives demonstrated a rather limited effectiveness, the third objective aimed to identify and study more in-depth the possible

reasons for this limited effectiveness of HIV prevention interventions for young people in sub-Saharan Africa. More specifically, we studied:

- the profile of active participants in interventions (data not presented here)
- the determinants of sexual behaviour of young people
- the theoretical underpinnings of HIV prevention interventions

This objective mainly relied on studies taking place in Rwanda and on literature.

### 3.1. Determinants of young people's sexual behaviour

A possible explanation of the limited effectiveness of HIV prevention interventions could be that the interventions do not address the right topics to make young people change their behaviour. Since sexuality and sexual relationships are inherently embedded in a social context, a thorough contextualized understanding of young people's perceptions on sex and relationships is essential for formulating effective SRH promotion interventions. However, few studies on sexuality of youth in Africa go beyond describing HIV risk related behaviours. We undertook two studies on determinants of young people's sexual health, focussing on different levels.

Firstly, we aimed to gain a thorough understanding of young Rwandans' perceptions on sexuality and relationships, by analysing the stories they spontaneously write about sexuality and relationships. This allowed to identify factors that young people themselves indicate to be important in their sexual decision making and allows to analyse their particular vulnerability for HIV infection and poor sexual and reproductive health.

Secondly, focusing on the environmental level, we assessed the link between being out-of-school on the one hand and HIV status and risky sexual behaviour on the other hand, thereby uncovering the protective/hazardous effect of schooling for young people. This study aims to demonstrate the important role of structural level factors on young people's HIV status, sexual and reproductive health and sexual behaviour. To this end, we undertook a literature review of descriptive studies in East and Southern Africa.

#### 3.1.1. Complexity of young people's sexual behaviour

One of the hypotheses of the observed limited effectiveness of HIV prevention interventions for young people in sub-Saharan Africa, and in Rwanda

in particular, is that HIV prevention interventions do not address the right topics to make young people change their sexual behaviour. Hence, a study into the factors that determine this sexual behaviour is advisable, but complex and sensitive. The main objective of this study was to gain a thorough understanding of young Rwandans' perceptions on sex and relationships. More specifically the study aimed to: (i) assess young Rwandans' vulnerability for poor sexual and reproductive health and (ii) to formulate recommendations for interventions that more directly address young people's needs. Given the exploratory nature of such a study, we opted for a qualitative approach. This allows to uncover hidden and underlying factors that influence sexual decision making, and allows to get an in-depth understanding of the perspectives of the study population. There were several concerns for collecting data among in-school Rwandan youth using on the sensitive topic of sexuality and relationships traditional qualitative methodologies. Since the majority of the students live in boarding schools, without privacy, using a diary method was not appropriate because of the lack of safe storage spaces. An essay method, asking young people to write an essay on a particular subject would have the downside that students would only be able to express their ideas on one particular (imposed) moment. We sought a way in which young people could freely and voluntarily express their ideas on paper without having to store their written documents in an unsafe place. The idea of a mailbox emerged, which offered the advantages of anonymity and spontaneity.

Mailboxes were installed in five secondary schools in Rwanda and students were invited to write about their ideas, secrets, wishes, desires and fears on sexuality and relationships. In total, 186 letters were collected, of which 154 were relevant to the topic. Analysis was done in QSR NVivo 9 (QSR International Pty Ltd, Melbourne, Australia).

Letters written by Rwandan young people in the qualitative mailbox technique, revealed a large number of determinants of sexual behaviour, ranging from personal factors (e.g. puberty, knowledge) over inter-personal factors (e.g. type of sexual relationships) and environmental factors (e.g. school) to social and cultural factors (e.g. norms, economic factors, gender), demonstrating the complexity of sexual behaviour of young people.

The letters found a dominance of two types of sexual relationships: experimental sex taking place unprepared among same-age youth and driven by sexual desire, and transactional sex, where young people have sex with an (often older) partner in exchange for money or goods and driven by peer pressure to possess the right material goods. While these

types of relationships and contextual factors put young people at risk for HIV infection, they were not dealt with in the intervention. The letters also clearly demonstrated that the young people do not have the necessary capacity to deal with the risks occurring from these relationships: they do not receive adequate support from important adults (i.e. parents and teachers), they have limited general biological knowledge, and the health services are often stigmatizing towards young people. Furthermore, we found that a number of structural factors as gender, societal norms and economic factors strongly influence young people's sexual behaviour.

We can conclude that the vulnerability of young people is determined by a complex interrelated web of mutually reinforcing factors. These factors carry different weights for different individuals and groups and in different situations. To be effective, interventions need to deal with these dynamic influencing factors. Targeting younger children with key messages on sexuality and relationships, before the complex physical and emotional process of sexual identity construction starts, might be a first step in making adolescents more able-bodied to deal with their vulnerability. Furthermore, research into the importance of the factors influencing this vulnerability could help in prioritizing intervention strategies. Next to prevention messages for larger groups, the vulnerability of adolescents – prone to peer pressure and doubt – calls for an individual approach. The creation of a 'safe haven' for them to be able to ask these questions and express their concerns is essential.

### 3.1.2. The role of structural factors: education (Stroeken et al., 2012)

To study the role of these determining factors influencing young people's sexuality, we studied one, often mentioned, factor in more detail: education. We assessed the link between being out-of-school on the one hand and HIV status and risky sexual behaviour on the other hand, thereby uncovering the protective/hazardous effect of schooling for young people. To this end, we undertook a literature review of descriptive studies in East and Southern Africa.

We found that in-school youth have less HIV and demonstrated less risky sexual behaviour than out-of-school youth. Out-of-school youth was significantly associated with risky sexual behaviour, more precisely with early sexual debut, high levels of partner concurrency, transactional sex, age-mixing, low risk perception, a high lifetime number of partners, and inconsistent condom use. Being-in-school not only raises health literacy; the in-school (e.g. age-near) sexual network may also be protective, an

effect which the better-studied (and regionally less significant) variable of educational attainment cannot measure.

### 3.2. To assess the theoretical assumptions used to change behaviour in HIV prevention interventions for young people in sub-Saharan Africa (Michielsens et al., 2012)

One of the conclusions of our literature review and meta-analysis was that the observed limited effectiveness might stem from flaws in the assumptions underlying HIV risk reduction interventions. We undertook a study assessing the theoretical underpinnings of HIV prevention interventions for young people in sub-Saharan Africa. Using a systematic literature, we assessed the theoretical underpinnings of existing HIV prevention interventions for young people in sub-Saharan Africa.

Based on pre-defined search criteria, the literature search initially identified 1073 article titles and/or abstract. After analysis of title and abstract using clear inclusion criteria, we reviewed 73 full-text publications. In total, evaluations of 34 studies met the inclusion criteria, reported on in 38 articles.

About three quarters of the studies – 25 of 34 – mention having used at least one theory. In total, 19 different theories were mentioned 42 times. Several stated they had applied two or more theories, with three papers reporting that the intervention design drew on three theories. Three behavioural theories were found to be at the basis of most interventions: social cognitive theory ( $n = 13$ ), theory of reasoned action/planned behavior ( $n = 7$ ) and health belief model ( $n = 6$ ). Assessment of the concepts used in the interventions not explicitly mentioning the use of a theory indicated that they also have operated from an assumption that knowledge, attitudes, beliefs and/or role models determine sexual behaviour.

Of 25 interventions that mentioned a theory, 7 said the theory was used to both inform the content of the intervention (e.g. the curriculum) and to inform the evaluation or questionnaire design. In 13 studies, theory was reportedly used only to inform the intervention content, and in 4 only for designing the evaluation or questionnaire.

Only three articles provided information on why a particular theory was selected, nine authors limited themselves to a brief explanation of the theory itself and the remainder did not provide any information on theory selection.

Theory-based interventions were not more effective than non-theory based interventions.

While theories could provide guidance in simplifying this complex behaviour and in identifying key

determinants, their focus remains on individual cognitions, such as HIV related knowledge and attitudes, simplifying sexual behaviour too much. To face the complexity of young people's sexual behaviour, interventions often resort to causal reductionism and simple, often (unconsciously) moralising messages. While such cognitive behavioural models can explain the links between intention and behaviour, particularly at an intra-personal level, they are less able to account for inter-personal and contextual factors related to the complexity of sex, the experience of youth and disparities in social, cultural and economic realities of youth in sub-Saharan Africa.

## Discussion

Given the high burden of HIV on young people in sub-Saharan Africa, the main objective of this study was to improve the effectiveness of HIV prevention interventions for young people in sub-Saharan Africa. To that end, we assessed the overall effectiveness of such interventions, identified reasons for their success/failure, and subsequently studied areas for improvement.

Three decades of developing, implementing and evaluating HIV prevention programmes for young people in sub-Saharan Africa has not resulted in a 'gold standard' intervention. Both on the macro-level (meta-analysis) and the micro-level (peer-led interventions) no convincing evidence was found of the effectiveness of these interventions in reducing sexual risk behaviour of and HIV incidence in the target population.

On the other hand, UNAIDS reports that HIV incidence declined among young people in 21 countries with generalized epidemics between 2001 and 2009 and that these reductions occurred amid signs of changes in sexual behaviour (later sexual debut, reduction of multiple partnerships and increase of condom use at last sex) (The International Group on Analysis of Trends in HIV Prevalence and Behaviours in Young People in Countries most Affected by HIV, 2010; UNAIDS 2011b). This means that young people are changing their behaviour, but that these changes are hardly observed as the results of HIV prevention interventions. In this section, we will elaborate on the possible reasons for the observed limited effectiveness of HIV prevention interventions on sexual risk behaviour of young people in sub-Saharan Africa.

The observed limited effectiveness of HIV prevention interventions in sub-Saharan Africa in changing young people's sexual behaviour and reducing HIV incidence cannot be attributed to one

single cause. Based on our studies and literature, we identified two main mechanisms:

- factors related to the intervention: intervention design (content and objectives) and intervention implementation (reach and approach);
- factors related to the evaluation: evaluation design and evaluation outcomes.

All aspects are discussed hereafter, followed by recommendations.

### *Factors related to the intervention*

Interventions focus too much on cognitions on the individual level, ignoring other determinants of sexual behaviour, making it possible that they are doomed from the outset, simply because it is immensely difficult to alter individual's sexual behaviour in the presence of static community norms and social and cultural factors.

### Intervention design

Sexual decisions depend on interlinked personal factors, partner characteristics, type of relationship, the proximate context (e.g. school, family) and the more distal social and cultural context (e.g. norms, gender, poverty) (Fig. 2). Seen from an ecological viewpoint, it is clear that interventions mainly focusing on personal HIV knowledge, attitudes and skills can only have limited effects on sexual behaviour. Recognizing the complexity and heterogeneity of sexual behaviour, theory could provide guidance in simplifying this complex behaviour and in identifying key determinants. However, the implicit assumptions made by many HIV prevention interventions might simplify sexual behaviour too much.

Reducing sexual risk behaviour among young people is essential in reducing HIV incidence, however, the extent to which changes in sexual behaviour are reflected in changes in HIV incidence also depends upon relational and contextual factors. Otherwise put, the same behaviour does not result in the same risk for HIV infection in every relationship or context. In order to have a high impact, interventions should focus on the most risky behaviour(s) of their target population, and its dominant predictors, and should consider the position of the target population within the dynamic sexual network through which HIV is spread (Hallett et al., 2007).

By analysing existing data on the determinants of this complex behaviour and their pathways, and by gathering additional information, researchers should make unprecedented efforts to develop more effective interventions. Interventions should be population- and context-specific, requiring renewed

attention to the first phase of intervention planning: the situation analysis and needs assessment.

## Implementation

The observed limited effectiveness of HIV prevention interventions for young people in sub-Saharan Africa is not responded to by extensive (published) process evaluations. Little is known about the implementation quality of interventions; in evaluation studies, implementation aspects are rarely or concisely reported upon. Scientific papers reporting uniquely on the implementation of interventions are even rarer; it seems that only large trials and study groups can afford to invest extensively in evaluating the process of developing and implementing HIV prevention interventions (Kinsman and Harrison, 1999; Jewkes et al., 2006; Pronyk et al., 2006; Pettifor et al., 2007; Cowan et al., 2008; Jewkes et al., 2010; Renju et al., 2010). Furthermore, process evaluations are more difficult to get published in scientific journals than outcome evaluations – while only one journal is specifically focused on implementation science for health interventions, a large number of journals are interested in outcome evaluations of health interventions. The limited word count that applies to most journals hinders that both evaluation types are presented together.

Monitoring interventions is essential in understanding their effectiveness. Evaluators, intervention managers and scientific journal editors should become aware of the importance of making the processes of intervention development and implementation publicly accessible, in order for others to learn from successes and failures.

## Recommendations

Existing data should be used, and new information needs to be collected, on what determines sexual behaviour of young people and how. Since it is difficult to address all factors that influence vulnerability in a single behavioural intervention, research into the importance of the factors influencing vulnerability and risk could help in prioritizing strategies.

Equally important is to study the causal pathways through which factors influence young people's sexual behaviour and HIV prevalence. This is essential both for intervention development (what are the determining factors of risky sexual behaviour and how can they be influenced) and intervention evaluation (which can then measure relevant intermediate determinants of sexual behaviour).

Given that sexual behaviour is context-specific, interventions should be designed to take into ac-

count the target populations' specificities. Hence, the process to arrive to the intervention deserves a central place in HIV prevention – e.g. start with a situation analysis and needs assessment and use a participatory approach to develop a context-specific intervention including key stakeholders and taking into account past, ongoing and planned interventions. We also argue to study the use of an alternative, less judgmental, and more empowering, intervention outcome in HIV prevention interventions for young people in sub-Saharan Africa: making young people sexually competent, stimulating them to be sexually responsible, making sure sexual intercourse is characterised by absence of coercion and regret, autonomy of decision, and use of a reliable protection method (Wellings et al., 2001).

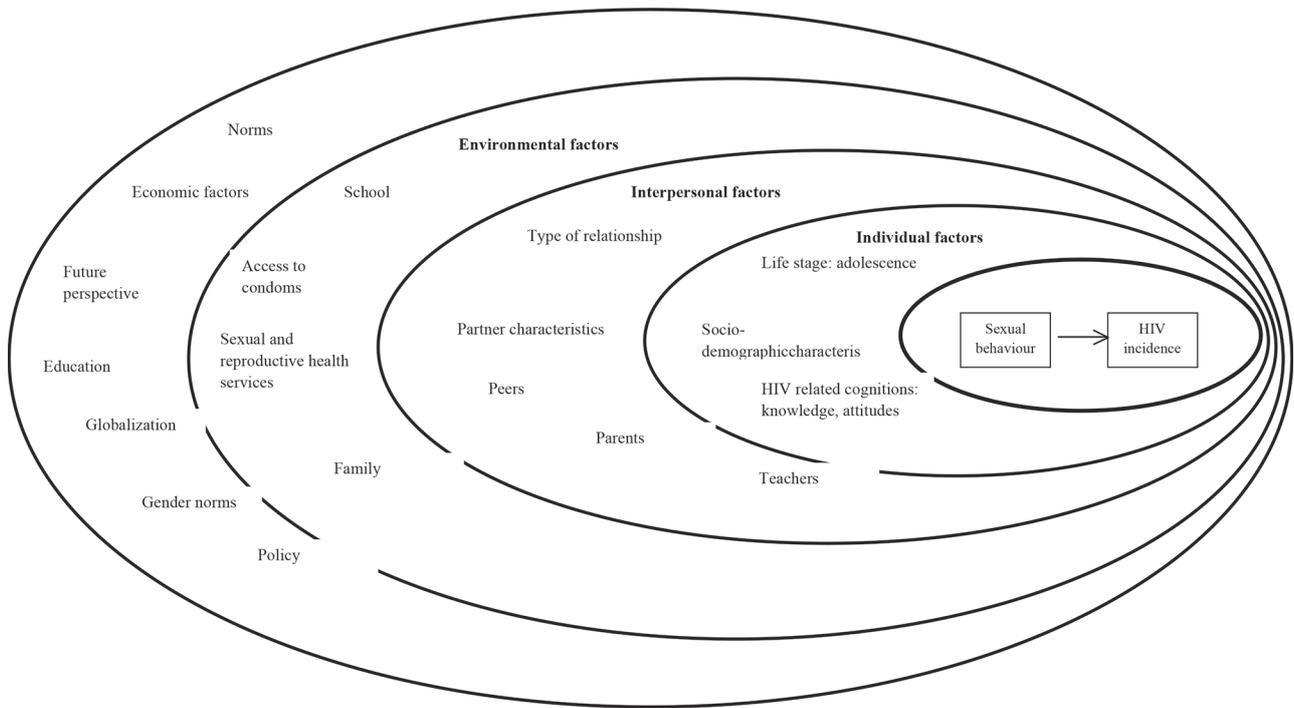
Interventions should be regularly monitored and adjusted if necessary, as an integral part of the implementation and evaluation process. In the preparatory phase of the intervention, intervention planners should study the preferred information sources and activities of the target population and adapt the intervention accordingly. The choice of an intervention strategy should be done in concordance with other activities taking place in the region. In order to increase collaboration between and among intervention planners, researchers and evaluators (Bertozzi et al., 2008; Gupta et al., 2008; Laga et al., 2012), we propose the development of a central online repository that gathers information on interventions (e.g. content, set-up), monitoring and process evaluations (e.g. implementation issues and solutions) and effectiveness evaluations (e.g. evaluation designs, outcome measures) (Plummer et al., 2011).

## *Factors related to the evaluation*

While we identified several flaws in intervention design and implementation, that may explain the observed limited effectiveness of HIV prevention interventions for young people in sub-Saharan Africa, UNAIDS data report that “young people are leading the HIV prevention revolution” and that reductions in HIV prevalence coincide with changes in sexual behaviour among young people. Therefore, we cannot exclude that interventions do have an effect on young people's sexual behaviour, but that evaluations do not succeed in demonstrating this effect.

## Design

An overview of evaluations of HIV prevention interventions for young people in sub-Saharan Africa demonstrates few commonalities in study design,



**Fig. 3.** — Determinants of sexual behaviour of young people identified in this doctoral research study

perhaps suggesting that there is little consensus on the optimal approach and that few studies have built upon previous knowledge in a linear way.

Randomized controlled trials are considered the gold standard for determining cause-and-effect relationships. However, their use in measuring the effectiveness of HIV prevention interventions on sexual behaviour is often compromised by the complexity of the real life situation in which these interventions take place. The long causal pathway in changing sexual behaviour and the multitude of influencing contextual factors hinder evaluators to assign changes to the intervention. While the ultimate objective of the interventions is to reduce HIV incidence among young people, this is difficult to assess due to the large sample size necessary to measure changes in HIV incidence. An additional challenge of evaluation studies, not only RCTs, is making sure the evaluation is sufficiently powerful. Problems with the correct use of evaluation designs might lead to false conclusions, while insufficiently powered evaluations or short-term measurements may hide actual effects.

Even though RCTs are still considered by many to be “the cornerstone of the evidence needed to support implementation of HIV prevention programmes” (Hayes et al., 2010) and “will remain the most rigorous and convincing intervention study design” (Ross, 2010), we follow Laga et al. (2012) when she “advocates for realism and pragmatism when it comes to generating more convincing evi-

dence to guide prevention programming” and proposes “plausibility designs” as an alternative.

#### Outcomes

We argue that the indicators currently used to measure this sexual risk behaviour are not a correct reflection of the actual risk taken, since they are taken out of the context of the relationship and network in which they take place. It is possible that interventions do change sexual behaviour, but that these changes are not observed due to flaws in the evaluation design and indicators used.

Alternative evaluation designs should be formulated, combining different evaluation approaches mirroring the intervention process (“combination evaluation”), and studying plausibility of effectiveness, rather than probability. In order to adequately measure sexual risk, composite contextualized indicators have to be developed combining aspects of transmission (including relational characteristics), exposure and infectiousness.

#### Recommendations

Researchers should invest in developing alternative, innovative, evaluation approaches that allow more flexibility and can better interpret results in the presence of societal changes and other influences on sexual behaviour. This includes that evaluating an intervention should not be limited to outcome

effectiveness, but should parallel the intervention process, including the essential phases of intervention development and implementation. Given the complexity of real life, context specific, HIV prevention interventions, studying interventions' effectiveness requires a creative combination of alternative approaches ("combination evaluation"), studying plausibility of effectiveness, rather than probability: process analysis and monitoring should be triangulated with (quasi-)experimental designs and other information sources as e.g. population-based surveys and statistical modeling (Laga et al., 2012). The latter can also assist programme developers and evaluators in understanding the expected effect of the intervention on HIV incidence.

Too often, these sexual behaviours are extracted from their context and measured in single variables. Complementing these indicators with newly developed contextualized, composite sexual behaviour measures is essential to measure the real risks young people are taking, and hence, the true effectiveness of interventions. Composite indicators should include three aspects: exposure (relationship and partner characteristics), transmission (type of sex and protective measures) and infectiousness (HIV infection and stage of infection of the partners).

## Conclusion

The conclusions and recommendations mainly affect five parties: researchers, intervention managers, evaluators, funders and scientific journal publishers. Accepting the complexity of sexual behaviour of young people, also means dealing with a considerable degree of uncertainty and flexibility. Intervention development, implementation and evaluation are to be considered inseparable: results of effectiveness evaluations should be considered of little use if no information is provided on the intervention or its implementation and vice versa. Since the evaluation should be an integral part of the intervention, intervention managers and evaluators need to work in close collaboration, without suspicion. Donors have to accept that a complex intervention cannot be designed beforehand, but requires a process approach that maps risky behaviours, dominant predictors, causal pathways and key stakeholders. This pre-intervention research should be considered a fundamental part of the intervention and donors should be aware that effectiveness depends on this phase, hence funding should be made available. In this process, reality, and not morality, should be at the forefront: young people should be approached as responsible individuals who are able to make their own decisions and need to be made competent to ensure their choice to (not) have sexual inter-

course is made autonomous, without coercion or regret and with the necessary in-depth knowledge of risks. This requires a change in attitudes of all stakeholders involved. A complex intervention approach also means that the intervention is monitored and can be changed during its course, resulting in the need for flexible, mixed and triangulated evaluation approaches ("combination evaluation") and flexible funding strategies. Scientific journals have the responsibility to make innovative approaches public, even though they might not be considered most rigorous by current scientific standards, as well as allow for elaborate reports on intervention development and implementation. We are convinced this can be done if all parties remain conscious of the ultimate objective; eradicating HIV among the important and vulnerable population of young people.

### What is already known?

- Reducing sexual risk behaviour in adolescents is crucial in tackling the HIV epidemic
- There is a paucity of evaluated HIV prevention interventions for young people especially in SSA and the quality of evaluation design is low
- Interventions generally succeed in increasing knowledge
- Their effectiveness on changing attitudes and self reported behaviour is less or ambiguous
- Their effectiveness to reduce HIV incidence has not been shown

### What is new in this research?

- Young people do not have the capacity to deal with the risks occurring during experimental and unprepared sex and sex with an older partner in exchange for money or goods, the 2 dominant types of sexual relationships among adolescents
- Interventions often resort to causal reductionism and simple moralizing messages, but they do not account for the complex interpersonal and contextual factors of sexual behaviour

### Remaining or new questions

- More research is needed on what determines sexual behaviour of young people, especially before planning a prevention intervention, in order to make the interventions population- and context specific
- Alternative and innovative evaluation approaches should be developed which can better interpret intervention results in the presence of societal changes and other influences on sexual behavior.

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