

"But there are no snakes in the wood": risk mapping as an outcome measure in evaluating complex interventions

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Objectives: To complement biological and social behavioural markers in evaluating the complex intervention of sexual and reproductive health among adolescents in rural Zimbabwe, community-derived markers of effectiveness were sought. Through a participatory workshop with adolescent boys and girls, an innovative "risk map research workshop" was developed to be conducted throughout the study sites.

Methods: 78 gender-specific standardised workshops were conducted among secondary school students. Participants drew risk maps of their community. Focus group discussions explored each risk area identified on the map. Grounded Theory was used to create "categories" and "subcategories." Workshops continued to be held until "saturation", whereby no new categories emerged. "Axial coding" identified the inter-relationship between categories and subcategories according to their relevance to sexual and reproductive health risk.

Results: Six "risk area" Grounded Theory categories emerged from the data: bush/rural terrain, commercial centres, homes, school environs, religious and spiritual venues, and roadsides. 17 subcategories emerged, grouped under each of the risk area categories, such as riverbeds, growth points, homesteads, classrooms, all-night prayer meetings and truck stops. Risks and the consequences of risks included sexually transmitted infections (including HIV), violence, sexual abuse, expulsion from school and illegal abortion.

Conclusions: Risk maps provide unique data that can be used to measure more subtle changes that occur as a result of social behavioural interventions aimed at addressing reproductive and sexual health. Another round of risk map research workshops will be held towards the end of the study to explore changes in milieu, behaviour and experiences, and will complement and triangulate the biological and other social behavioural outcome measures.

Not all sexually active people become pregnant or contract a sexually transmitted infection, but you do need to be sexually active to do so. In the pilot of the Regai Dzive Shiri study, a community randomised trial of a multicomponent adolescent HIV prevention intervention in rural Zimbabwe, only 13% (95% CI 4% to 27%) of those with gonorrhoea or chlamydia answered "yes" to the question "have you ever had sex?".¹ Data from our baseline survey of 6791 adolescents indicated that none of the HIV-positive boys or girls reported having had sex. Also, of the four girls who tested positive for pregnancy, none answered "yes" to the above question. The well-recognised weaknesses in self-reported behavioural data led us to seek ways to augment our outcome measures by devising community-derived markers of effectiveness.

We held a 3-day participatory workshop with 30 adolescent boys and girls who had just completed secondary school (aged 16–18 years) in Rowa, Manicaland, Zimbabwe, to engage young people in designing new outcome measures for the study. During this workshop, we piloted a number of participatory methods, including story telling, timelines, role-play and drama, pairwise ranking and mapping. The consensus among the participants and facilitators was that "risk mapping", with follow-up focus group discussions, was especially valuable in providing insightful data on sexual behaviour and concomitant risk. Subsequently, we developed and refined a risk map research workshop, aimed at providing us with community-level outcome measures, but also to deepen our understanding of the milieu and mores of adolescent sexual behaviour. Indeed, many studies have shown the importance of exploring the environment and context of sexual risk, in countries as diverse as Uganda,² Vietnam,³ Sweden,⁴ South

Africa,⁵ Cambodia,⁷ Kenya,⁸ Zimbabwe⁹ and Tanzania,^{10–12} but this is the first time that risk maps have been used both as a research tool and as a means to help measure the impact of an intervention. More commonly, risk maps are used in formative research to aid intervention development, such as in identifying environmental variables associated with incidences of snake bite in West Africa,¹³ for risk analysis of malaria in Sri Lanka¹⁴ and for identifying local non-biological factors determining the incidences of tick-borne diseases¹⁵ and geostatistics¹⁶.

Using guidelines developed at the Rowa workshop, risk map research workshops were held across the study sites. These were expected to provide valuable baseline data that (1) would be compared later with risk maps drawn at the time of the final survey and (2) provide a descriptive framework of young people's perception of risk. Repeating the exercise at the end of the study would enable us to detect subtle changes in risk in the environment that may have occurred as a result of our intervention.

METHODS

Risk map research workshops were conducted at 39 secondary schools (between July 2003 and January 2004) across all three provinces involved in the study (Masvingo, Manicaland and Mashonaland East). A total of 78 gender-specific workshops were conducted: 39 with boys and 39 with girls, with attendances ranging from 8 to 12 per group. Participants were recruited from the 14-year-old age group, form 2 pupils (totalling 37 boys' and 35 girls' workshops, who had already consented through the main cohort study). A further two boys' workshops and four girls' workshops comprised form 3 and 4 pupils, who were aged 16–18 years and who had given consent. Each workshop was facilitated by a same-sex member of the

Table 1 Sexual and reproductive risk categories

Risk areas	Risks	Consequences of risk
Bush/rural terrain Forest or bush (B = 12; G = 17) Hills and grazing (B = 13; G = 13) Riverbeds (B = 12; G = 24) Dip tank and borehole (B = 9; G = 2)	Consensual unprotected sex Forced sex Gambling Alcohol and drug misuse	Unplanned pregnancy STIs, including HIV Violence Sexual abuse
Commercial centres Growth points (B = 5; G = 6) Business centres (B = 33; G = 35)	Older men in night clubs (females only) Alcohol and drug misuse Unprotected sex	Theft Expulsion from school Illegal abortion
Home Familial household (B = 22; G = 34) Lodging (B = 0; G = 1) Child-headed households (B = 0; G = 3) Cultural practices (B = 3; G = 1)	Sexual and physical abuse Abortion (assisted by family) Alcohol misuse Forced marriage	Baby dumping
School environments School (B = 38; G = 38) Sports field (B = 16; G = 8)	Sex for better grades/marks Sexual abuse from teachers Consensual unprotected sex Corporal punishment Alcohol misuse	
Religious and spiritual venues Church and all-night prayer meetings (B = 30; G = 33) Traditional healers (B = 0; G = 4)	Consensual unprotected sex Forced sex (by peers and adult church leaders) Forced marriage (to adults and church leaders)	
Roadside Highways (B = 9; G = 15) Bus stops ((B = 1; G = 1)	Consensual unprotected sex Sexual abuse and rape (hitch-hiking) Violence	

B, boy; G, girl; STI, sexually transmitted infection.
Axial coding resulted in specific outcomes as noted in the risks column and more generic consequences of risk, as listed in the final column of the table.

Regai Dzive Shiri social science team, with another team member taking notes. All workshops were conducted in Shona (the indigenous language), following a standard format trialled in the pilot workshop. First, the group was given a large sheet of A1-sized paper and coloured pens and asked to draw their community by identifying “places where it is risky for young people to be.” This activity lasted for about 30 min, and consensus about which venues should appear on the risk map was reached within the group. Second, a focus group discussion took place, during which the risk map was presented to researchers who then explored each of the risk areas identified on the map, with questions asked about why it was perceived as risky, what took place at the location, and what the consequences of the risky behaviours might be.

Digital photographs of all risk maps were taken and field notes were transcribed into English by the social science team and then entered into the NVivo (QSR International, Victoria, Australia) computer program for qualitative research.

The data were analysed within an inductive framework, according to the general principles of Grounded Theory.¹⁷ Regular weekly meetings were held by the social science team, where the risk mapping data were discussed and a consensus regarding main “categories” and “subcategories” was arrived at. Subsequently, a template was created in NVivo for data management and retrieval according to the agreed categories and subcategories. Risk map research workshops continued to be held until “saturation”, whereby no new categories emerged from the data. We then undertook the process of “axial coding” to look at the inter-relationship between categories and subcategories according to their relevance to sexual and reproductive health risk.

RESULTS

Table 1 outlines the Grounded Theory analysis of the risk map research workshops. This shows six “risk area” Grounded

Theory categories and 17 subcategories, grouped under the risk area categories. This table also shows the number of times each risk venue was mentioned in the risk map research workshops by the gender group.

As table 1 shows, the risk map research workshops identified a wide range of risk locations, environments and scenarios. The predominant risk activity centred around sex, either consensual or forced, and, as reiterated during all the focus discussion groups, only rarely with condoms. However, for male youths, gambling, drinking and smoking marijuana were also common activities, which often resulted in violence and sexual abuse of girls.

It also became apparent from all discussions following the mapping exercise that many risk locations were also places where young people would meet for consensual sexual activity.

Workshop participants often spoke about the importance of an area being secluded: allowing young people to meet in secret, yet also making them risky locations. Also, as table 1 clearly illustrates, less secluded locations, notably school, church and the familial home, were venues with high risk of sexual abuse.

The results and illustrations described below derive from the focus group discussions that took place once the maps had been drawn in the workshops.

Bush/rural terrain

It is difficult for young adolescents in rural Zimbabwe to find private places to go. Forests, dry river beds, and the often lengthy journey to and from school or from a sports activity are all examples of places where young people can find seclusion. These were locations highlighted on the risk maps by respondents as places where consensual and non-consensual sex occurred.

Commercial centre

Commercial or shopping centres commonly comprise small clusters of around six shops or stalls selling general household

Box 1: Qualitative data from focus groups

Bush/rural terrain

- "There are thick forests there. Men wait for people there. These men are mostly the community youths who get drugged with mbanje [marijuana] in that forest. You just meet them and they rape you. Boys and girls from the school have sex [there]. In the bushes, young girls are raped when they go to fetch firewood and this results in unwanted pregnancies." (Girls' Focus Group (GFG) 10)
- "Boys and girls from the community who have love affairs go to the bushes to have sex. This is so because there is less chance of them being caught in the act Girls get pregnant couples have sex without using condoms. Some girls are raped by strangers. The strangers take advantage of the thick forest and the distance it is from the homesteads: no one will hear the girl even if she screams." (Boys' Focus Group (BFG) 9)

Commercial centre

- "The girls are lured by small material things like biscuits and "zapp snacks" (crisps). Sometimes, the older men lace the girls' drinks with alcohol, so that they can sleep with them when they are drunk. There are older women who drink beer who often sleep with young boys." (Field notes, GFG27)
- "Girls have sex with older men at the shops who give them money and material goods in return. The girls also sleep with the "home defenders" (unemployed male youths who look after the homesteads) at the shops where they meet and the home defenders buy them what they want or the girls are given money." (GFG37)
- "Some prostitutes, who are usually school drop-outs, fight over (the rich) men at the night club. They are not concerned about condom use. As long as they get their money they are not concerned about protection. The youths know this ... (as) ... STIs are spread to the youths who sleep with the prostitutes." (BFG30)

STI, sexually transmitted infection.

items and foodstuffs, where young people meet (box 1). A "growth point" is a designated business growth area, often at crossroads, that normally has a bottle store, food store, telephone shop, one or two small businesses (such as a clothes repairer), but seldom much more. Most commercial centres have a bottle store and beer hall.

These centres were also identified as high-risk locations, where adolescent boys buy drinks, where commercial sex work is plied and adolescent girls are approached by older rich men, such as "sugar daddies" and shopkeepers as they go about fetching beer for older men in their households. These are also venues where sex workers operate, often school leavers, commonly offering sex without protection.

Home

Sexual abuse in the home was mentioned repeatedly, especially by girls, with male family members reported as the main perpetrators: fathers, uncles, grandfathers and brothers. Sexual risk was compounded by abuse of traditional practices and beliefs. Notable among these were chiramu (a teasing relationship between a young girl and her older sister's husband, which

now often includes sex), and the belief that men who are HIV positive can be cured through sex with a virgin (often with their younger female relative).

Staying in the home of a relative was perceived to be risky, as often occurred when orphans or other children lodged with an extended family. As one girl explained, "staying with aunts is worse, because even if your brother-in-law molests you, the aunt will pretend not to notice for fear of destroying her home". (Girls Focus Group 9)

Abortion, which is illegal in Zimbabwe, commonly occurs in the home, mainly with the assistance of the mother and grandmother, using traditional herbs. This is a high-risk activity, with the potential for morbidity and mortality. Additionally, girls, when discussing "the home" on the risk maps, pointed to traditional ceremonies (memorial) or celebrations (engagement, funerals or marriages) as venues for risky sexual activity. These ceremonies and celebrations usually take place around the home at night, where adolescents have ample opportunity to "drink traditional brewed beer, get drunk and have sex or become violent". (Girls Focus Group 14)

School environs

The school was reported by 76 of the 78 groups as a sexual risk environment. Sex was reported between teachers and female students, with the latter reporting receiving better school grades, small gifts and even prestige among peers, in exchange (box 2).

Along with consensual and transactional sex, there were many reports of sexual abuse of pupils by teachers. There were also cases of schoolteachers making pupils pregnant and then being transferred or leaving the locality to avoid responsibility.

During the study period, four girls left one school because of pregnancy; at another school the number was nearly 20. During an ice-breaker singing exercise, all the girls' songs were about abortion. When asked why this was, the girls reported that pregnancy and illegal abortion were real problems in their community. Indeed, in addition to reports of sex between teachers and students, consensual and non-consensual sex between boys and girls was common. This took place on the way to and from school; in the bushes and other secluded locations near the school; at the sports field and during sports events when students are permitted to stay after school; and during lunch breaks, often linked to boys drinking beer.

Religious and spiritual venues

Church was perceived as a risky location, both as a place where young people meet, unaccompanied by their parents, for consensual sex and also as a place where adults sexually abused church attendees. Young people would often plan to go to all-night prayer meetings, as they provided secluded and dark locations and was one of the few occasions where young people were relatively unsupervised.

Non-consensual sex was also reported, where church leaders, in particular "prophets", would select a girl for spiritual cleansing, that included unprotected penetrative sex.

Reinforcing the common theme of transactional sex and the direct link of sex with poverty, some parents pledge their daughters to a wealthier church elder.

Roadside

As with other locations identified in the mapping exercise, such as all-night prayer meetings and forests, highways are places where consensual sex takes place, but also where girls are exposed to sexual abuse. Many girls also reported receiving lifts on the road from long-distance truck drivers, or local bus drivers ("gonyet"), who would routinely expect unprotected sex in return for the favour.

Box 2: Qualitative data from focus groups

School environs

- "Teachers are having sex with students the girls normally initiate these affairs and teachers capitalize on the situation. Girls are given money and extra marks in exchange for sex ... it is normally not very bright students who prefer going out with teachers. (Girls Focus Group (GFG) 3)
- "The teacher will start to favour the girl ... in the end she gets good marks and is given money. She won't get punished for not completing her assignments and may even be given text books which others don't have." (GFG16)
- "Some of the students become pregnant from teachers who are not expelled from their profession, but are only transferred to other schools ... there is no teacher who has married a student. Affairs between students and teachers are difficult to confirm, but in the end pregnancy will reveal the affair." (Boys Focus Group (BFG) 21)

Religious and spiritual venues

- "Some young people actually lie to their parents that they are going to a church meeting at night, and meet their boyfriends, as well as engage in sex, while others disappear from the church session to go and have sex." (GFG25)
- "During the church meetings the youths sneak out and meet their boyfriends and girlfriends and have sex in the darkness." (BFG12)
- "Females are being given to older (church) men as wives. This wife pledging is done by parents who are poor and they are given food in exchange for their daughters." (GFG22)
- "Some prophets take advantage of some members ... under the guise of cleansing them. (One girl) was raped by a church leader when she had gone (to him) seeking to be healed." (BFG11)
- "A girl told of a local pastor who made a girl pregnant, and quickly ran away (transferred) from the community when he discovered she was pregnant." (Field notes, GFG7)

Roadside

- "The roads are also used by people, usually men, coming from beer halls or bottle stores. The men sexually harass (the girls) ... they're drunk ... and it makes the girls afraid." (GFG15)

Gender differences were seen throughout the analysis. Although both genders mentioned risk areas with equal frequency, the risks they highlighted differed. For example, in discussions around risk at growth points, girls focused on sexual risk, whereas boys also included drinking and gambling that could lead to violence.

CONCLUSION

There is recognition of the need for rigorous evaluation of complex interventions to determine effectiveness, especially when social behavioural and biological outcomes are

targeted.¹⁸⁻¹⁹ We need interventions that are both theoretically based,²⁰⁻²⁴ and are also aware that effectiveness is likely to be context specific.²⁵ The primary outcome of the Regai Dzive Shiri study will provide evidence as to whether we have reduced the incidences of HIV, herpes simplex virus 2, unintended pregnancy and self-reported sexual behaviour. We also used the risk maps to measure more subtle changes that may have occurred as a result of the intervention.

Another round of risk map research workshops will be held towards the end of the study to explore changes in milieu, behaviour and experiences, and will complement and triangulate the biological and other social behavioural outcome measures. Primarily, we will examine qualitative differences between early and deferred communities. We will begin by pooling the risk maps from early intervention study communities and from deferred intervention (control) communities. We will then examine all the issues that emerge from the two sets of qualitative data. We will then compare the differences between maps from early and deferred intervention communities. Although the researchers will not be blinded to community study areas, checks will be put in place to ensure that analysis is conducted independently and as objectively as possible.

The risk map research workshops have provided a descriptive framework and offered new insights into sexual behaviour of young people in rural Zimbabwe. Risky areas were often secluded and offered young people a chance to experiment and have consensual sex. This concurs with research in Tanzania which showed that sexual culture is based on permissive and restrictive norms and expectations for young people.¹⁰ However, because seclusion was a dominant characteristic, forced sex also took place in many of these risky areas. Risk maps highlighted areas that the programme and research team were not previously aware of (such as all-night prayer meetings) and also the extent of young people's exposure to sexual abuse.

The risk map research workshops were held in a truly participatory context and enhanced our reputation with the study population, enabling us to build greater rapport with our research cohort, having gained local knowledge about the context and language of risk. Participatory methods have been lauded for creating an enabling environment for positive behaviour change.²⁶ This interactive forum which involves the target population has been used in a wide range of natural and social sciences, including community decision making,²⁷ primary healthcare and assessment of pharmaceutical needs,²⁸ as well as, broadly, in conflict resolution, medical education and sexual health. Our experience was that the participatory method excites individuals. In short, the risk map research workshops were inspirational and fun. They allow people to express themselves non-verbally: although we are all used to discussing our ideas, we rarely are given the opportunity to draw our lives. Risk maps add an additional participatory dimension to standard focus group discussions by providing contexts from participants, which frame the discussion. These risk maps afforded an opportunity for young people to draw

Key messages

- Participatory workshops are a valuable tool for complementing a randomised controlled research design.
- Risk mapping produces insightful contextual qualitative data.
- Risk mapping has potential as an outcome measure in evaluating complex interventions.

their world, which sets a tone that says "not only are we listening to you, we are waiting for you to guide us".

To end where we began. In that first workshop in Rowa, the girls' risk map showed both the forest and the woodcutters' yard as risky locations. When we came to the focus group discussion the girls were asked to explain these venues. They said that they had to fetch wood before breakfast and as the forest near their village was full of snakes they would go to the woodcutter, be given kindling and would often have unprotected sex in return. Later, when we brought the two gender groups together, the boys challenged this explanation. According to them, it was the woodcutters who scared the girls with stories of snake-infested forests.

"But there are no snakes in the woods!" (Boys Focus Group, Rowa).

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REFERENCES

- 1 **Cowan FM**, Langhaug LF, Mashungu GP, *et al.* School based HIV prevention in Zimbabwe: feasibility and acceptability of evaluation trials using biological outcomes. *AIDS* 2002;**16**:1673–8.
- 2 **Twa-Twa JM**. The role of the environment in the sexual activity of school students in Tororo and Pallisa Districts in Uganda. *Health Transit Rev* 1997;**7**(Suppl):67–81.
- 3 **Gammeltoft T**. Seeking trust and transcendence: sexual risk-taking among Vietnamese youth. *Soc Sci Med* 2002;**55**:483–96.
- 4 **Edgardh K**. Adolescent sexual health in Sweden. *Sex Transm Infect* 2002;**78**:352–6.
- 5 **Swart-Kruger J**, Richter LM. AIDS-related knowledge, attitudes and behavior among South African street youth: reflections on power, sexuality and the autonomous self. *Soc Sci Med* 1997;**45**:957–66.
- 6 **Eaton L**, Flisher AJ, Aaro LE. Unsafe sexual behaviour in South African youth. *Soc Sci Med* 2003;**56**:149–65.
- 7 **Tarr CM**, Aggleton P. Young people and HIV in Cambodia: meanings, contexts and sexual cultures. *AIDS Care* 1999;**11**:375–84.
- 8 **Ahlberg BM**, Jylkas E, Krantz I. Gendered construction of sexual risks: implications for safer sex among young people in Kenya and Sweden. *Reprod Health Matters* 2001;**9**:26–36.
- 9 **Ray S**, Latif A, Machekeano R, *et al.* Sexual behavior and risk assessment of HIV seroconvertors among urban male factory workers in Zimbabwe. *Soc Sci Med* 1998;**47**:1431–43.
- 10 **Wight D**, Plummer ML, Wayomi J, *et al.* Contradictory sexual norms and expectations for young people in northern Tanzania. *Soc Sci Med* 2006;**62**:987–97.
- 11 **Mshana G**, Plummer M, Wamoyi J, *et al.* 'She was bewitched and caught in an illness similar to AIDS': AIDS and sexually transmitted infection causation beliefs in rural northern Tanzania. *Cult Health Sex* 2006;**8**:45–58.
- 12 **Plummer M**, Wight D, Wamoyi J, *et al.* Farming with your hoe in a sack: condom attitudes, access and use in rural Tanzania. *Stud Fam Plann* 2006;**37**:29–40.
- 13 **Molesworth AM**, Harrison R, Theakston RD, *et al.* Geographic Information System mapping of snakebite incidence in Northern Ghana and Nigeria using environmental indicators: a preliminary study. *Trans R Soc Trop Med Hyg* 2003;**97**:188–92.
- 14 **Klinkenberg E**, van-der-Hoek W, Amerasinghe FP. A malaria risk analysis in an irrigated area in Sri Lanka. *Acta-trop* 2004;**89**:215–25.
- 15 **Randolph S**. Predicting the risk of tick-borne diseases. *Int J Med Microbiol* 2002;**291**(Suppl 33):6–10.
- 16 **Zh HC**, Charlet JM, Poffijn A. Randon risk mapping in southern Belgium: an application of geostatistical and GIS techniques. *Sci Tot Environ* 2001;**14**:203–10.
- 17 **Glaser B**, Strauss A. *The discovery of grounded theory: strategies for qualitative research*. Chicago: Aldine, 1996.
- 18 **Campbell M**, Fitzpatrick R, Haines A, *et al.* Framework for design and evaluation of complex interventions to improve health. *BMJ* 2000;**321**:694–969.
- 19 **Stephenson J**, Imrie J. Why do we need randomised controlled trials to assess behavioural interventions. *BMJ* 1998;**316**:611–13.
- 20 **Wight D**, Abraham C, Scott S. Towards a psycho-social theoretical framework for sexual health promotion. *Health Educ Res* 1998;**13**:317–30.
- 21 **Oakley A**, Fullerton D, Holland J, *et al.* Sexual health education interventions for young people: a methodological review. *BMJ* 1995;**310**:158–62.
- 22 **Harden A**, Oakley A, Oliver S. Peer-delivered health promotion for young people: a systematic review of different study designs. *Health Educ J* 2001;**60**:339–53.
- 23 **UNAIDS**. *Impact of HIV and sexual health education on the sexual behaviour of your people: A review update*. Geneva: UNAIDS, 1997.
- 24 **Fisher JD**, Fisher WA. Changing AIDS-risk behaviour. *Psychol Bull* 1992;**111**:455–74.
- 25 **Elford J**, Bolding G, Sherr L. Peer education has no significant impact on HIV risk behaviours among gay men in London. *AIDS* 2001;**15**:535–8.
- 26 **Kirby D**, Short L, Collins J, *et al.* School-based programs to reduce sexual behaviors: a review of effectiveness. *Public Health Rep* 1994;**109**:339–60.
- 27 **Kuipers P**, Kendall E, Hancock T. Developing a rural community-based disability service: (I) service framework and implementation strategy. *Aust J Rural Health* 2001;**9**:22–8.
- 28 **Williams SE**, Bond CM, Menzies C. A pharmaceutical needs assessment in a primary care setting. *British Journal of General Practice. J R Coll Gen Pract* 2000;**50**:95–9.