

# ALCOHOL & HIV IN SUB-SAHARAN AFRICA: SITUATIONAL ANALYSIS



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# **Situational Analysis on Alcohol and HIV in Sub-Saharan Africa: Findings and Recommendations**

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## LIST OF ABBREVIATIONS

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AIDS	Acquired Immune Deficiency Syndrome
ACASI	Audio Computer Assisted Self Interviewing
ACTG	AIDS Clinical Trial Group Scale
ANOVA	Analysis of Variance
ANCOVA	Analysis of Covariance
AOD	Alcohol and Other Drug
ART	Antiretroviral Therapy
ARV	Antiretroviral
ASSIST	Alcohol, Smoking, Substance Involvement Screening Test
AUDIT	Alcohol Use Disorders Identification Test
AUDIT-C	The AUDIT alcohol consumption questions
CAGE	Cut down, Annoyed, Guilt, Eye opener (screening tool for alcohol problems)
cART	Combination Antiretroviral Therapy
CASI	Computer Assisted Self Interviewing
CBT	Cognitive Behaviour Therapy
CDT	Carbohydrate-Deficient Transferrin
CES-D	Center of Epidemiological Studies Depression Scale
DALYs	Disability Adjusted Life Years
DSM-IV	Diagnostic and Statistical Manual, 4th Edition
FGD	Focus Group Discussion
GBV	Gender-based Violence
GSHS	Global School-based Health Survey
HAART	Highly Active Antiretroviral Therapy
HCT	HIV Counselling and Testing
HIV	Human Immunodeficiency Virus
IMB	Information, Motivation, and Behaviour model
MEMS	Medication Event Monitoring System
MSM	Men who have Sex with Men
NNRTI	Non-nucleoside Reverse Transcriptase Inhibitor
OR	Odds Ratio
PLWHA	People Living With HIV/AIDS
RDS	Respondent Driven Sampling
SAS	Statistical Analysis System
SD	Standard Deviation
SSA	Sub-Saharan Africa
SPSS	Statistical Package for the Social Sciences
STI	Sexually Transmitted Infection
VCT	Voluntary Counselling and Testing
VAS	Visual Analogue Scale



## EXECUTIVE SUMMARY

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The role of alcohol consumption in HIV disease is of particular concern in Sub-Saharan Africa (SSA), which has among the highest HIV prevalence rates globally (UNAIDS, 2010a) and high levels of harmful use of alcohol (WHO, 2011). This report contains the findings of a systematic review of published studies conducted in SSA between 2008 and 2011, relating to (a) the associations between alcohol use, sexual risk behaviour and HIV infection; (b) the associations between alcohol use and HIV disease, including uptake of HIV treatment services, antiretroviral therapy (ART) adherence and HIV outcomes; and (c) evaluations of interventions that have been implemented to address the links between alcohol use and HIV. The overarching objective of this review is to provide recommendations on how to mitigate the effects of alcohol on the acquisition and progression of HIV disease.

Searches were conducted on African Journal Archive, Biomed Central, Ebscohost, South African Medical Journal Association, Pubmed Central, and South African Medical Association databases for relevant literature to include in the review. The search terms that were used were: “alcohol”, “HIV” and “Africa”, with a specified publication date range of 2008 to 2011.

Following multiple phases of sifting through literature, we sourced 72 eligible articles that had been published during the review period. The majority of articles concerned associations between alcohol use and HIV transmission (n=40), while fewer articles focussed on studies of alcohol use and HIV disease (n=21), and even fewer (n=11) studies described the results of interventions that have been evaluated to reduce alcohol use and sexual risk behaviour. We were not able to find any SSA studies addressing the association between alcohol use and disease progression.

### **Key findings of reviews**

#### Alcohol use and HIV transmission

- Research in SSA has yielded mostly positive significant associations between alcohol consumption and sexual risk behaviour and/or HIV infection in multiple settings, viz. health care, school/university, alcohol drinking and community settings for both HIV infected and uninfected samples.
- Adolescents who consume alcohol are more likely than their counterparts who do not drink to engage in sex, experience their first sexual encounter at a younger age, and engage in sexual encounters with multiple partners.

- Emerging evidence suggests that certain populations are at particularly high risk of alcohol-related sexual risk behaviour. These include men who have sex with men (MSMs), men and women who engage in commercial and/or transactional sex, women who work in hotels, restaurants and other alcohol drinking venues, and patrons of drinking establishments.
- High risk/problem drinkers have the greatest vulnerability regarding HIV infection and engagement in sexual risk behaviour, compared with non-problem drinkers and non-drinkers. The risk among non-problem drinkers is sometimes no different from that of non-drinkers, suggesting that non-hazardous/non-harmful drinking may be a viable goal to be achieved by current high risk drinkers who are seeking to minimise their alcohol-associated risk of HIV infection.
- There is emerging evidence that alcohol use may delay HIV testing.

#### Alcohol use and HIV disease

- Alcohol abuse among family members and significant others may influence the decision to withhold sero-status disclosure in some people living with HIV & AIDS (PLWHA).
- Alcohol and HIV stigma and gender-related factors (e.g. constructions of masculinity) may indirectly affect/delay health seeking behaviours, including the uptake of ART services.
- Alcohol use may minimise the uptake/initiation of (ART), often due to a misperception that abstinence is a prerequisite to ART enrolment.
- Higher levels of alcohol consumption tend to be associated with more ART non-adherence. Numerous mechanisms explain these associations, including patients' beliefs about potential alcohol and ART interactions; service provider advice; and actual effects of alcohol on forgetting to take ART.
- Despite a lack of SSA studies on alcohol use and HIV disease progression, there is strong biological plausibility that heavy alcohol consumption accelerates disease progression: fairly strong evidence suggests that heavy alcohol consumption results in biological and behavioural processes that are likely to increase HIV disease progression.
- Based on studies conducted in the US, the effect of alcohol on CD4 cell decline appears to be independent of ART, through a direct action on CD4 cells. Conversely, the effect of alcohol abuse on viral load appears to be indirect, through reduced ART adherence.

- There remains a paucity of primary research on alcohol and HIV disease progression in SSA.

#### Interventions to reduce alcohol and risk of HIV acquisition

- Positive intervention effects emerged in all settings in which the studies were conducted (military, schools, health care, community). Positive intervention effects were obtained most consistently from evaluation studies of interventions in health care environments (80% of the outcomes measured were significant), whereas the least promising outcomes were obtained in the learning environments (43%).
- Many intervention effects dissipate over time, suggesting that longer-term interventions are more likely than brief interventions to be successful in reducing alcohol-related sexual risk behaviour.
- One study demonstrated the efficacy of group-based cognitive behavioural therapy (CBT) for reducing alcohol use among HIV patients.
- Studies in community and health care settings provided evidence that group interventions may be as effective as individual interventions; a positive finding, given the costs associated with individual interventions.
- Many interventions can be delivered effectively by non-professionals. This finding has positive implications for settings with limited capacity and resources.
- There were no published studies of evaluations of interventions conducted in alcohol drinking settings, or of interventions to reduce ART non-adherence among alcohol using populations.

#### **Strengths and limitations of studies**

The studies varied in quality. However, many of them used large representative samples, standardised measures, and appropriate designs and analytical techniques. In addition, some of the intervention studies involved randomised controlled designs and had high retention rates.

The main limitations of the studies included their reliance on self-reporting of alcohol use, sexual risk behaviour, and ART adherence. Reporting of these sensitive behaviours may be influenced by social desirability effects. The greatest limitations were observed for the intervention studies, many of which lacked representative samples, used only pre-post designs, had short follow-up periods, and small convenience samples.

## **Recommendations**

### Recommendations for HIV prevention

Interventions to reduce HIV prevention can be implemented in multiple settings (health care, school/university, drinking venue, community and workplace environments). Key interventions include:

- Individual screening, brief intervention and referral to treatment (SBIRT) should be conducted by trained health care workers or lay counsellors, using standardised screening tools, such as the CAGE or AUDIT to screen for alcohol use, and appropriate tools to determine individuals' HIV-related risk profile.
- Services provided should be tailored to the individual's risk profile, and entail (a) provision of simple information about alcohol and HIV transmission for people with a low-risk profile; (b) Voluntary Counselling and Testing (VCT), which includes an alcohol-related HIV risk reduction component for people with a medium-risk profile; and (c) active case management or intensive alcohol and other drug (AOD) treatment for people with a high risk profile.
- Information should be readily available to communicate the link between alcohol and HIV transmission, via information sheets or brochures and/or information sessions given by appropriately trained and knowledgeable health care providers.
- Patients and clients with HIV infection may benefit from individual counselling to address the risk of alcohol-related HIV transmission to their undisclosed and/or prospective partners. Couples counselling may address alcohol-related HIV transmission and HIV re-infection among sero-concordant couples.
- HIV testing facilities should be readily available, and specific effort should be made to encourage testing among individuals who engage in high risk alcohol use.

### Recommendations for treatment, care and support

- Multi-disciplinary and integrated approaches to the treatment, care and support of HIV patients who drink alcohol are recommended.
- Services should ideally be available for patients with HIV, TB and STIs in settings with one-stop centres, to facilitate patients' ability to access core medical, as well as ancillary psycho-social services (including psychologists and adherence counsellors).

- Individual screening, brief intervention and referral to treatment (SBRIT) of clients/patients by trained health care workers, using standardised screening tools, such as the CAGE or AUDIT (to screen for alcohol).
- Brief sensitive screening tools for ART non-adherence should be used; biological markers for disease progression (for example, viral loads, CD4 counts etc) should be employed routinely where possible.
- Services should be tailored to the individual's risk profile: (a) simple information about alcohol and all pertinent aspects of HIV disease for people with a low-risk profile; (b) brief interventions (5 minutes risk reduction counselling/Motivational Interviewing; MI) and boosters at subsequent visits for people with a medium-risk profile; and (c) brief interventions and more active case management to reduce the risk of re-infection or non-adherence to ART or disease progression and promote alcohol treatment and aftercare for patients with a high-risk profile.
- Service users should be better informed (a) that alcohol use should not delay the uptake of ART services, but that efforts should be made to taper the user's drinking substantially, if not completely, over time; (b) about alcohol's role in ART non-adherence, and conditions under which ART's effectiveness could be compromised by heavy alcohol use; and (c) about alcohol's effects on HIV disease progression.
- Group psychotherapy for people living with HIV/AIDS (PLWHA) or support groups to address concerns about sero-status disclosure to family members or close others who abuse alcohol.
- Gender transformative interventions to address the role of constructions of masculinity in the maintenance of alcohol use, and in delaying health seeking behaviour.
- Stigma reduction programmes are needed to tackle the role played by stigma in the delayed uptake of HIV services and poor ART adherence.
- Key health care providers include adherence counsellors, social workers, nurses, medical doctors, pharmacists/pharmacy technicians, patient advocates, and psychologists.
- Preparation of specific guidelines for health care workers and lay counsellors, and ongoing in-service training on the management of ART enrolled patients who are using alcohol. Such training should provide knowledge about ART, alcohol use and HIV (e.g. how alcohol affects the immune system, ART adherence, and sexual risk behaviour). Health care providers who will be

conducting SBIRT should also be given training, guidelines and standardised materials on screening and brief intervention, and referral to services, as well as training to reduce stigma associated with harmful use of alcohol.

#### Recommendations for further research

This review has highlighted the need for the following research studies:

- Investigations of the associations between alcohol use and disease progression, as there is a dearth of research on this topic in SSA.
- Studies using objective measures of alcohol use and ART adherence (such as biological markers) should be considered to minimise reliance on self-reports of these behaviours.
- More qualitative and theoretically-driven research studies to better explain the interrelationships among alcohol use, sexual risk behaviour and HIV infection. For quantitative studies, appropriate statistical tools should be used that can take into account the complex relationships between alcohol and other variables that might mediate between alcohol use and the outcomes of interest (e.g. structural equation modelling).
- Further development and evaluation of HIV prevention programmes with an alcohol reduction focus among all potentially vulnerable populations in a range of settings.
- More research on alcohol and HIV transmission is needed among adolescents, Most-at-risk-populations (MARPS) and people in the workplace, given the few studies conducted among these populations.
- The development of specific guidelines for investigators who are interested in studying the links between alcohol and HIV. Such guidelines would indicate the research methods, designs, instruments and tools to use in order to help to ensure that future studies are able to respond more definitively to currently unanswered questions regarding alcohol's role in HIV infection, sexual risk behaviour, ART adherence and HIV disease progression.



## CHAPTER 1: BACKGROUND AND METHODS

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### Background

According to the 2010 UNAIDS Report on the global AIDS epidemic, Sub-Saharan Africa (SSA) is the region of the world with the highest prevalence of HIV infection, and an estimated 34% of all people living with HIV are in Southern Africa (UNAIDS, 2010a). The report also indicated that there were an estimated 22.5 million people living with HIV, and 1.3 million AIDS-related deaths in Africa in 2009. At the same time, the region experienced declines in HIV incidence (which was mainly attributable to positive behaviour change, including increased condom use and decreased numbers of casual partners). In addition, AIDS-related deaths have also declined, mostly due to the increased availability of antiretroviral therapy (ART).

South Africa had the largest number of people living with HIV in 2009 with 5.6 million. According to the WHO Global Status Report on Alcohol and Health (2011), numerous countries in SSA have high rates of harmful alcohol use. The WHO report also indicates an increase in consumption trends in the African region between 2001 and 2005; with 70% of the population showing stability, 4.5% a decrease and 25.3% an increase. The most common pattern of drinking in the region, described as risky drinking, involves heavy episodic drinking which results in acute problems, including intentional and unintentional injuries, and inter-personal violence. Alcohol consumption is also associated with an increased risk of health problems including non-communicable diseases such as cancer, heart disease and liver disease (Parry et al., 2011). In addition, alcohol is increasingly being recognised as a key risk factor for infectious diseases, most notably, tuberculosis infection (Rehm et al., 2009), as well as HIV infection (Parry et al., 2009).

In recent years, particular attention has been paid to how alcohol consumption may impact on various aspects of HIV disease. Such aspects range from the initial acquisition of the disease, through to help-seeking behaviours carried out by those who are infected, the course of the disease following initial infection (for individuals using or not using ART treatment), its impact on ART adherence, and finally alcohol's effects on AIDS-related mortality. Such interest has been demonstrated by a number of international, national and regional agencies. For example, the World Health Organization's Global Strategy on Harmful Alcohol Use (WHO, 2011), as well as the strategy for the WHO African region (WHO, 2010) both refer to the potential role of harmful alcohol use in high risk sexual behaviour, HIV and AIDS. However, alcohol's role in HIV, relative to that of other (illicit) drugs, and to other risk factors, is not fully recognised (Fritz, Morojele & Kalichman, 2010; Rehm & Parry, 2009; Schneider, Chersich, Neuman & Parry, in press). Evidence of this can be seen in



the UNAIDS Strategy 2011-2015 document (UNAIDS, 2010b) which does not recognise or acknowledge alcohol's role in HIV at all. In terms of documents focusing on ART programmes, little mention again is made of the possible role of alcohol in ART adherence despite the growing evidence of alcohol's impact on ART adherence, as reviewed below (Chersich and Rees, 2010).

## **ALCOHOL USE AND HIV ACQUISITION**

Alcohol's role in HIV infection is usually attributed to both behavioural and biological factors (Hahn, Woolf-King & Muyindike, 2011; Shuper et al., 2010). Numerous reviews have been conducted of studies of the associations between alcohol use and HIV infection (Fisher et al., 2007; Hahn, Woolf-King & Muyindike, 2011; Pithey & Parry, 2009; Shuper et al., 2010), alcohol use and incident HIV infection (e.g. Balianus et al., 2009); and alcohol use and sexual risk behaviours (Kalichman et al., 2007; Neuman et al., in press; Shuper et al., 2010; Woolf-King & Maisto, 2011). Some reviews included studies examining more than one type of association (e.g. Shuper et al., 2010).

### **Alcohol use and HIV infection**

Fisher et al. (2007) conducted one of the first systematic reviews and meta-analysis of studies in Africa covering publication dates from 1990 to 2006. The review included 20 studies, most of which were cross-sectional, and had been conducted in East and Southern Africa. The studies involved both high risk and general population samples. Their meta-analysis indicated that those who consumed alcohol were 70% more likely to be HIV+; or 57% more likely to be HIV+ when confounders were considered. The studies' findings were consistent across sites and populations; and dose-response effects were also indicated, with problem drinkers found to be 104% more likely to be HIV positive than non-drinkers (Fisher et al., 2007).

Of growing interest is the question of whether the associations between alcohol use and HIV infection are causal (e.g. Shuper et al., 2010). Shuper et al.'s (2010) review of studies globally provided only partial support for a causal association between alcohol use and HIV infection. It indicated moderate global associations between alcohol use and HIV infection, and many studies of event-level analyses revealed non-significant associations. The reviewed studies also provided support for the temporal role, but neither the reversibility criterion nor the dose-response association were addressed by the studies included in the review. Their review included data from studies conducted until 2009, and did not focus exclusively on studies conducted in Sub-Saharan Africa.

Pithey and Parry's (2009) findings were similar. They reviewed 21 studies published between 2000 and 2008. Studies were included if they reported on "relative measures of the association between

alcohol use and HIV prevalence and/or seroconversion rates” (page 157). The review included studies conducted mainly in Southern and East Africa. Most studies revealed a positive association between alcohol consumption and HIV infection; but a few exceptions were observed among men and women in various STI clinic and community samples.

### **Alcohol use and incident HIV infection**

Balianus et al. (2009) conducted a review and meta-analysis of studies of the association between alcohol consumption and incident HIV infection, which included 10 studies, 5 of which were conducted in developing countries, with only two from Africa (Tanzania and Uganda). From their meta-analysis, they concluded that alcohol consumers have a higher chance than non-users of becoming HIV infected (pooled RR=1.98; 95% CI = 1.59-2.47). The effect was greater among binge drinkers than among non-binge drinkers; and no differences were found in the effects according to gender, region of the world or sexual orientation of men. They concluded that the study did not provide sufficient information to finalise the causality question, but nonetheless, they also argued that alcohol-specific interventions should be incorporated into HIV prevention risk reduction packages.

### **Alcohol use and high risk sexual behaviour**

Reviews have also been conducted of alcohol’s association with high risk/risky sexual behaviour including those of Kalichman et al. (2007) for studies in Africa; Neuman et al (in press) and Shuper et al. (2010) for studies around the globe; and Hahn et al. (2011) and Woolf-King and Maisto (2011) for studies in sub-Saharan Africa. Kalichman et al. (2007) conducted one of the first reviews of African literature on the associations between alcohol consumption and sexual risks. The review included a total of 33 studies, and indicated that these tended to substantiate claims of associations between alcohol use and sexual risks. They also identified drinking contexts, economic conditions, sexual violence, personality disposition and alcohol coercion as key moderators of the associations. They discussed strengths and pitfalls of the studies which included problems with the measures (e.g. reliance on self-reporting of alcohol use and sexual risk behaviour); designs (primarily cross-sectional); sampling constraints (e.g. small convenience samples); measures of alcohol use (global retrospective accounts); availability of only one event-level study; and use of non-standardised measures.

Shuper et al.’s (2010) review’s main focus was on the causal role of alcohol in sexual risk behaviour. One angle of their paper was to review studies in order to find support for the hypothesised behavioural and biological pathways between alcohol use and sexual risk behaviour. Their review indicated that the size of associations between alcohol use and unprotected sex tended to be

moderate, suggestive of third variables' effects or confounding. They noted also, that event-level studies did not find significant associations between alcohol use and sexual risk behaviour when confounders were taken into account (e.g. personality); and hence still were not able to conclude that the association is causative. It is worth noting, however, that the two event-level studies that have been published in Africa have confirmed this association. They concluded that "there is insufficient evidence for a direct behavioural pathway linking alcohol, risky sex and incident HIV" (page 4).

Hahn, Woolf-King and Munyidike (2011) reviewed studies conducted in sub-Saharan Africa of the role of alcohol consumption in HIV acquisition, treatment entry, ART adherence and biological susceptibility. They noted that an overwhelming number of studies support the associations between alcohol use and high risk sexual behaviour. They also noted the paucity of event-level studies that had been conducted in the SSA region (only 2) and pointed to the need for more event-level-type studies to be able to further study the nature of the associations, and specifically to answer the question of the temporal role of alcohol in high risk sexual behaviour.

Woolf-King and Maisto (2011) conducted a narrative review of studies that had been conducted in the Sub-Saharan region between 1992 and 2008. Their review included both qualitative and quantitative studies; the quantitative studies comprised studies of global associations (the majority of studies), situational associations (where for example, alcohol use before sex is examined in relation to the nature of the sexual acts that are carried out), and event-level studies (for which only two studies were uncovered). The overall conclusion was that alcohol use and sexual risk behaviour are linked and, on the basis of the studies, the authors proposed two separate models of alcohol's association with sexual risk behaviour; one for males and one for females. One of the major differences between the male model and the female model is based on the finding that males' alcohol consumption impacts on women's risky sexual behaviour whereas no studies to date have shown that men's vulnerability to sexual risk behaviour and HIV infection is associated with their female partner's drinking.

Neuman et al. (in press) conducted a systematic literature review including 107 studies around the globe. The aim of the review was to acquire evidence to further support the causality question, and to examine potential causal pathways between alcohol use, unsafe sex, and HIV infection. The populations included comprised mainly "high risk groups". In most, but not all, cases of "high risk" groups, which included commercial sex workers and their clients, army personnel and migrant labourers, heterosexual individuals, men who have sex with men (MSM), injection drug users, and emerging adults they found that alcohol consumption was significantly associated with sexual risk

behaviour. The review indicated a need to also consider mediators and moderators of the associations between alcohol use and sexual risk behaviours, including aggressive and violent behaviours (especially among sex workers), level of education, context (e.g. context in which behaviours are taking place, such as parties for “emerging adults”), and gender dynamics. The authors concluded that the question of causality could not be finalised (“closed”) by the findings of the review. They also highlighted the various studies’ findings of inconsistent associations between condom use and alcohol use, and discussed the need for more nuanced measurement of condom use (e.g. consistent use, effective application etc.) than has been the case thus far.

In conclusion, the reviews reveal significant associations between alcohol use and sexual risk behaviour and alcohol use and HIV infection in most studies. The reviews have provided overwhelming support for alcohol’s association with high risk sexual behaviour, but also note the possibility of moderator and mediators of the associations. However, the causal nature of the associations is yet to be established (Neuman et al., in press; Parry et al., 2010; Shuper et al., 2010). This lack of empirical evidence of the causal nature of the association has hampered efforts to carefully quantify alcohol’s effects in terms of BOD estimates and to incorporate alcohol use in HIV intervention, policy and programming activities (Chersich & Rees, 2010). However, despite the absence of the empirical evidence regarding causality, the associations tend to be sufficiently strong and replicated often enough to warrant serious attention being given to ways in which to minimise individuals’ risks of HIV infection and/or of high risk sexual behaviour by reducing their levels of alcohol consumption.

## **ALCOHOL USE AND HIV DISEASE**

Once individuals are infected with HIV, there are concerns that alcohol use may directly and/or indirectly affect the prognosis of the disease. Specifically, alcohol users may be less inclined to engage in health-seeking behaviours (getting tested and/or seeking treatment); alcohol users may be less likely to adhere to their treatment regimen once enrolled on ART programmes and hence indirectly worsen the prognosis of the disease; and alcohol use may affect the progression of their disease via biological mechanisms. We discuss these areas in turn.

### **Uptake of and enrolment in HIV services**

A number of studies conducted in SSA suggest that alcohol use is negatively associated with HIV testing and receipt of HIV results (Hahn et al., 2011), although findings are somewhat mixed in this regard. In addition, alcohol use is associated with the uptake/initiation of ART (Hahn et al., 2011; Hendershot et al., 2009; Martinez et al., 2008), although there are mixed results regarding its role in health care utilisation. Regarding ART uptake, stigmatisation (resulting from being HIV infected and

being a problem drinker) is amongst the barriers to the uptake of alcohol and HIV services (ICRW, 2010; Fortney et al., 2004) In their review, Hahn et al. (2011) revealed that alcohol use has been found to be both positively and negatively associated with late presentation for HIV care (i.e. mixed results), and that there was a lack of studies in SSA on the association between alcohol use and retention in HIV care prior to ART initiation. Further research on alcohol's role in uptake and enrolment on ART services is needed particularly given the importance of early testing and early enrolment in treatment.

### **Alcohol use and ART adherence**

Gmel, Shield & Rehm (2011) conducted a study to present a method for calculating the percentage of HIV/AIDS-related deaths that were attributable to alcohol-related ART non-adherence. In a secondary analysis of cross-sectional data from five Global Burden of Disease (GBD) regions of Africa they found a clear negative impact of alcohol on ART adherence, and consequently (indirectly) on HIV disease outcome. They found considerable regional variability in alcohol attributable fractions (AAFs). The detrimental effect of alcohol-attributable ART non-adherence on HIV/AIDS mortality and morbidity was statistically significant in each of the five regions, except for the North Africa/Middle East region. AAFs were generally higher for males than for females (0.03% to 0.34% for men; and 0% to 0.17% for women). The main limitations of the study, however, were the categorical (as opposed to continuous) nature of the alcohol data available (drink vs. do not drink), and the fact that the study failed to take into account the role of alcohol in disease progression. They stressed that alcohol prevention should be part of all protocols for ART treatment.

Most studies which have borne the relationship between alcohol and sub-optimal adherence to ART have been conducted outside SSA (e.g. Arnsten et al., 2002; Braithwaite et al., 2005; Chander et al., 2006; Cook et al., 2001; Hendershot et al., 2009; Parsons, Rosof & Mustanski, 2007). However, as we discuss in Chapter 3 of this report, there are some emerging studies in SSA on alcohol and ART adherence (mostly in 2010). In their review and meta-analyses of the alcohol-ART adherence association (of mostly North American studies), Hendershot et al. (2009) stated categorically that the association between alcohol and ART adherence is significant and reliable across studies, and declared that further research to evaluate alcohol-ART adherence global associations in the developed world was unlikely to advance the field very much. They proposed instead that intervening variables (mediators and moderators) of the alcohol-ART adherence association ought to be further elucidated. For the developing world, where there is a paucity of research on alcohol-ART adherence, they argued that further research on alcohol-ART adherence global associations is still warranted.

The likely role of alcohol as a risk factor for ART non-adherence in SSA has been highlighted by a number of commentators (e.g. Kagee, 2009). In his literature review of SSA studies, Kagee (2009) identified substance abuse (alcohol use) as a potential psychosocial barrier to ART adherence in the region. He called particular attention to the need for the development of empirically-supported interventions to address modifiable ART barriers which could then lead to improved ART adherence, and hence, better ART treatment outcomes.

The paucity of research focusing on barriers to ART adherence (including alcohol) in SSA could potentially be due to a misperception emanating from various studies (e.g. Mills et al., 2006; Weiser et al., 2003) that SSA patients' ART adherence rates are on par with, and in some cases even higher than, those of their developed world counterparts. However, such apparently high rates are based on studies with non-representative samples of relatively well ART patients who tend to have access to a plethora of support services (Jaffer et al., 2008). Jaffer et al. (2008) underscore that following the advent of ART, mortality among HIV patients in SSA has reduced significantly compared to the pre-ART era, although high mortality rates as well as low retention rates persist in some settings. Hence, there is a vital need to devise evidence-based cost-effective strategies to maximise enrolment, retention and ART adherence in SSA. Wester et al. (2009) emphasise that to fully garner the benefits of ART from the increased national ART roll-outs across the continent, more robust education and training programs, as well as more effective patient-retention strategies, are needed.

### **Alcohol use and disease progression**

In SSA to-date, primary research on alcohol and disease progression remains uncharted territory, potentially because primary/universal prevention tends to be the first line approach in most public health crises. However, there have been a number of seminal works from North America (e.g. Baum et al., 2010; Braithwaite et al., 2007, Hahn & Samet, 2010), some key systematic reviews which included meta-analyses from the sub-Saharan region (e.g. Shuper et al., 2010), as well as recent review articles with specific relevance for SSA (Hahn et al., 2011; Schneider et al., 2012) addressing the issue of alcohol use and disease progression.

A number of authors (e.g. Baum et al., 2010; Hahn and Samet, 2010; Hahn et al., 2011) posit that the extent to which alcohol impacts disease progression remains to be fully explicated owing to the mixed results from studies on the effect of alcohol on HIV disease progression. According to Hahn and Samet (2010) pre-HAART studies found no association between alcohol consumption and HAART outcomes, while many (although not all) post-HAART studies are beginning to demonstrate significant associations between alcohol and disease progression.

It is important to pursue regional primary studies in this regard because there is strong biological plausibility that heavy alcohol consumption accelerates disease progression. Specifically, fairly strong evidence suggests that heavy alcohol consumption results in biological and behavioural processes that likely increase HIV disease progression (Hahn & Samet, 2010; Parry et al., 2010; Schneider et al., 2012; Shuper et al., 2010). Some of the behavioural mechanisms include nutritional deficiencies, lower engagement in care and decreased adherence to ART. Plausible biological mechanisms include overlapping pathways for alcohol and ART metabolism; increased bacterial translocation in the gut to cause HIV immune activation; chronic alcohol consumption resulting in cirrhosis and liver disease (which could negatively affect immune-competence); and alcohol use resulting in functional abnormalities in T and B lymphocytes and decreasing the ability of lymphocytes to generate interleukin 2 as well as soluble immune response suppressors. Alcohol may also impact the metabolism of some NNRTIs and PIs, and hence chronic alcohol users may be at risk for *potential* alcohol-ART interactions, drug toxicities and ineffective therapies due to inadequate concentrations of the ART drugs in the plasma, and additionally, chronic alcohol consumption may alter drug protein binding (Hahn & Samet, 2010).

Another area that is noteworthy concerns studies comparing disease outcomes of alcohol users who are ART recipients and alcohol users who are ART naive. Specifically, the impact of alcohol use on markers of disease progression (e.g. HIV replication) seems to be worse for those on ART than their ART inexperienced counterparts. For instance, Samet et al. (2003) found that alcohol consumption was associated with higher HIV RNA levels as well as lower CD4 counts for patients with a history of alcohol problems who were on ART, but that this relationship did not hold for ART naive patients. On the other hand, recent research by Baum et al. (2010), using a prospective longitudinal design (N = 231 HIV positive adults), found frequent alcohol users (as a group) on ART to have a 2.91 fold likelihood (95% CI: 1.23-6.85,  $p = 0.015$ ) of a higher decline of CD4 counts, which was independent of their baseline CD4 cell count and HIV viral load, antiretroviral use over time, time since HIV diagnosis, age, and gender. Frequent alcohol users who were *not* on ART also had an increased risk for CD4 cell decline to  $\leq 200$  cells/mm<sup>3</sup> (HR = 7.76: 95% CI: 1.2–49.2,  $p = 0.03$ ), as compared with their counterparts on ART. Conversely, frequent alcohol intake was associated with higher viral load over time, in those receiving ART (beta = 0.384,  $p = 0.0457$ ), but not in those who were not on ART. Baum et al. concluded that the effect of alcohol on CD4 cell decline appears to be independent of ART, through a direct action on CD4 cells; but that the effect of alcohol on viral load, appears to be through reduced adherence to ART. Similarly, Miguez et al. (2003) also found a poor HIV viral load response in those on ART, in an alcohol and drug using cohort. Despite the preceding mixed findings, other research has uncovered that ART treated patients who engage in hazardous/heavy alcohol use

are less likely to attain positive immunological and virological suppression (Chander et al, 2006; Conigliaro et al., 2003; Samet et al., 2007; Hahn & Samet, 2010); and that heavy alcohol use (particularly of spirits) also compromises immune reconstitution (Miguez-Burbano et al., 2009). In summary, despite discrepant findings ART recipients who abuse alcohol seem to be a vulnerable sub-group.

Studies on alcohol and HIV survival end-points also point to the importance of studying alcohol and disease progression in SSA. Alcohol use is associated with decreased survival in PLWHA (Reilly et al, 2010). In a study which used a calibrated and validated computer simulation of HIV disease and which integrated a temporal and dose-response relationship between alcohol and adherence to ART from a large cohort, Braithwaite et al. (2007) found that non-hazardous alcohol consumption decreased survival by more than one year if the frequency of alcohol consumption was one time per week or more; survival decreased by 3.3 years if the consumption of alcohol was daily for non-hazardous drinkers; and hazardous alcohol consumption decreased overall survival by more than three years if the frequency of alcohol consumption was one time per week or more. In addition, survival decreased by 6.4 years if the consumption of alcohol was daily for hazardous drinkers.

Furthermore, a burden of disease study by Rehm et al. (2009) which took into account the impact of alcohol on disease progression further highlights the importance of putting alcohol and disease progression studies on the research agenda for SSA. Rehm et al. (2009) estimated alcohol-attributable HIV/AIDS deaths to account for 12.0% of all alcohol-attributable deaths in males (ranking 4<sup>th</sup> in terms of the contribution to alcohol-attributable deaths), and 32.8% of all alcohol-attributable HIV/AIDS deaths in females, in South Africa in 2004. Regarding disability adjusted life years (DALYS) lost (in terms of years lost through death attributable to alcohol or years lost through living with an alcohol-attributable disability), Rehm et al. (2009) estimated that 6.3% of all DALYS lost can be attributed to alcohol (with 10.0% and 2.4% of all DALYS lost for males and females, respectively). Alcohol-attributable HIV/AIDS DALYS lost accounted for 9.7% and 27.8% of all alcohol-attributable DALYS lost in males (ranking 5<sup>th</sup> in terms of the contribution to alcohol-attributable DALYS lost) and females (the largest proportion), respectively. As with calculations of alcohol-attributable HIV/AIDS-related deaths only the impact of alcohol on the progression of the disease (and not on HIV acquisition) was taken into account, when alcohol-attributable HIV/AIDS DALYS lost were estimated.

In conclusion, there is an urgent need to identify (and conduct) primary studies on alcohol and disease progression in SSA. The results of this research, if in line with those from high income



countries, would then be the basis for modifying drinking behaviour among PLWHA, and especially the more vulnerable sub-groups (i.e. heavy alcohol drinkers, spirit drinkers and those on ART).

## **AIMS OF THE REVIEW**

The review to be described in the next three chapters of this report builds on previous reviews by including an array of different dimensions of the associations between alcohol and HIV, and including studies conducted in SSA between 2008 and 2011. The rapidly changing nature of HIV disease, and its treatment and management, coupled with shifts in societal perceptions regarding HIV are clearly strong reasons for continually updating the literature concerning HIV and alcohol use. Many of the findings of reviews conducted even ten years ago are not likely to have the same relevance in 2012 as they did in 2002. Consequently this review provides a valuable update and comprehensive overview of the literature on alcohol and HIV for the four-year period: 2008-2011. The results of this review will include important recommendations on how best to address alcohol's role in HIV in SSA.

The aims of this review were to systematically review studies of (a) the associations between alcohol use, sexual risk behaviour and HIV infection; (b) the associations between alcohol use and HIV disease, including uptake of HIV treatment services, ART adherence and HIV outcomes; and (c) evaluations of interventions that have been implemented to address the links between alcohol use and HIV. The final goal of this review is to provide recommendations on how to mitigate the effects of alcohol on the acquisition and progression of HIV disease.

## **Methods**

Searches were conducted on African Journal Archive, Biomed Central, Ebscohost, South African Medical Journal Association, Pubmed Central, and South African Medical Association databases for relevant literature to include in the review. The search terms that were used were: alcohol, HIV, and Africa, with a specified publication date range of 2008 to 2011. Figure 1 shows the methods and outcomes of the literature search. The African Journal Archive did not return any results, Biomed Central returned 51, Ebscohost returned 175 results, South African Medical Journal Association returned 32 results and Pubmed Central returned 908 results. The total number of articles for consideration was 1166.

The initial phase (Phase 1) of reviewing studies for inclusion involved one reviewer (SN) reading the titles and abstracts to determine the articles' relevance as well as to allocate these articles to the three areas for review, viz HIV transmission; ART adherence and disease progression; and

interventions. Studies that were not conducted in SSA and/or were not concerned with the association between alcohol and HIV were eliminated.

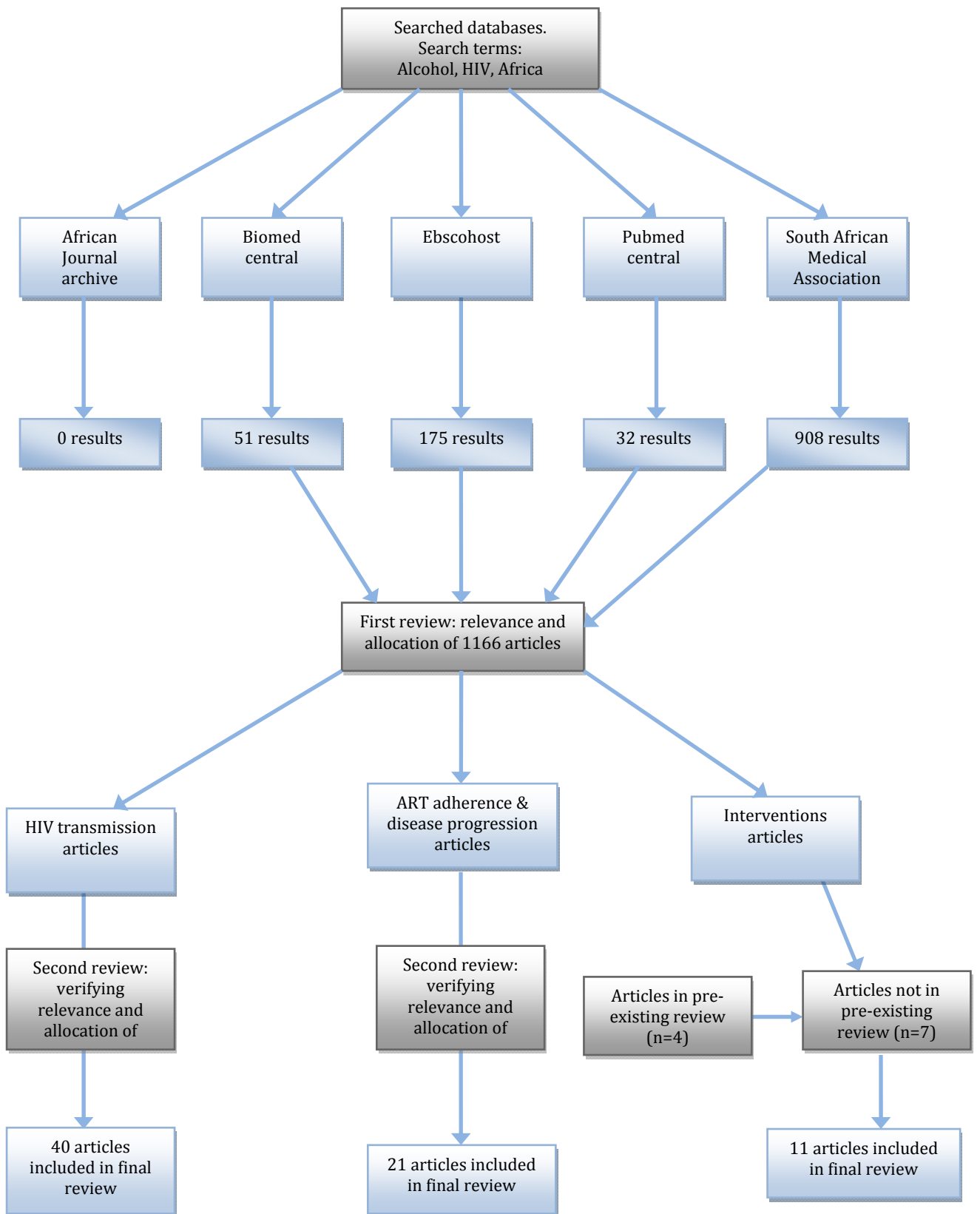
The abstracts that were allocated to the three areas were subsequently reviewed by a minimum of two reviewers to verify their eligibility. During this phase, the reviewers repeated the Phase 1 process to reach consensus on whether a study qualified for inclusion and had been accurately allocated to the respective review areas. In the instances where there was disagreement and/or the abstract did not offer sufficient information to inform a decision, the full article was obtained and a decision was based on the content thereof.

The total number of articles that met the criteria for inclusion for the HIV transmission area was 40. We found 21 articles concerning alcohol and HIV disease (ART adherence). With regard to the interventions area, an update of a pre-existing review of eight articles published between 1990 and 2010 (Morojele & Ranchod, in press) was done. We included four articles from that pre-existing review that met our current criteria (i.e. published in 2008-2011) as well as new articles (n=7) that had been published since completion of that review (i.e. articles published since 2010). A total of 11 articles from both sources met our criteria for inclusion of intervention studies in the present review.

The studies that were described in the papers that were eligible for inclusion were then summarised, using a table format, in terms of specific categories of information, namely, author and date, location, aim(s), design, setting, sampling and sample, tools and/or measures, analysis software and main analyses. These studies were then described and their findings were discussed and compared. Overall, a total of 72 papers are included in this review.

The remainder of this report consists of four sections. Chapter 2 reviews studies examining the link between alcohol use and HIV transmission. Chapter 3 focuses on studies on alcohol use and ART adherence only, since no studies on alcohol use and disease progression were found. Chapter 4 focuses on studies seeking to evaluate interventions for addressing alcohol-related sexual risk behaviour. Chapter 5 concludes by providing recommendations for addressing alcohol-related HIV transmission, disease progression and ART non-adherence with particular reference to the sub-Saharan African context.

Figure 1. Flow diagram of review methods



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## CHAPTER 2: ALCOHOL USE AND HIV TRANSMISSION

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The focus of this chapter is on reviewing studies that have been conducted on the association between alcohol and HIV transmission. Numerous studies have examined alcohol's role in terms of various outcomes which can be categorised as (a) HIV infection; (b) unprotected sex; (d) number of sexual partners; and (e) partner types. This section describes the studies in terms of the settings in which the studies were conducted and/or the target populations which were involved. The settings include (a) community settings; (b) alcohol serving/drinking settings; (c) educational settings; (d) workplace settings (including the military); and (e) health care settings.

### Description of Studies

More than half (n=40) of the 72 papers included in this review examined the role of alcohol consumption on HIV transmission. Table A.1 in the Appendices summarises the included papers. Eleven of the papers were published in 2011,<sup>1-11</sup> seven in 2010,<sup>13-18</sup> nine in 2009,<sup>19-27</sup> and thirteen in 2008.<sup>28-40</sup> The references for each of the reviewed papers can be seen at the end of this chapter.

### Aims of the studies

The aims of the studies fit into at least ten broad categories. Just about two fifths of the studies (n=16) aimed specifically to address the association between alcohol consumption and sexual risk behaviour.<sup>4,6,7,11-13,18,20-21,23,25,28-29,33-35</sup> Eight studies aimed to examine the predictors of sexual risk behaviour.<sup>22,26,30-32,36-37,40</sup> Four studies were concerned with the predictors of HIV prevalence.<sup>5,15,19,27</sup> A further two studies aimed to examine the predictors of HIV incidence.<sup>4,10</sup> Three studies aimed to examine determinants of HIV counselling and testing.<sup>17,24,36</sup> A number of qualitative studies aimed to explore dynamics underlying sexual risk behaviour among various populations.<sup>9,38</sup> Two descriptive studies focused on examining the nature of their participants' sexual behaviour and knowledge.<sup>3,14</sup> The remaining three studies examined the following topics: sexual coercion and risky sex;<sup>1</sup> factors associated with STI acquisition;<sup>39</sup> and sexual concurrency and predictors and associations with HIV.<sup>8</sup>

### Locations

Eighteen studies were conducted in South Africa.<sup>3-5,12-13,16-18,20-22,24,30,33-37</sup> Six studies were conducted in Uganda.<sup>1,7-8,10,27,38</sup> Four studies were conducted in Kenya<sup>6,9,19,31</sup> and Tanzania,<sup>20,26,29,39</sup> and in multi-country locations, that is Rwanda and Zambia;<sup>32</sup> Thailand, Zimbabwe, Tanzania and South Africa;<sup>25</sup> Botswana, Kenya, Namibia, Uganda, Zambia and Zimbabwe;<sup>15</sup> Zimbabwe, Harare and Tanzania.<sup>13</sup> Two studies were conducted in Nigeria<sup>14,40</sup> and one each in Zambia,<sup>11</sup> Ethiopia,<sup>2</sup> and Namibia.<sup>23</sup>



## Designs

Seventeen papers reported using a cross-sectional design.<sup>1-3,6-7,13-15,17-22,30,34,40</sup> Six papers reported using a longitudinal/cohort design.<sup>16,27-30,33</sup> Two reported using a Randomised Clinical Trial design.<sup>24,32</sup> Four used a qualitative design,<sup>9,18,23,38</sup> another two a descriptive design,<sup>32,35</sup> and another two a survey design.<sup>25,37</sup> One paper reported using a case control cross-over design.<sup>26</sup> Six papers did not report on the design used in their studies.<sup>4,8,10-11,36,39</sup>

## Settings

Eighteen of the studies were conducted in community settings.<sup>5-11,18-20,23-24,27,29,31-32,36,40</sup> Fifteen studies were conducted at health care settings.<sup>2,4,13,15-17,21-22,26,28,33,35,37-39</sup> Four studies were conducted in educational settings, including universities and schools.<sup>1,3,25,30</sup> Two studies were conducted in a bar setting,<sup>12,34</sup> and one study in a military setting.<sup>14</sup>

## Sampling approaches

Twenty-two of the papers reported on the sampling strategies that were used in their studies. Four reported using chain-referral sampling, two of these reported using snowball sampling,<sup>34,36</sup> and the other two reported using respondent-driven sampling.<sup>5,18</sup> Five reported using purposive sampling.<sup>2,7,12,35,38</sup> One reported using time location sampling.<sup>31</sup> Three reported using convenience sampling,<sup>9,11,21</sup> however one used it in conjunction with systematic fixed sampling with probability of selection proportionate to size.<sup>11</sup> Another paper also reported using probability proportionate to size sampling.<sup>6</sup> Eight papers reported using various systematic sampling methods.<sup>3,13,17,19-20,25,32,40</sup> A few papers did not report about the sampling strategy used in their studies.<sup>1,4-5,8,10,14-16,23,26-28,30,33,37,39</sup>

## Samples

Thirteen papers reported the mean ages of their studies' samples, which ranged from 15.4 to 36.2 years.<sup>2-3,6,10,15,21-22,26,30,32,35,38-39</sup> Three papers reported the median ages of their sample, which ranged from 19 to 34 years.<sup>12,19,34</sup> Twenty three papers did not report their studies' samples' mean or median,<sup>1,4-5,7-9,11,14,16-18,20,23-25,27-29,31,33,36-37,40</sup> although six of these did report on their samples' age range.<sup>9,18,20,24,27,29</sup>

A few papers reported their studies having a sample that comprised of only one gender group. Nine papers reported a sample that comprised females only,<sup>11,14-15,17,20,24,26,29,40</sup> while seven other papers reported a sample that comprised males only.<sup>6,12,18,22,31,36</sup> Some papers reported a moderate to large difference in their samples' gender distribution.<sup>1,4,21,33,35</sup> A few papers reported an equal to a fairly

equal gender distribution in their samples.<sup>2-3,7-9,13,19,32,38-39</sup> Nine papers did not report about their samples' gender distribution.<sup>10,16,23,25,27-28,30,37</sup>

## **Procedures**

Twelve studies used structured interviewing. Six of these used interviewer-administered questionnaires,<sup>2,6,10,15,31-32,36</sup> while there is no reporting of the instrument used for the other four studies.<sup>19,24,29,40</sup> Six studies used a structured instrument, however no information regarding the administration of the instrument is reported.<sup>5,7-8,20,27,39</sup> One study used a structured interview guide and a focus group discussion guide.<sup>23</sup> In-depth interviews were conducted in three studies,<sup>9,12,38</sup> in-depth interviews and structured interviews in another study,<sup>11</sup> and a computer-administered behavioural assessment was conducted in three studies.<sup>16,21-22</sup> Seven studies used a respondent-administered questionnaire.<sup>1,3-4,18,25,30,34</sup>

## **Measures**

### HIV transmission/Sexual risk behaviour

The studies included numerous measures of various types of sexual risk behaviours. Most concerned paper and pencil or computer assisted measures of unprotected sex, multiple partners, partner types, initiation of sex or age of sexual debut, and sex under the influence of alcohol. Some definitions of sexual risk behaviours were reported in some papers. In one paper, sexual risk behaviour involved multiple partners, defined as two or more partners, and transactional sex, defined as giving or receiving money in exchange for sex in the past year.<sup>11</sup> High risk sexual behaviour, in another study, was defined as having two or more sex partners in the last 12 months.<sup>40</sup> Another paper defined concurrent partnership as any sexual activity in the past 30 days with at least two regular or non-regular partners. Nine studies conducted laboratory or rapid testing to detect HIV sero-status.<sup>5,10,15,18-20,27,29,37</sup>

### Alcohol use

Alcohol use was measured with various instruments across the various studies, although the AUDIT was fairly widely used, i.e. six studies.<sup>5,16-17,21,34</sup> One study used the AUDIT in conjunction with other two single item measures of frequency of alcohol use and binge drinking.<sup>6</sup> Another study used adapted AUDIT items regarding frequency of alcohol use and binge drinking.<sup>4</sup> Two studies used the CAGE.<sup>20,29</sup> One study used the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) to assess hazardous alcohol use and drug use.<sup>13</sup> One study conducted laboratory testing of urine samples to detect drug use.<sup>24</sup>

## Analytical methods

A large number of papers reported about the software used to analyse their studies' data. Eight papers reported using Stata,<sup>6-8,10,15,18,31,36</sup> six reported using SPSS,<sup>1-3,24,30,35,37</sup> four reported using SAS,<sup>5,20,25,28</sup> one reported using SAS and Stata,<sup>19</sup> one reported using Software package R,<sup>32</sup> another one MLwiN<sup>40</sup> and another Atlas ti. for qualitative analyses.<sup>9</sup> Fourteen papers did not report on the software used for the analyses.<sup>4,11-14,16-17,21-22,26,29,33-34,38</sup>

Further, papers reported on the main analyses that were conducted. Most (n=19) of the papers reported logistic regression as the only main analysis conducted.<sup>1,4-5,7,9,11,14,17-19,21-22,25-27,29,32,34</sup> Other papers reported logistic regression in combination with other statistical methods.<sup>6,15-16,18,20,24,28,31,36-37,39</sup> Other papers reported other types of regression or predictive techniques (including Poisson regression, Generalised Estimating Equation analysis and Path analysis).<sup>10,33,35</sup> Two papers reported Chi-Square tests<sup>3,30</sup>. For the qualitative studies, Grounded Theory,<sup>8,9</sup> and thematic content analysis<sup>22,23</sup> were used for analysis.

## Findings

This section describes the findings of the 40 studies in terms of whether alcohol use was associated with HIV and/or a sexual risk behaviour. The findings of studies focusing on each of the five settings are described in separate sub-sections in turn. In each sub-section, we describe whether the results yielded a significant association (either positive or negative), no association (meaning alcohol use is neither associated with an increased or a decreased chance of HIV infection/sexual risk behaviour), or whether the findings were inconclusive. We refer to findings as inconclusive if it was impossible to reach a conclusion about the results due to design and/or methodological limitations, insufficient information, or there was a lack of clarity in the write-up of the results.

The number of studies that addressed each type of association for each of the five different settings can be seen in Table 1. Most studies focused on the associations between alcohol use and unprotected sex (n=19), multiple partners (n=14) and HIV infection (n=10), while relatively few focused on the associations between alcohol use and other types of sexual risk behaviour.

Table 1. Number of studies per setting addressing association between alcohol use and HIV infection and sexual risk behaviour.

Setting	Alcohol Use and HIV Infection	Alcohol Use and Unprotected Sex	Alcohol Use and Multiple Partners	Alcohol Use and Partner Types	Alcohol Use and HIV Testing	Alcohol Use and Sexual Debut/Activity	Alcohol Use and Sexual Risk Behaviour (Miscellaneous)	Extent of sex under the influence of alcohol
<b>Community settings</b>	5	6	7	2	1	0	0	0
<b>Alcohol serving/drinking settings</b>	1	3	2	4	0	1	0	0
<b>Educational settings</b>	0	1	2	0	0	2	0	2
<b>Workplace settings</b>	0	0	1	0	0	0	0	0
<b>Health Care settings</b>	4	9	2	0	2	0	2	0
<b>TOTAL</b>	10	19	14	6	3	3	2	2

## COMMUNITY SETTINGS

A total of 16 quantitative studies were conducted in community settings. They examined associations between alcohol use and (a) HIV infection; (b) unprotected sex; (c) sex with multiple partners; (d) sex with “risky” partner types; and (e) HIV testing. Two papers described qualitative studies. The findings of these studies are described in turn.

### Alcohol use and HIV infection

Two studies reported a positive association between alcohol use and HIV infection, two reported no significant association, and the findings of one study were inconclusive.

Studies finding a positive association (N=2): Zatblotska et al. (2009) conducted a community cross-sectional study in Rakai, Uganda, among 3,422 women aged 15-24 years.<sup>27</sup> They found that HIV prevalence was significantly associated with alcohol consumption before sex. Women who reported alcohol consumption before sex, and sexual coercion were particularly vulnerable to HIV infection. Ruzagira et al. (2011) conducted a prospective study of 495 HIV-uninfected men and women who were married to or co-habiting with an HIV-infected individual.<sup>10</sup> The participants’ mean age was 36.2 years (SD=9.2) and 69% of them were male. It was found that in multivariate analyses alcohol use at the start of the study (baseline) was associated with sero-conversion. Alcohol use at two-year follow-up was associated with HIV incidence in bivariate analyses, but not in multivariate analyses. No information is provided about how alcohol use was assessed.

Studies finding no significant association (N=2): Armonkul et al. (2009) conducted a community-based cross-sectional study among 1822 participants comprising 930 women and 832 men whose mean age was 19 years.<sup>19</sup> They found that past month alcohol use was not significantly associated with HIV infection among men and women who were sexually active, and who had ever been married. However, the authors failed to describe how alcohol use was measured. Townsend et al. (2010) also found, among a sample of 848 high risk men (aged 25-55 years), that there was no significant association between problem drinking (CAGE score greater than or equal to 3) and HIV status.<sup>18</sup> The HIV prevalence rates were 15.1% and 14.1% for the non-problem drinkers and the problem drinkers, respectively. It is interesting that in this study, *perceived* HIV+ status was significantly associated with being a problem drinker. A very strict cut-off point of having a score of 3 or more was used to denote problem drinking. Participants also overestimated their chances of being HIV infected.

Inconclusive findings (N=1): Lane et al. (2011) conducted a study of men who have sex with men (MSM) in Soweto, South Africa (n=378), with a median age of 23 years (range = 18-48).<sup>4</sup> They found

that those who were HIV infected were more likely to have bought alcohol or drugs for their partner, and have used marijuana in the past 6 months. Although alcohol consumption was measured via the AUDIT, the authors did not report whether it was associated with HIV infection.

### **Alcohol use and unprotected sex**

Three studies found a positive association between alcohol use and unprotected sex, one found a negative association, one study reported inconsistent findings, and one found no significant association.

Studies finding a positive association (N=4): Townsend et al. (2010) found, among a sample of 848 high risk men (described above), that problem drinkers were more likely than non-problem drinkers to report not using condoms due to drinking in the past year.<sup>18</sup> Townsend et al. (2010) also found that high risk men who were problem drinkers were more likely than men who were not problem drinkers to report inconsistent condom use or no condom use with two partner types in the past three months [(main partner(s), and casual partner(s)]. However, regarding the third partner type measured (once-off), the problem drinkers were more likely than non-problem drinkers to use condoms inconsistently, but not more likely to never use condoms (OR=1.47, 0.94-2.31). Geibel et al. (2008) conducted a study of 425 men who were aged 16 years and older in Mombasa, Kenya.<sup>31</sup> They found alcohol consumption to be a significant predictor of unprotected anal sex, as measured in terms of alcohol consumption 3 or more days per week. Men for this study were recruited from places where “male sex workers sought clients”. Lane et al. (2008) conducted a study of men who had ever had manual, oral or anal sex with other men (n=199), with the sample being 18-24 years and 25 years and older.<sup>36</sup> They used chain referral and recruitment from venues. Alcohol use was grouped into three categories (a) ‘infrequent/irregular use’ (drank < once per week and intoxicated less than once per week, or never drink); (b) ‘regular’ (drank at least once per week but intoxicated less than once per week); and (c) ‘regular to intoxication’ (drank at least once per week and intoxicated at least once per week). Unprotected anal sex was measured by asking about how often they had engaged in insertive or receptive anal intercourse and how frequently they had used condoms during these acts (for condom consistency) and whether condoms had slipped, torn or broken during these acts (for condom failure). They found that alcohol consumption was associated with unprotected anal sex. Specifically, both ‘regular’ and ‘regular to intoxication’ drinkers were more likely than ‘irregular/infrequent’ drinkers to report unprotected anal intercourse among MSM who were sexually active during the preceding 6-month period. Lundberg et al. (2011) conducted a cross-sectional study, recruiting participants from mainly households, but also shops and businesses.<sup>7</sup> Participants comprised 334 men and 312 women aged 18-30 years in two districts in

Uganda. Inconsistent condom use was defined as sometimes or never (as opposed to always) using condoms when having sex. In bivariate analysis alcohol use was found to be associated with inconsistent condom use for men but not for women. In multivariate analyses, for both men and women, there was no difference between those reporting being drunk less than once per week and those reporting being drunk at least once a week in rates of inconsistent condom use.

Studies finding a negative association (N=1): Genberg et al. (2008) reported on a study conducted in Thailand, Zimbabwe, Tanzania and two sites in South Africa.<sup>32</sup> It involved a household survey among men and women, as part of the baseline survey for a multi-site project (Project Accept). The samples comprised men and women whose mean age was between 22.9 and 25.8 years across the sites; eligible participants were aged between 18 and 32 years. In all five sites, in bivariate analyses, participants who used alcohol less than weekly, or weekly or more, were less likely to report never using condoms in the past 6 months than were participants who had been abstinent in the past 30 days; but in multivariate analyses alcohol use was not significantly associated with condom use.

Studies finding no significant associations (N=1): Ghebremicheal et al. (2009) conducted a cross-sectional study among women aged 20-44 years in a household survey in the Moshi urban district.<sup>20</sup> Frequency of condom use in the past 12 months was measured as never, sometimes and often/always. Alcohol abusers were those who had a score of 2-4 on the CAGE. There was no significant association between alcohol abuse and frequency of condom use in either the bivariate or the multivariate analyses.

### **Alcohol use and multiple partners**

Seven studies examined the association between alcohol use and multiple partners. They focused specifically on the number of sexual partners that participants reported having had (N=3), or on their engagement in sex concurrently with different partners (N=4).

#### *Number of partners:*

Two studies found a significant positive association between alcohol use and number of partners, while the association was not significant in one study.

Studies finding a positive association (N=2): Lundberg et al. (2011) conducted a study among 334 males and 312 females, aged 18-30 years who were recruited mainly from their households, but also from shops and businesses.<sup>7</sup> They found that alcohol consumption was significantly associated with the number of lifetime partners the respondents reported to have had, particularly for women. Specifically, those who reported being drunk at least once per week were significantly more likely to report four or more lifetime partners than those reporting being drunk less than weekly.

Ghebremichael et al. (2009) conducted a household survey of women aged 20-44 years. They found that alcohol abuse (CAGE score from 2-4) was a significant predictor of number of sexual partners (1 versus 2+) in the past three years in both bivariate and multivariate analyses.<sup>20</sup>

Studies finding no significant associations (N=1): Townsend et al. (2010) in their study among high risk men (described above), found no significant association in both bivariate and multivariate analyses between problem drinker status and reporting having had 4 or more partners in the past 3 months among high risk men (aged 25-55 years) in an RDS study in Cape Town (n=848).<sup>18</sup>

*Concurrent partners:*

Three studies found a significant association between alcohol use and concurrent partners, while one found a non-significant association between the two behaviours.

Studies finding a positive association (N=3): Lundberg et al. (2011), found that alcohol consumption was associated with having concurrent sexual partners in both men and women, in a study conducted in Uganda.<sup>7</sup> Participants were recruited from households, shops and businesses, and comprised 312 women and 334 men, aged 18-30 years. In multivariate analyses, those who reported getting drunk at least weekly were significantly more likely to report having more than one current partner than those who got drunk less than weekly, especially among women. Maher et al. (2011) also conducted a household study of a large sample of males (n=3291) and females (n=4052) in Uganda.<sup>8</sup> Since rates of concurrency were so low among women, the analyses were only conducted on the men's data. They found among the men that problem drinking (AUDIT score >8) was positively associated with concurrency excluding cases of polygyny. However, problem drinking was not significantly associated with 'any concurrency'. Uthman and Kongnyuy (2008) studied 6362 sexually active women in Nigeria in a household survey.<sup>40</sup> They found that women who drank alcohol in the past three months (i.e. 1 versus 0, 2 versus 0, and 3 or more versus 0 times) were more likely to report multiple concurrent sex. Multiple concurrent sex was not defined clearly, but seems to have been operationalised as having 2 or more sexual partners in the past 12 months.

Studies finding no significant associations (N=1): Townsend et al. (2010), in their study among high risk men (described above) found no significant difference in both bivariate and multivariate analyses between the proportions of problem drinkers and non-problem drinkers reporting concurrent partners in the past 3 months (as in 'having begun a sexual relationship with a woman while still engaged in a sexual relationship with another' p. 1545).<sup>18</sup>



### **Alcohol use and partner types**

Two studies examined the associations between alcohol use and “risky partner types”, which included partners who were met at drinking places and once-off partners. Both studies found a significant association between these behaviours.

#### *Met most recent partner in drinking place:*

Studies finding significant associations (N=1): Townsend et al. (2010) in their study among high risk men (described above), found that high risk men (see sample descriptions above) who were problem drinkers were more likely than men who were not problem drinkers to report having met their most recent partner at a bar; these results were significant for separate analyses conducted for main, casual and once-off partners<sup>18</sup>.

#### *Once-off relationships:*

Studies finding significant associations (N=1): Townsend et al. (2010), in their study among high risk men (described above), found that men who were problem drinkers were more likely than men who were not problem drinkers to report having had a once-off sexual relationship in the past 3 months<sup>18</sup>.

### **Alcohol use and HIV testing**

One study examined the association between alcohol use and HIV testing behaviour.

Studies finding significant associations (N=1): Luseno et al. (2009) found, among 425 women who were involved in a randomised controlled trial, that at baseline, having a past year history of alcohol abuse (DSM-IV -criteria) and daily cannabis use were significantly associated with taking the HIV test.<sup>24</sup> The women were recruited on the basis of being age 18 and above, having used alcohol on at least 13 days in the past 90 days, and having either traded sex for money in the past 90 days or had unprotected sex.

### **Qualitative studies**

Two papers described qualitative studies that addressed the issue of alcohol use and sexual risk behaviour. Lightfoot et al. (2009) conducted a study in a mining village in Namibia.<sup>12</sup> They collected data from six focus group discussions and sixteen in-depth interviews among the mine workers, their family members and professionals living in the town. The interviews and focus groups were concerned with perceptions of the extent to which the people in the village understood the link between alcohol consumption and HIV/AIDS. It emerged that there were high levels of substance use, particularly alcohol, and that this was related to the living conditions of mineworkers, specifically, loneliness and boredom as a result of living in a remote town with limited entertainment

away from families. Further, it emerged that alcohol use seemed to fuel risky sexual behaviour. The general perception was that alcohol use leads to loss of inhibition and impaired reasoning, resulting in sexual engagement with multiple partners without the use of condoms.

Townsend et al. (2011) conducted a study among 20 high-risk heterosexual men, who had multiple sexual partners.<sup>23</sup> These participants were purposively sampled from a larger sample that participated in a quantitative study. The 20 men took part in an in-depth interview which covered broad themes, viz. sexual behaviours, friendship networks, new sexual partner acquisition, and alcohol consumption. It emerged that men purchased and displayed large quantities of alcoholic beverages in a manner that symbolised wealth, attracted sexual partnerships with women, and facilitated sexual relations. Furthermore, the combination of alcohol consumption and need for sexual gratification was perceived to override men's awareness of HIV risk and interfere with their ability to use condoms.

### **ALCOHOL DRINKING/SERVING SETTINGS**

The five studies included in this sub-section involved participants who were either workers or patrons of drinking venues. These include studies of women who worked in bars or hotels,<sup>26,29</sup> men who were recruited from bars and other venues,<sup>6</sup> women who were recruited from bars and other venues<sup>11</sup>, and men and women who were recruited from shebeens.<sup>34</sup> These studies examined the associations between alcohol use and HIV infection, unprotected sex, multiple partners, partner types and sexual debut/activity. One paper involved a qualitative study.

### **Alcohol use and HIV infection**

We found one study that had examined the association between alcohol use and HIV infection.

Studies finding a positive association (N=1): Fisher et al. (2008) found that HIV infection was more common among drinkers than non-drinkers in a study of high-risk women in Moshi, Tanzania (n=1050).<sup>29</sup> HIV infection was also associated with problem drinking and greater involvement with alcohol (in terms of recency, frequency and quantity measures), indicating a dose-response relationship.

### **Alcohol use and unprotected sex**

Of three studies including participants recruited via bars that examined the association between alcohol use and unprotected sex, two found a positive association and one found a negative association between the two behaviours.

Studies finding a positive association (N=2): Luchters et al. (2011) conducted a study of 442 men who were recruited from various community sites including night clubs, beach areas, bars, street parks, private brothels and businesses, in Mombasa, Kenya.<sup>5</sup> A total of 65 different venues were selected. The participants were men who sold sex to men in exchange for money or goods and they had to be 16 years or older. The aim of the study was to determine which alcohol indicator was associated with inconsistent condom use in anal sex with male clients over the past 30 days. The authors did not specify how inconsistent condom use was measured. They found that alcohol dependence, frequent drinking and binge drinking were all associated with inconsistent condom use. They found specifically that the AUDIT measure was the best at distinguishing between those who had and those who had not engaged in inconsistent condom use.

Tassiopoulos et al. (2009) found that alcohol use was associated with unprotected sex among female sex workers in Moshi Tanzania in bivariate analyses but not in multivariate analyses.<sup>26</sup> The participants were female bar workers who were already involved in a study in Moshi to determine the incidence of HIV and predictors of sero-conversion. The women were 14 years and older and a case-crossover design was used, where the authors compared situations in which the outcome did and did not occur.

Studies finding a significant negative association (N=1): Among high risk women in Moshi, Tanzania, Fisher et al. (2008) found that in multivariate analyses (controlling for demographic factors, local ward where participants worked and receipt of a salary), problem drinkers were less likely to not have used a condom at last sex than non-drinkers.<sup>29</sup> But there was no difference between non-problem drinkers and non-drinkers in rates of non-condom use at last sexual occasions. There was also no significant bivariate association between condom use at last sex and problem drinker status. The finding of a negative association between problem drinking and condom use is consistent with the bivariate finding of Genberg et al. (2008) for all 5 Project Accept sites,<sup>32</sup> which was that drinkers were less likely to engage in unprotected sex than abstinent participants.

### **Alcohol use and multiple partners**

The two studies involving bar-recruited participants (workers or patrons) that examined alcohol use and multiple partners showed significant positive associations between the two behaviours.

#### *Number of partners:*

Studies finding a positive association (N=2): Fisher et al. (2008) found that problem drinkers were more likely than non-drinkers to report having (a) 3 or more sexual partners during the past 5 years;

and (b) 2 or more partners during the past year.<sup>29</sup> However, non-problem drinkers were not more or less likely than non-drinkers to report these behaviours.

Singh et al. (2011) conducted a study among women recruited from various venues in Zambia and found that there was a significant association between having 2 or more partners and having drunk alcohol in the past 30 days.<sup>11</sup> The women who were recruited from nightlife/drinking sites as opposed to open/transport related sites, were also more likely to report 2 or more partners in the past.

### **Alcohol use and partner types**

Four studies examined associations between alcohol use and sex with “risky” partners, as in transactional sex, partners from drinking venues and partners who had other sexual partners.

#### *Transactional sex:*

Studies finding significant associations (N=2): Fisher et al. (2008) found that problem drinkers were more likely than non-problem drinkers to report having engaged in transactional sex; but there was no significant difference between problem drinkers and non-problem drinkers on this variable.<sup>29</sup> Singh et al. (2011), in their study among women recruited from various venues in Zambia also found that there was a significant association between engagement in transactional sex and having drunk alcohol in the past 30 days (with a dose-response relationship).<sup>11</sup> Being recruited from night life/drinking sites as opposed to open/transport-related sites was also associated with having consumed alcohol in the past 30 days.

#### *Met partner in drinking venue:*

Studies finding significant associations (N=2): Fisher et al (2008) also found among high risk women, that problem drinkers and non-problem drinkers were more likely than non-drinkers to report having met their last sexual partner in a bar/hotel than non-drinkers.<sup>29</sup>

Kalichman et al. (2008b) recruited male and female participants from shebeens in Cape Town in a cross-sectional analytical study and used an adapted snowballing sampling method.<sup>34</sup> They found that those who had met their sexual partner(s) at a shebeen were 3.8 times more likely to report an AUDIT score of 9 or higher than those who had not met a partner at a shebeen.

#### *Partners with other sexual partners:*

Studies finding significant associations (N=1): Fisher et al. (2008) found that problem drinkers were more likely than non-drinkers to report that their male partner had another or other sexual partners.<sup>29</sup> However, non-problem drinkers did not differ from non-drinkers on this measure.

### **Alcohol use and sexual debut/activity**

One study examined the association between alcohol use and age of sexual debut.

Studies finding significant association (N=1): Fisher et al. (2008) found that drinkers (both non-problem drinkers and problem drinkers) were significantly more likely than non-drinkers to report having initiated sex at age 17 years or younger.<sup>29</sup>

### **Qualitative study**

In a qualitative study Njue et al. (2011) sought to understand sexual interactions among young people and in particular to understand why rates of HIV were high among this group.<sup>9</sup> The study involved in-depth interviews, observations and FGDs among in-school and out-of-school youth. It emerged that alcohol fuelled sexual risk behaviour with girls being more likely to agree to sexual encounters when under the influence of alcohol. Alcohol was also used in transactional relationships. Drinking contexts were places where the likelihood of having sexual encounters was increased.

### **EDUCATIONAL SETTINGS**

We found only four studies that had been conducted among school or university students. They examined alcohol use and (a) unprotected sex; (b) multiple partners; and (c) sexual debut/activity. A few were descriptive and reported on the extent to which students had engaged in sex under the influence of alcohol, without examining the association between alcohol use and HIV or sexual risk behaviour. We report on these associations in turn.

### **Alcohol use and unprotected sex**

One study examined the association between alcohol use and unprotected sex among participants in educational settings.

Studies finding no significant association (N=1): Agardh et al. (2011) reported on the associations between alcohol use and inconsistent condom use in their study involving 980 male and female university students in Uganda. In bivariate analyses they found a non-significant association between alcohol use at last sex and inconsistent condom use for the total sample, the males, and the females.<sup>1</sup> Inconsistent condom use was operationalised as not having used any method and not having used condoms as a “method of avoiding sexually transmitted diseases on your last occasion of sexual intercourse.”

### **Alcohol use and multiple partners**

Two studies found a positive association between alcohol use and multiple partners among participants in educational settings.

Studies finding a positive association (N=2): Agardh et al. (2011) examined the association between alcohol use and number of sexual partners in their study of 980 male and female university students in Uganda.<sup>1</sup> In bivariate analyses they found that among the total sample and the males (but not the females), those who reported having consumed alcohol on the last sexual occasion were more likely than those who did not, to report a high number of lifetime sexual partners. No multivariate analyses examining these associations were reported on.

Page and Hall (2009) conducted a school-based study across 6 sub-Saharan countries, viz. Botswana, Kenya, Namibia, Uganda, Zambia, and Zimbabwe.<sup>25</sup> Participants comprised 22949 learners who had taken part in the Global School-based Health Survey (GSHS) in 2003/2004. The participants comprised male and female students mainly aged from 13 to 15 years. The study's aim was to examine the relationship between sexual behaviour, alcohol use and indicators of psychological distress. They found that the odds of having had sex with 2 or more people increased as the number of days of alcohol consumption in the past 30 days increased.

#### **Alcohol use and sexual debut/activity**

Two studies found a positive association between alcohol use and sexual debut/activity among participants in educational settings.

Studies finding a significant association (N=2): In their study among 980 male and female university students in Uganda (assessing the association between experience of sexual coercion and risky sexual behaviour), Agardh et al. (2011) found that 23.9% of the sexually active participants reported having consumed alcohol at their last sexual act.<sup>1</sup> In bivariate analyses they found that among the total sample and the males (but not the females), those who had consumed alcohol on the last sexual occasion were more likely than those who reported not having consumed alcohol on the last occasion to report a low age of sexual debut. No multivariate analyses examining these associations are reported on.

Page and Hall (2009), in their school-based study (described above), also found that the odds of ever having had sex, sex in the past 12 months, and sex before age 13 years increased as the number of days of alcohol consumption in the past 30 days increased.<sup>25</sup>

#### **Extent of sex under the influence of alcohol**

Although two studies that were identified did not examine the association between alcohol use and sexual risk behaviour they provide useful data that can contribute to better understanding of the associations, including the extent of sex under the influence of alcohol.<sup>3,30</sup> Both studies were conducted in Durban, South Africa. Frank et al. (2008) conducted a study among 805 Grade 10 high-

school learners in Wentworth, a suburb of Durban, South Africa (mean age = 15.4 years).<sup>30</sup> The overall goal of the study was to identify behaviours and demographic factors that predispose high-school learners to HIV and AIDS. They found an association between gender and alcohol use at last sex among sexually active learners, with males (33.5%) being more likely than females (20.0%) to have used alcohol at last sex. Hoque and Ghuman (2011) conducted a descriptive cross-sectional study among 752 undergraduate university students in Umlazi (a township south of Durban), South Africa; mean age = 21.6 years (SD=2.99); 52% female.<sup>3</sup> The aim of the study was to examine the students' sexual behaviour and their knowledge of STIs. They found that 27.9% of the sexually active students reported having engaged in sex under the influence of alcohol. Males (39.2%) were more likely than females (14.6%) to have had sex under the influence of alcohol.

### **WORK PLACE SETTINGS**

We only found one study that addressed associations between alcohol use and sexual risk behaviour/HIV among a particular group of people from one work environment (namely female military personnel).<sup>14</sup> This study examined alcohol use and multiple partners.

#### **Alcohol use and multiple partners**

The only study focusing specifically on participants from a particular work environment yielded inconclusive findings regarding the association between alcohol use and multiple partners.

Inconclusive Results (N=1): Essien et al. (2010) reported on the results of a study among 346 female military personnel in Nigeria who were recruited to take part in an HIV prevention trial.<sup>14</sup> Women were eligible for the study if they had a history of alcohol or drug use, multiple sexual partners, were sexually active, and had a history of unprotected vaginal sex in the past 12 months. Just over half the sample were aged between 30 and 39 years. The aim of the study was to examine knowledge and sexual risk behaviours in military personnel. A scale of substance use (including alcohol) and sexual risk behaviours was developed. The scale solicited information regarding use of substances prior to sexual encounters and frequency of use of any of the substances in the past three months. Results indicated that 31% of participants had used a substance prior to a sexual encounter. Furthermore, the dependent variable 'substance use and risky sexual behaviour' was significantly predicted by number of sexual partners. However, these results are inconclusive regarding the specific role of alcohol use in sexual risk behaviour.

### **HEALTH CARE SETTINGS**

We found 13 studies that involved participants who were recruited from health care settings. These involved mainly STI clinics;<sup>4,16,21,22,39</sup> antenatal clinics;<sup>15,17</sup> VCT sites;<sup>28</sup> and wellness clinics.<sup>37</sup> These

studies examined associations between alcohol use and HIV infection, HIV testing, unprotected sex, multiple partners and various general forms of sexual risk behaviour that could not fit into the main categories of sexual risk behaviour considered by most of the studies. One paper described a qualitative study.

### **Alcohol use and HIV infection**

Of four studies that examined the association between alcohol use and HIV infection, two found a positive association, one yielded mixed findings, and one found no significant association.

Studies finding a positive association (N=2): Urassa et al. (2008) conducted a study among 304 youth attending an STI clinic in Dar es Salaam.<sup>39</sup> Their aim was to understand factors that facilitate STI (including HIV) acquisition. They reported that the HIV prevalence rate was 15.3% and 7.5% among females and males respectively, while the prevalence of other STIs was relatively low. They further found that the use of alcohol or illicit drugs was associated with an increased risk of HIV infection.

Kalichman et al. (2008a) conducted a prospective study among STI clinic patients in Cape Town, South Africa, comprising 157 men and 64 women.<sup>33</sup> They found that the participants who reported having consumed alcohol before sex during the past three months were more likely to be HIV+.

Inconsistent Findings (N=1): Mapingure et al. (2010) conducted a study among two samples of pregnant women who were enrolled at antenatal clinics; one in Harare, Zimbabwe and one in Moshi, Tanzania.<sup>15</sup> They found that alcohol consumption did not increase the risk of HIV infection among the Zimbabwean women. They also found that alcohol consumption was associated with an increased risk of HIV infection among the Tanzanian women in bivariate analyses, but not in multivariate analyses. It is surprising that the HIV prevalence rate was 25.6% (177/691) in the Zimbabwean sample and 6.9% (184/2654) in the Tanzanian sample, however, alcohol consumption and risky sexual behaviours were more common in the Tanzanian sample than the Zimbabwean sample.

Studies finding no significant association (N=1): Kalichman et al. (2010) conducted a study among male and female HIV sero-negative STI patients in Cape Town, South Africa.<sup>16</sup> At baseline the patients underwent a structured interview, Voluntary HIV Counselling and Testing (VCT), and then received risk-reduction counselling and treatment for their STI. They were re-tested for HIV and interviewed a year later. The sample included 29 people who sero-converted between baseline and one year follow-up and 77 people who remained HIV negative. At one-year follow-up, alcohol use was found not to be able to distinguish between those who sero-converted and those who remained HIV negative.



### **Alcohol use and unprotected sex**

Most studies that examined associations between alcohol use and unprotected sex among participants recruited from health care settings (N=6) found a significant positive association between alcohol use and unprotected sex, while three found a non-significant association.

Studies finding a positive association (N=6): Kalichman et al. (2009a) conducted a study among 1732 HIV sero-positive people who were being treated for a co-occurring STI in Cape Town, South Africa.<sup>21</sup> They found that alcohol use was associated with unprotected sex with partners who were uninfected or whose HIV sero-status was unknown.

Coldiron et al. (2008) conducted a study among heterosexual HIV sero-discordant couples (990 couples in Rwanda and 947 couples in Zambia).<sup>28</sup> Eligible couples comprised those who had cohabited for at least six months, were HIV sero-discordant, and were aged from 18-48 years for the women and 18-65 years for the men. The participants were recruited from HIV Couples' VCT sites, where they were receiving a same-day couples VCT service. For couples from both Rwanda and Zambia study sites, unprotected sex during the three-month period between the recruitment and follow-up interviews was associated with one of three alcohol measures that were included, specifically alcohol use during the year prior to testing/ enrolment. There was no significant association between unprotected sex and (a) six-item composite continuous measure for alcohol use and, (b) a six-item composite categorical measure of alcohol use.

Kiene et al. (2008) conducted a study among 82 male and female HIV sero-positive individuals in Cape Town, South Africa.<sup>35</sup> Participants were eligible if they were (a) above 18 years; (b) HIV positive; (c) had vaginal or anal sex; (d) had consumed alcohol in the past 30 days; (e) had access to a phone at which they could receive telephone calls. The study involved an event-level analysis. Respondents were telephoned and had to report daily on their alcohol use and sexual behaviour during the preceding night and the day on which the phone interview was conducted. They found that alcohol use before sex was associated with an increase in both the proportion and number of unprotected sex events that occurred per day.

Lurie et al. (2008) also conducted a study among 3819 HIV sero-positive individuals recruited from hospital wards and VCT sites in South Africa.<sup>37</sup> Their study was done in an urban and rural wellness clinic in Soweto and Bushbuckridge, respectively. They aimed to explore factors that were associated with safe sexual behaviour. They found that consistent condom use was associated with no history of alcohol consumption for men in general and rural men in multivariate analyses, whereas for urban

men the association was not significant. History of alcohol consumption was not associated with consistent condom use for women in general or women in either location.

Kalichman et al. (2008a), in their prospective study among STI clinic patients in Cape Town (described above) found, in bivariate analyses, that the participants who reported having consumed alcohol before sex during the past three months reported a significantly greater number of occasions of unprotected anal sex than did those who did not report having engaged in alcohol use before sex during the past three months.<sup>33</sup> No results of multivariate analyses are provided.

Dessie et al. (2011) conducted a cross-sectional study among people living with HIV who were attending ART clinics in Addis Ababa, Ethiopia, who were all ART recipients.<sup>2</sup> The participants included 601 patients (55.1% female), whose mean age was 33.4 years (SD=6.5). A total of 5.7% of respondents reported not using a condom due to being drunk. There was a significant bivariate association between alcohol consumption and engagement in condom unprotected sex in the past three months. However, in multivariate analyses alcohol use failed to be a significant predictor of unprotected sex.

Studies finding no association (N=3): Coldiron et al. (2008), in their longitudinal study of heterosexual HIV sero-discordant couples in Rwanda and Zambia (described above), found that unprotected sex during the period between baseline and 3-month follow-up interviews was not associated with two composite alcohol use measures, namely (a) the number of alcohol-related problems, and (b) the frequency of alcohol-related problems.<sup>28</sup>

Kalichman and Simbayi (2011) conducted a study among 739 women and men seeking treatment for an identified STI at an STI clinic in Cape Town, South Africa.<sup>4</sup> Their aim was to examine the combined risks of multiple recent partners and alcohol use. Unprotected sex was one of the outcomes of their study. They found that global alcohol use was not associated with rates of unprotected sex.

Kalichman et al. (2008a) in their prospective study (described above) found that consuming alcohol before sex was not significantly associated with engagement in unprotected sex in the past three months.<sup>33</sup>

### **Alcohol use and multiple partners**

Both studies among participants in health care settings examining associations between alcohol use and multiple partners found these associations to be statistically significant.

Studies finding a positive association (N=2): As described above, Kalichman and Simbayi's (2011) study was conducted among people seeking treatment for an STI.<sup>4</sup> They found that alcohol use and drinking in sexual contexts was positively associated with having multiple recent partners (which was defined as having two or more partners in the past two months, including concurrent and non-concurrent partners).

Kalichman et al. (2008a), in the study of STI clinic patients described above, found that the participants who reported having consumed alcohol before sex during the past three months were more likely to report having had 2 or more sex partners in the past three months.<sup>33</sup> They also reported a higher mean number of sexual partners during the past three months of 3 (SD=6.5) as opposed to 1.5 (SD=1.1) for those who did not drink before sex in the past three months.

### **Alcohol use and HIV testing**

Both studies that examined associations between alcohol use and HIV testing found a significant negative association between the two behaviours.

Studies finding a significant negative association (N=2): Peltzer et al. (2010) conducted a study among 930 pregnant women attending antenatal clinics in Mpumalanga, South Africa who had an opportunity to participate in VCT.<sup>17</sup> The aim of the study was to determine factors that were associated with pregnant women accepting HIV pre-test and post-test counselling. Eighty one percent of the women sought their test result in post-test HIV counselling. Obtaining a low alcohol drinking score (based on the AUDIT) was found to be positively associated with HIV pre-test counselling in bivariate and multivariate analyses. However, it was only associated with post-test counselling in bivariate analyses.

Kalichman et al. (2008a), in their prospective study described above, found that there was no significant difference between the proportion of participants who reported having consumed alcohol before sex during the past three months (59%) and those who reported having not consumed alcohol (69%) in terms of their likelihood of having had an HIV test.<sup>33</sup>

### **Alcohol use and sexual risk behaviour (miscellaneous)**

Two studies examining alcohol use and various general forms of sexual risk behaviour among participants in health care settings found the two variables to be associated significantly.

Studies finding a positive association (N=2): Avalos et al. (2010) conducted a study among 2618 male and female primary care patients in Cape Town, South Africa.<sup>13</sup> Their outcome variable was a count of six sexual risk behaviours, which were: (a) had a partner who traded sex for drugs, transport or

money, (b) a male partner who ever had sex with another man, (c) had a partner who used injection drugs, (d) had a partner who had an STI, and (e) had multiple sex partners during the past year, as well as (f) failed to use a condom at last sex. Hazardous alcohol use was measured by the ASSIST. They found that those who drank alcohol at hazardous levels engaged in more sexual risk behaviours.

Kalichman et al. (2008a), in the prospective study among STI clinic patients (described above), tested a model examining the relationship between sensation seeking, alcohol outcome expectancies, alcohol use in relation to sex and sexual risk behaviours.<sup>33</sup> They found that sensation seeking was related to drinking in sexual contexts at baseline but not at follow up. Alcohol outcome expectancies were a predictor of drinking in sexual contexts at follow up. Drinking in relation to sex (in sexual contexts) was related to HIV transmission risk behaviour at follow-up. Quantity and frequency of alcohol consumption was related to drinking in sexual contexts at both baseline and follow-up.

### **Qualitative studies**

Mwaba et al. (2008) conducted a study among 21 STI clinic patients (12 female and 9 male) in South Africa.<sup>38</sup> Participants were aged between 16 and 35 years and took part in brief (20-30 minute) in-depth interviews. One of the key themes that emerged from the study was that alcohol increases the risk of individuals having multiple partners; it was felt that alcohol renders individuals less likely to think about the consequences of sexual encounters. Inconsistent condom use was seen to result from alcohol consumption because individuals neither think nor care about protecting themselves when they are under the influence of alcohol. The context of shebeens was seen as a high risk environment for “securing” commercial sex.

Table 2. Numbers of studies finding significant (Sig), non-significant associations (NS), and inconclusive (IC) results between alcohol use and sexual risk behaviour

	Alcohol use and HIV infection			Alcohol use and unprotected sex				Alcohol use and multiple partners			Alcohol use and partner types			Alcohol use and HIV testing			Alcohol use and sexual debut/activity			Alcohol and sexual risk behaviour: general		
	Sig	NS	IC	Sig+	Sig-	NS	IC	Sig	NS	IC	Sig	NS	IC	Sig	NS	IC	Sig	NS	IC	Sig	NS	IC
<b>Community settings</b>	2	2	1	4	1	1	0	5	2	0	2	0	0	1	0	0	-	-	-	-	-	-
<b>Alcohol serving/drinking settings</b>	1	0	0	2	1	0	0	2	0	0	5	0	0	-	-	-	1	0	0	-	-	-
<b>Educational settings</b>	-	-	-	0	0	1	0	2	0	0	-	-	-	-	-	-	2	0	0	-	-	-
<b>Workplace settings</b>	-	-	-	-	-	-	-	0	0	1	-	-	-	-	-	-	-	-	-	-	-	-
<b>Health Care settings</b>	2	1	1	6	0	3	0	2	0	0	-	-	-	2	0	0	-	-	-	2	0	0
<b>TOTAL</b>	5	3	2	11	2	5	1	11	2	1	7	0	0	3	0	0	3	0	0	2	0	0

Note: The same study is counted more than once if it reports more than one association. --- Association not examined.

## Discussion

In this chapter we have reviewed 40 published studies that have been conducted in SSA and have addressed the association between alcohol use and sexual risk behaviour and HIV infection. The studies' participants were recruited from varied settings including communities, drinking establishments, schools and universities, workplaces and health care environments. The bulk of the studies were based in community and health care settings, while fewer were conducted among participants from bar and educational settings, and only one study involved a work place environment. The most common associations that were examined related to alcohol use and unprotected sex, alcohol use and multiple partners, and alcohol use and HIV. Relatively few studies concerned other types of sexual risk behaviours (including engagement in sex with 'risky' partner types, or initiation of sex).

In general the findings support previous research showing a link between alcohol use and HIV infection, and various sexual risk behaviours, as shown in Table 2. The proportions of associations that were statistically significant seemed to vary by the type of sexual risk behaviour/HIV-related outcome under consideration. All (100%) of the associations between alcohol use and the partner types, HIV testing, sexual debut and general sexual risk behaviour outcomes were statistically significant. The next most commonly confirmed associations were for alcohol use and multiple partners (11/14 = 78.6%). This was followed by the positive associations between alcohol use and unprotected sex (12/19 = 63.2%). However, only half (50%) of the associations between alcohol use and HIV infection that were tested were statistically significant (5/10).

We considered the findings of two studies to be inconclusive.<sup>5,14</sup> In their study conducted in a community setting, Lane et al. failed to report on whether alcohol use was associated with HIV, despite including a measure of alcohol use (AUDIT) in their study. In their study in a work place setting, Essien et al. (2010), used a combined measure of alcohol and other substance use (rather than a measure of alcohol use on its own) in their analysis of the associations with sex with multiple partners.<sup>14</sup>

The non-significant findings mainly emerged from studies concerned with the association between (a) alcohol use and HIV infection; (b) alcohol use and unprotected sex; and (c) alcohol use and multiple partners.

*Associations between alcohol use and HIV infection* were not significant in three studies, which included two in a community setting,<sup>18-19</sup> and one in a health care setting.<sup>16</sup> The findings of Armonkul et al.<sup>19</sup> are difficult to interpret as they failed to describe how alcohol use was measured. The non-

significant findings in the study by Townsend et al.<sup>18</sup> could be due to the characteristics of the sample, as it comprised men who were at heightened risk of HIV infection. In addition they used a very strict measure of problem drinking. The non-significant findings in Kalichman et al.'s<sup>16</sup> study may likely to be due to their small sample.

*Associations between alcohol use and unprotected sex* were not significant in five studies which comprised one in a community setting,<sup>32</sup> one among high risk university students,<sup>1</sup> and three in health care settings.<sup>4,28,33</sup> A meta-analysis of event-level studies has supported a positive association between alcohol use and unprotected sex primarily among young people during their first sexual experience, but not for adults (Leigh, 2002). Other somewhat unexpected results were the negative (rather than positive) associations between unprotected sex and alcohol use that were found by Fisher et al.<sup>29</sup> in multivariate analyses, and Genberg et al.<sup>32</sup> in bivariate analyses; alcohol users were found to be less rather than more likely to engage in unprotected sex. This trend has been observed elsewhere (see Fisher et al., 2007). Fisher et al., suggested that condom use may in fact be a “marker of high risk behaviors” (p.543). Also, it is conceivable that individuals who may be conscious of their risk of HIV infection as a result of their high risk behaviours (e.g. heavy drinking, engagement in sex work and other risky activities), may become more vigilant regarding their need to protect themselves by using condoms during their sexual encounters (Morojele et al., 2006).

*Associations between alcohol use and multiple partners* were not significant in two community studies.<sup>18-19</sup> Armonkul et al.<sup>19</sup> found that the association between “alcohol intake during previous month” and unprotected sex was not significant but failed to describe specifically how alcohol use was measured. Townsend et al.'s<sup>18</sup> findings are not surprising as the participants were all ‘high risk’ to begin with, in that they qualified for participation by virtue of their engagement in sex with multiple concurrent partners. In addition, analyses comparing less strict cut-off points for number of partners may have yielded different results.

In spite of the few negative and inconclusive findings, the overwhelming majority of the associations (43/58 = 74.1%) support a link between alcohol and HIV infection and sexual risk behaviour among males and females, people of different age groups, and individuals in different settings. The qualitative studies provide explanations for the likely mechanisms supporting some of the observed associations. Specifically, and consistent with previous qualitative studies (e.g. Morojele et al., 2006), individuals refer to alcohol's effects on cognitions, and the contexts of alcohol drinking venues, as among the potential reasons why alcohol may increase the risk of engagement in sexual risk behaviours.

The findings suggest that particular contexts and groups present a heightened risk for HIV transmission associated with their alcohol consumption. For example, individuals who serve/sell alcohol and/or drink alcohol in alcohol serving establishments are at heightened risk. The findings (e.g. Fisher et al., 2008) also point to the importance of considering patterns and quantities of alcohol consumed. Various studies indicated that problem/high risk drinkers had the greatest vulnerability to HIV infection and engagement in sexual risk behaviours, while the risks for non-problem drinkers are often either lower than those of problem drinkers, or no different from those of non-drinkers.

The study's findings have limited implications for the question of whether alcohol use causes HIV. For example, the finding that there is a dose-response association between alcohol use and sexual risk behaviour supports the notion of causality (Hahn et al., 2011). However, few studies were longitudinal and hence this requirement for causation cannot be addressed. The studies also do not provide any indication about alcohol's likely biological role in HIV infection, including possible effects on the immune system.

Important groups for whom this study has implications are most at risk populations (MARPs), such as men who have sex with men (MSM). Relatively little previous research has examined the role of alcohol in HIV transmission among this population. It is clear that alcohol has an effect on MSMs' sexual behaviours, and coupled with their already increased risk, alcohol use may further increase their risk of HIV infection. Other particularly vulnerable groups include men and women who sell sex, those who engage in transactional sex, and women who work in hotels and restaurants (e.g. Fisher et al., 2008; Neuman et al., in press) for whom protective interventions are urgently needed.

### **Strength of the Studies**

In general the reviewed studies have numerous strengths, and are generally superior in quality to those that were included in the review published by Kalichman and his colleagues in 2007. Many of the studies were well designed and have very large representative samples rather than small convenience samples. They also included various designs, including both cross-sectional and longitudinal designs. In addition, some studies included multiple measures of alcohol use and sexual risk behaviour, which can provide more detailed and specific understanding of the nature of the associations between different types of alcohol use and sexual risk behaviours. Among the studies with these features are Fisher et al.'s (2008)<sup>29</sup> among high risk women in Tanzania, and Townsend et al.'s (2010)<sup>18</sup> among high risk men in South Africa.



### **Limitations of the Studies**

The studies had five main limitations. First, the inconsistent measures of alcohol use and sexual risk behaviour render the studies difficult to compare. Second, the use of self-report measures may have yielded under-reporting of both alcohol use and sexual risk behaviour among the studies' participants. Third, a number of the papers provided incomplete information about the methods and measures of alcohol or sexual risk behaviour used, rendering it difficult to interpret their findings. Fourth, most studies were conducted in southern Africa, and hence this review does not provide a picture of the alcohol and HIV associations for the entire sub-Saharan region. Finally, it is notable that relatively few studies included adolescent and youth samples as most studies' eligibility criteria required participants to be aged 18 years or older. It is likely that challenges concerning obtaining consent from parents of minors may be one reason why adolescents have been studied so infrequently.

### **Suggestions for Further Research**

The findings of this review have numerous implications for further research. First, it could be of value for a handbook or guidelines for researchers focusing on alcohol use and HIV to be developed with recommended measures of alcohol use and sexual risk behaviour to be described. Further research is needed to understand the conditions under which alcohol use is negatively versus positively associated with unprotected sex, as findings regarding this association are inconsistent. In addition, more qualitative and theoretically-driven research would benefit this field and would help to further explain mechanisms underlying the observed associations. Furthermore, further studies on the role of alcohol in sexual risk behaviour and HIV transmission among adolescents and other young people are urgently needed. Finally, more research involving path analyses and complex modelling is needed to examine the interrelationships among risk factors for alcohol consumption and sexual risk behaviour.

### **Conclusion**

This review of studies conducted mainly in community, health care and bar settings provides overwhelming support for the association between alcohol use, sexual risk behaviour and HIV. Greater consideration of these links is required in these settings, and alcohol users and problem drinkers in particular, should be included as among individuals recognised as most at risk populations (MARPS), along with their drug-using and MSM counterparts. This need is particularly heightened given the relatively high proportions of heavy/binge/problem drinkers in SSA, and especially in the sub-region where the HIV epidemic continues to be at its most severe (UNAIDS, 2010a).

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## CHAPTER 3: ALCOHOL USE AND ADHERENCE TO ANTIRETROVIRAL THERAPY (ART)

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This chapter describes the findings of our review of studies that address the association between alcohol use and HIV care. We report on studies of the following kinds: (a) descriptive studies which report on the proportions of ART patients who endorse alcohol as a barrier to their adherence to ART; (b) analytical studies which examine the association between alcohol use and ART adherence; and (c) qualitative studies which address the association between alcohol use and HIV-related services, including ART uptake, enrolment and non-adherence.

### Description of Studies

About a quarter (n=21) of the 72 papers included in this review covered the topics of alcohol consumption and ART adherence. Table A.2 in the Appendices summarises the included papers in terms of aims, design, setting, sampling and sample, data collection, tools and/or measures, and statistical software and main analyses. Of 21 papers which were eligible for inclusion in this review, two of were published in 2011,<sup>1,2</sup> eleven in 2010,<sup>3-13</sup> three in 2009,<sup>14-16</sup> and five in 2008.<sup>17-21</sup> The references for each of the reviewed papers can be seen at the end of this chapter.

### Aims of the studies

Three studies aimed to explore barriers and enablers to ART adherence.<sup>10,18,21</sup> Nine studies aimed to determine factors that were associated with ART adherence, including alcohol use.<sup>3,5-6,9,12,14-16,19</sup> Two studies were concerned with how gender influences health behaviours and health care experiences.<sup>2,8</sup> Two studies examined the association between alcohol use and ART uptake.<sup>1,20</sup> Two studies had multiple aims, which included to determine the prevalence of hazardous alcohol and its correlates with ART adherence<sup>7,16</sup>

### Locations

Six of the studies were conducted in South Africa,<sup>3-4,8,11,16,18</sup> two each in Zambia,<sup>15,21</sup> Botswana;<sup>5,14</sup> Nigeria,<sup>7,12</sup> Uganda,<sup>10,20</sup> and Ethiopia,<sup>1,17</sup> and one each in Cameroon<sup>19</sup>, Zimbabwe<sup>2</sup> and DRC<sup>13</sup>. Two studies were conducted at multi-country sites, one was conducted in five countries, viz. Kenya, Uganda, Zambia, Nigeria, and Rwanda<sup>6</sup> and another in three West African countries, namely Benin, Cote d'Ivoire, and Mali<sup>9</sup>.

### Settings

Most of the studies were conducted at clinics, eight were conducted at hospital-based ART clinics,<sup>1,4,7-8,11-12,17,19</sup> seven at ART/HIV clinics,<sup>3,5-6,9,13-14,20</sup> three at treatment/health centres,<sup>2,10,16</sup> one

at a workplace,<sup>18</sup> one was conducted at two sites, namely, a local clinic and a governmental organisation's training centre<sup>21</sup>, and one paper did not specify the setting.<sup>15</sup>

### **Designs**

Five studies used an exploratory qualitative design,<sup>2,8,15,18,21</sup> four used a descriptive quantitative design,<sup>5,14,16-17</sup> one study used both exploratory and descriptive designs,<sup>10</sup> and eight studies used a quantitative analytical design.<sup>3,6-7,9,11-12,19-20</sup> One study employed a prospective analytical design,<sup>1</sup> and another a case-control design.<sup>4</sup>

### **Sampling approaches**

Eight of the papers reported the sampling techniques that were used. Three studies used two used purposive sampling,<sup>4,10,18</sup> one of which used it with probability proportionate to size sampling.<sup>10</sup> Five studies used random sampling,<sup>1,11-12,14,19</sup> although only three studies specified the type of random sampling they used.<sup>11-12,14</sup> Other studies reported using convenience sampling,<sup>16</sup> "volunteer sampling",<sup>3</sup> and one-stage cluster sampling<sup>9</sup>.

### **Samples**

Six papers reported median ages of their studies' samples which ranged between 30-46 years. Two papers reported mean ages for their studies' samples: i.e. 33.9 years<sup>3</sup> and 38.4 years.<sup>14</sup> Twelve papers did not report about their samples' mean nor median ages, although five papers mentioned the age range of their studies' sample.<sup>5,7,12,16,21</sup> A majority of the studies' samples comprised a larger number of female than male participants.<sup>2-3,5-11,14,16-17,19-21</sup> Two papers reported their sample to have comprised more males than females.<sup>4,18</sup> Three papers did not report the gender composition of their sample.<sup>12-13,15</sup>

### **Procedures**

Seven studies used interviewing methods using semi-structured interview guides;<sup>2,4,8,10,15,18,21</sup> two of these six studies used additional data collection approaches, one used a free listing technique<sup>15</sup> and another used focus groups with role playing.<sup>2</sup> Eight studies used structured interviews to obtain data; seven of these used structured questionnaires<sup>1,3,11,14,16,17,19</sup> while two used screening tools<sup>7,20</sup>. Three studies used respondent-administered questionnaires.<sup>5-6,9</sup> Two papers did not specify whether the questionnaires were interviewer- or respondent-administered.<sup>12-13</sup>

### **Measures**

The studies included various measures of alcohol use. Three studies measured hazardous alcohol use, two with the 10-item Alcohol Use Disorder Identification Test (AUDIT)<sup>7,16</sup> and one with the 3-item AUDIT-C.<sup>11</sup> One study measured alcohol use using the 10-item AUDIT as well as current alcohol

use by means of participants' self-report regarding whether they had used any alcohol within the past year.<sup>9</sup> One study measured binge drinking by means of participants' self-report regarding whether they had had >3 large bottles of beer and/or six glasses of other alcoholic drinks on one occasion.<sup>19</sup> One study measured frequency and quantity of alcohol use as well as whether participants continued with ART when consuming alcohol.<sup>5</sup> One study reported having measured alcohol use in terms of frequency<sup>1</sup> and another with number of units consumed per week.<sup>4</sup>

In terms of ART adherence, some studies reported the working definition of ART adherence, whereas others reported the measures they used. The studies measured ART adherence by means of various measures including, the 30-day Visual Analog Scale (VAS),<sup>16</sup> the VAS as well as the AIDS Clinical Trial Group measure (ACTG),<sup>11</sup> a culturally sensitive modified version of Morisky score,<sup>5</sup> pharmacy refill records,<sup>7</sup> and medical records.<sup>20</sup> Varied definitions of adherence were used. The studies defined ART adherence as, self-reported dose adherence in the past 4 days,<sup>9</sup> and self-reported dose, time and food adherence in the past seven days.<sup>17</sup> Non-adherence was defined as missed doses in the past week or missed appointments in the past 3 months,<sup>6</sup> and self-reported ART interruptions longer than 2 consecutive days in the past 4 weeks.<sup>11,19</sup> One study<sup>11</sup> included multiple definitions as they considered different elements of adherence: Dose non-adherence was defined as having missed at least all doses on at least one day during the past 4 day schedule; schedule non-adherence was defined as missing scheduling in the past 4 days; food non-adherence was defined as not having followed special instructions over the last 4 days.

### **Analytical methods**

Five studies used qualitative data analysis methods, including thematic content analysis,<sup>18</sup> summary lists and domain analysis technique,<sup>15</sup> Attride-Stirling's thematic network analysis,<sup>2</sup> Giorgi's phenomenological analysis<sup>21</sup> and one study did not specify its data analysis method.<sup>8</sup> One study used both qualitative and quantitative data analysis methods, i.e. thematic content analysis and frequencies in SPSS.<sup>10</sup> The other studies conducted quantitative analyses using various statistical software, viz. SPSS,<sup>12,14,16,20</sup> SAS,<sup>5,7,9,19</sup> STATA,<sup>6</sup> Microstat statistical software,<sup>3</sup> and one paper did not report its statistical software.<sup>17</sup> Two studies conducted Chi-square tests,<sup>14,16</sup> one conducted Chi-square and Fisher's exact tests,<sup>5</sup> and one conducted Chi-square test, Mann-Whitney U and multivariate logistic regression.<sup>20</sup> Different types of regression analyses were commonly used.<sup>1,4,6-7,9,11,17,19</sup> Bhat et al., (2010) report having analysed statistical significance of various parameters on adherence.<sup>3</sup> Usman (2010) did not report on the main analyses they conducted for their study.<sup>12</sup>



## Findings

This section describes the results of 21 studies that addressed alcohol use and ART adherence. It consists of 3 sections. First we describe the descriptive studies, second analytical studies, and finally qualitative studies.

Table 3. Number of studies that addressed alcohol and ART adherence\*

Nature of study	Focus of study	Number of studies
<b>Descriptive</b>	Alcohol use as reason for non-adherence	2
<b>Analytical</b>	Uptake of HIV services	2
	Alcohol and adherence	11
	Alcohol and ART outcomes	1
<b>Qualitative</b>	Barriers to uptake of services	1
	Barriers and facilitators to ART adherence	2
	Reasons for accepting or continuing ART	1

\*Please note that most of the studies did not set out to specifically test the association.

### DESCRIPTIVE STUDIES

#### Alcohol use as a reason for non-adherence

Kip et al. (2009) conducted a quantitative descriptive survey among 400 randomly selected ART patients.<sup>14</sup> The patients took part in a face-to-face interview, with questions asked from a structured questionnaire. The patients were randomly sampled from four ART clinics in Botswana. They were all 21 years or older. A total of 37% of the patients reported having missed a dose of their ART due to alcohol. However, no further details are provided on this finding.

Kunihira et al (2010) conducted a qualitative and a quantitative study.<sup>10</sup> In total, 384 PLWHA were interviewed with a semi-structured interview schedule, with 71% of them being on ARTS. Thirty eight KIIs were conducted among supervisors of ART clinics, supervisors of ART outreach programmes, people from district teams, NGO representatives and counsellors. The two most prominent beliefs that are relevant here are that (a) abstinence is necessary to be enrolled on ART programmes, and (b) difficulties associated with giving up drinking are a barrier. The paper does not go on to explain how this is a barrier but it seems to imply that drinking alcohol will cause people to miss a dose/doses of ART. The main findings is the belief that quitting drinking is essential to be

enrolled on an ART programme and that drinking alcohol will cause one to miss taking one's medication.

## **ANALYTICAL STUDIES**

### **Uptake of HIV services**

Abaynew et al. (2011) examined factors related to late presentation to HIV/AIDS care in Northern Ethiopia in a case control design study.<sup>1</sup> Cases were PLWHA who had a WHO clinical stage of III or IV or a CD4 count of less than 200 at first presentation at an ART clinic, while controls were PLWHA who had WHO clinical stage I or II or a CD4 count of more than 200, irrespective of clinical staging at the time of first presentation to the ART clinics. In-depth interviews were conducted with 10 health workers and 8 PLWHA. It emerged that severity of alcohol use was associated with late presentation to HIV/AIDS care. Specifically, alcohol use "most of the time" as compared with "never" was significantly and independently associated with late presentation to HIV/AIDS care, whereas users of alcohol "sometimes" were not more likely to be late presenters to HIV/AIDS care than non-users of alcohol.

Martinez et al. (2011) conducted a cross-sectional study among 421 randomly selected HIV infected patients.<sup>20</sup> They aimed to assess whether alcohol use and depressive symptoms are associated with receipt of ART. Medical records with ART prescription were used to confirm receipt of ART. Alcohol use was assessed with the AUDIT and items relating to history of consumption. Two hundred and sixty one patients were in WHO Stage III and IV HIV disease and 149 (57.1%) were currently taking ART. Drinking alcohol in the last year was negatively associated with receipt of ART in multivariate analysis. The AUDIT item "ever get concern from others" was associated with increased ART use, while none of the other AUDIT items were significantly associated with receipt of ART.

Positive findings between alcohol and ART adherence (N = 6): Usman (2010) conducted a simple random sampling survey, designed to identify factors that determine optimal adherence to ART.<sup>12</sup> He enrolled a cohort of 50 patients (Plateau State, Nigeria) on first line ARVs (for at least 6 to 12 months) accessing HIV care at a secondary health facility. He found a significant relationship between alcohol consumption and the respondents' tendency to miss their ARV doses ( $\chi^2=26.58$ ,  $df=8$ ,  $p=0.001$ ). However, he did not find a statistically significant relationship between other substances of abuse (besides alcohol) and the advent of missing ARVs ( $\chi^2=0.69$ ,  $df=2$ ,  $p= 0.71$ ).

In a cross-sectional prospective survey, Do et al. (2010) set out to evaluate a large group (N = 300) of combination ART (cART) treated adults in urban Botswana who had been receiving ART for various time frames; to determine which factors were negatively correlated with overall ART adherence.<sup>5</sup>

Patients were asked about the frequency and quantity of alcohol use, and whether they continued with ART when consuming alcohol (using 4-point Likert-style response options). Adherence was measured with a culturally sensitive and modified version of the Morisky score for adherence. Overall, adherence was defined as: no missed doses on 4-day and 1-month patient recall and no missed clinic attendance for ART refills during the past 3 months. Do et al. (2010) reported that alcohol use was one of the psychosocial factors predictive of poor ART adherence rates in this sample (although no statistics were found in the manuscript to support this statement, except the  $p$ -value  $<0.02$ ; an attempt to source this information from the authors was not fruitful).

Jacquet et al. (2010) conducted a cross-sectional study amongst 2920 HAART patients treated at 8 clinics which are part of an HIV clinic network in West Africa (Benin, Cote d'Ivoire and Mali).<sup>9</sup> The aim of the study was to investigate the association between alcohol use and treatment (HAART) adherence. Participants completed surveys on demographics, alcohol use [AUDIT] and ART adherence behavior [ACTG adherence measure]). Current alcohol use was defined as any alcohol use within the past year, while hazardous drinking was defined as an AUDIT score  $\geq 8$ . Non-adherence to HAART was defined as taking  $<95\%$  of HAART doses in the past 4 days. Jacquet et al. (2010) found a significant positive association between alcohol use and non-adherence to HAART for current drinkers (OR 1.4; 95% CI 1.1–2.0), as well as for hazardous drinkers (OR 4.7; 95% CI 2.6– 8.6).

Marcellin et al. (2008) conducted a sub-study of the EVAL (ANRS12-116) study which was a national cross-sectional multi-centre survey conducted in Cameroon between Sept 2006 and March 2007 across 6 hospitals which provide HIV care.<sup>19</sup> Their sub-study used random sampling, and aimed at identifying correlates of self-reported ART interruptions (among which was drinking alcohol) among PLWHA in Cameroon. Participants were 533 ART treated PLWHA in Yaounde', and its neighbourhood. The majority of the sample was women (70.9%). Binge drinking was defined as drinking  $> 3$  large (65 cc) bottles of beer and/or  $> 6$  glasses of other alcoholic drinks on one occasion; adherence was defined as self-reported ART interruptions longer than 2 consecutive days during the past 4 weeks. After adjustment for covariates like gender, education and household income, binge drinking was found to be one of the characteristics which were independently associated with ART interruptions [OR (95%CI): 2.87 (1.39–5.91,  $P = .004$ )].

In a 5-country (Kenya, Uganda, Zambia, Nigeria and Rwanda) cross-sectional survey given to patients (N = 921) whose medical charts were drawn at random, Etienne et al. (2010) set out to identify adherence indicators that will ensure long-term treatment success.<sup>6</sup> Participants completed a 6-component survey designed to identify specific indicators that influence adherence, among which was past month alcohol use. Adherence was defined as missed doses in the past week or missed

appointments in the past 3 months. Logistic regression was employed to predict which indicators significantly affected adherence to ART. Regarding past month alcohol use (with “more than once” as the reference group): unadjusted OR (95% CI) for “never” = 1.98 (1.29-3.04),  $p < 0.01$ ; adjusted OR (95% CI) = 2.14 (1.36-3.37),  $p < 0.001$ . Unadjusted OR (95% CI) for “once” = 1.28 (0.71-2.29); adjusted OR (95% CI) = 1.34 (0.73-2.45).

Bhat et al. (2010) conducted a descriptive and analytical study in South Africa.<sup>3</sup> This study involved 168 patients receiving ART treatment who were interviewed. The aim of the study was to identify the factors associated with poor compliance among ART patients. The setting for this study was health centre ART clinics in Ngangelizwe community area which is in rural Eastern Cape. Questionnaires were used and participants took part in face-to-face interviews. The study took place in May-September 2009. The sample of 168 people included 67 men and 101 women aged 18-62 years (mainly aged between 18 and 48 years). Adherence was measured in terms of missing ART doses, but not specifically defined (e.g. in terms of numbers of doses missed or recency of having missed a dose to qualify as non-adherence). No information is given about how alcohol consumption was assessed, but the results refer to ever use (which the authors seemed to use interchangeably with regular use), versus never use of alcohol. The study found that among men, 47.1% of regular drinkers were not compliant as opposed to 25% of teetotallers. Among women, 60% of regular drinkers were not compliant, as opposed to 25.9% of non-drinkers. The authors reported in the discussion section of the paper that the results were statistically significant, but the statistical test that was used is not reported anywhere in the paper. These findings indicate that compliance rates were higher among non-drinkers than among drinkers for both men and women.

Studies finding no association between alcohol use and ART adherence (N=2): A study conducted in Nigeria by Farley et al. (2010) whose data were collected between June and July 2007 sought to screen 177 ART-naïve and 222 ART-experienced HIV-infected male and female patients at a large HIV care program in central Nigeria.<sup>7</sup> The first aim of the study was to determine the prevalence of positive screens for hazardous alcohol use (and depressive symptoms) and to identify related patient characteristics. The study’s second aim was to evaluate the association of positive screens for hazardous alcohol use (or depressive symptoms) with adherence (as assessed by pharmacy refill records) among 222 ART-experienced male and female patients at a large HIV care program in central Nigeria. The AUDIT was employed to assess alcohol use; while the Centre of Epidemiological Studies Depression Scale (CES-D) was employed for the assessment of depression. Twelve per cent of the sample had an AUDIT score  $\geq 8$ ; which was more frequent among ART-naïve participants ( $p = 0.06$ ) on univariate analysis. Seven percent of the sample had an AUDIT score  $\geq 10$ ; this was similar

for both the ART-naive and experienced groups. There was a trend for increased odds of an AUDIT score  $\geq 8$  among ART-naïve participants (Unadjusted OR; 95% CI, p value is 1.82 (0.98-3.36, P = 0.06); adjusted OR; 95% CI, p value is 1.88 (0.91-3.88; P = 0.09). No association between AUDIT scores and pharmacy refill rate was observed (no statistics given).

Peltzer et al. (2010) conducted a prospective cross-sectional design (6-month follow up) study of all treatment naive patients at 3 public hospitals in Kwa-Zulu Natal, South Africa (using systematic sampling) to assess factors (including the IMB model) contributing to ART adherence 6 months after starting ART.<sup>11</sup> Alcohol use was assessed as one of the factors impacting ART adherence. The sample for the analyses in this study comprised 519 male (26.6%) and female (73.4%) patients who had initiated ART. Alcohol use was measured using the AUDIT-C; adherence to ART was measured with the 30-day VAS and the ACTG measure. Regarding VAS adherence: for past month alcohol use (with “no” as the reference group) unadjusted OR (95% CI) for “yes” = 0.08 (0.03-0.28); adjusted OR (95% CI) = 0.47 (0.04-5.84). Regarding VAS adherence: for AUDIT-C 4 or more (with no as the reference group) unadjusted OR (95% CI) for “yes” = 0.08 (0.02-0.33); adjusted OR (95% CI) = 0.76 (0.04-13.48). Results for ACTG dose, schedule and food adherence were also not significant, for adjusted and unadjusted OR (no statistics given in this regard).

Inconclusive findings (N=3): In a letter to the editor whose purpose was to put on the agenda (for SSA studies), the issue of alcohol use and ART adherence, Van Geertruyden et al. (2010) briefly mention preliminary results of a prospective study (follow-up of patients) which they had conducted in the Democratic Republic of Congo (DRC).<sup>13</sup> Participants in the overall study were 1909 male and female ART patients treated at different treatment centers across the DRC. Adherence was defined as not missing ART >2 consecutive days in the last month. No information is available at this time on how alcohol use was measured (an attempt to source this information from the authors was not fruitful; the response was to await a full publication with all information). The authors reported that 17 of 44 patients (39%) who reported non-adherence (missing ART >2 consecutive days in the last month previously) reported drinking more than one alcoholic drink/day compared with 491 of 1909 (26%) who were adherent (i.e. reported not missing ART doses >2 consecutive days; OR: 1.82, 95% CI: 0.94 - 3.49; p = 0.053). Overall, there was a trend for increased odds of high alcohol use to be associated with poor adherence.

Peltzer et al. (2009) conducted a cross-sectional study using a convenience sample of 607 PLWHA; comprising 475 males and 132 females.<sup>16</sup> The participants were all recruited by other PLWHA at health facilities (42.0%), key informants (44.1%), and support groups (13.9%). Participants were included in the study if they were HIV+ and if they were 18 years or older. The study examined the

association between ART adherence and (a) past month alcohol use, and (b) hazardous or harmful drinking, assessed by the AUDIT. ART adherence was assessed by the 30-day VAS. It emerged that there was no significant association between past month alcohol and ART adherence ( $\chi^2 = 1.76$ ,  $df = 2$ ), however no information regarding statistical significance was provided in respect of harmful/hazardous drinking, most likely due to small number. The results of this study were inconclusive regarding the associations between alcohol consumption and adherence to ART primarily because of the sparsity of cell counts which invalidated the results of the chi-square test that was used rather than more appropriate tests such as Fisher's Exact test.

Amberbir et al. (2008) conducted a prospective study to examine the rate of ART adherence and the predictors of ART adherence.<sup>17</sup> The study was conducted in South West Ethiopia at the ART unit at Jimma University specialised hospital among 400 HIV infected people. A structured questionnaire was used; participants were interviewed at Month 0, and then again at Month 3 (December 2006 to April 2007, respectively). There were 400 patients at baseline and 383 patients at 3 month follow-up. Participants were aged from 18 years (mainly between 25 and 44 years), with a mean age of 30 years. Most started ART when they were at WHO Stage III. Most had a CD4 count less than 200 at initiation on ART (72.2%). Duration on ART was 3-67 months with a median of 8 months. A total of 94.3% had self-reported adherence (dose adherence) and 75.7% had combined indicator (dose, time and food) adherence. The dependent variable was the combined indicator of adherence which included dose, time, and food, with an adherent person being one who took more than or equal to 95% of the prescribed dose correctly, and always followed scheduling instructions, and always followed dietary requirements. The independent variables were not specified, except as explanatory variables. In addition, no mention was made of how substance use was measured. Of present relevance were the findings that 38 people (9.5%) reported active substance use at baseline and 39 people (10.2%) reported active substance use at follow-up. Combined adherence was 79.3% at baseline and 75.7% at follow-up but this reduction was not significantly different. The main reasons for non-adherence included forgetting, feeling sick, being too busy and also running out of medications (but this was only at baseline). The significant predictors of combined adherence were examined in multivariate logistic regression analysis and were found to be social support and depression at baseline, and social support and use of memory aids at follow-up. It is not specifically reported, but implied, that substance use was not included in the multivariate analyses as an independent variable owing to a non-significant bivariate relationship with the outcome (combined adherence).

### **Alcohol use and ART outcomes**

Dahab et al. (2010) conducted an observational cohort study in South Africa of ART inexperienced, but medically eligible, patients in a community and workplace setting.<sup>5</sup> Aiming at examining baseline factors potentially predictive of poor treatment outcomes (viral load > 400 copies/ml or to have discontinued treatment by 6 month time point), dissimilar predictors of poor ART outcomes were evident between the settings. In the community sample, predictors of worse ART outcomes included drinking more than 20 units of alcohol per week (Adj OR = 15.36, 95% CI: 3.22-73.27), among other variables. However, alcohol was not found to be a significant predictor of worse ART outcomes in the workplace sample. Dahab et al. (2010) concluded that baseline predictors of poor ART treatment outcomes were unique to setting/each program; which seems to suggest different populations have different pathways to HIV care. Hence the results of this study provide both positive and negative findings regarding the association between alcohol and poor ART outcomes.

### **Qualitative studies**

Fitzgerald et al. (2010) conducted a qualitative study to examine “gendered dimensions to men’s health and health care uptake”.<sup>8</sup> The sample comprised 14 key informants and eight men who were HIV positive who were initiating an HIV treatment programme and undergoing education sessions in a rural district hospital in KwaZulu-Natal. The men took part in in-depth interviews, one at the time of initiating ART treatment, and the second after four months. Interviews were also conducted with family members who also served as treatment supporters (x9) and health service providers from the ART programme (x5) in 2005/2006. Among some of the key findings were men’s expressed feelings of failure due to their inability to meet expectations as fathers, husbands and breadwinners often due to their ill health (HIV) and lack of employment (which was partially due to their HIV-related ill health). Alcohol was believed to play a role in a number of ways in terms of: (a) initiation of treatment – some men delayed treatment seeking while trying to give up drinking, with a perception that alcohol had to be stopped if one wanted to enrol on an ART programme, and most men gave up drinking on their own; (b) alcohol was useful for coping with stress associated with being HIV positive; (c) guilt was felt by those who continued to drink while on ART; (d) family members’ alcohol use was considered to be a hindrance to disclosure – they feared that there would be a low level of support from family members who could not be trusted to keep confidential their information about their illness and HIV status; (e) the need to keep one’s HIV status confidential seemed important as stigma was prevalent and people felt a sense of failure as a result of their HIV status. The study finds, in summary, that alcohol delays ART uptake due to the perception that abstinence is necessary to be enrolled on ART.

Skovdal et al. (2011) conducted a qualitative case study to examine barriers to men's use of ART services, gendered health-seeking behaviours.<sup>2</sup> The aim was described as to examine "the pathways through which gendered constructions impact on men's use of HIV testing services, uptake of ART and adherence to antiretroviral drugs" (page 2 of 14). The study was conducted in rural Manicaland province in Eastern Zimbabwe. The participants included 53 ART initiated men and 25 health care providers. Adult ART users took part in 19 individual interviews and four focus group discussions. Carers of children on ART took part in 21 individual interviews, and three group interviews. Health staff (mainly nurses) took part in 18 individual interviews and one group discussion. Role plays were also asked of participants in the focus group discussions. The study focused on the following areas: (a) social constructions of masculinity, (b) barriers to HIV services uptake and (c) facilitators of the use of services. The main findings of the study were as follows: First, it was found that alcohol use reflects social constructions of masculinity – men were seen to drink in order to bond with other males in beer halls and their drinking leads to sexual risk behaviour and meeting sexual partners in beer halls. Second, it emerged that alcohol was a barrier to the uptake of services in that men use alcohol to cope with stress and the reality of their HIV status, they use alcohol and end up forgetting to take ART, or that they are on ART; and they do not enrol early on ART programmes sometimes because they are not keen on sticking to requisite health behaviours, including refraining from drinking and smoking, and healthy eating and having multiple partners. Finally, it became apparent that once on ART men speak about and demonstrate their ability to adopt healthy behaviours (e.g. no drinking) in order to be able to live up to their perceived important role in their family and concentrate on their treatment.

Murray et al. (2009) conducted a study among Zambian women, to understand the reasons why they decided to accept or continue with ART.<sup>15</sup> The study involved two sets of methods: (a) free listing interviews, where women were asked why HIV+ women do not start taking ART from a clinic (47 interviewees), and why women do not continue taking ART from a clinic (45 interviewees); and (b) key informant interviews, inquiring about the main reasons for women's non-acceptance of or non-adherence to ART. The key informants were interviewed multiple times. They included community members (x18), clinic staff (x7) and ZEBS staff (x5). Free listing was completed first, and then the KIIs followed, and explored the ideas brought up in the free listing activity. In terms of the references made to alcohol use, the key informants indicated that when women's health improves due to ART they start drinking (x3); that women become careless after learning of their HIV status and start going to night clubs (x3), which usually involves alcohol use (although no specific mention of drinking alcohol at such night clubs was made); that women would forget to take their medication when drunk (x3). The authors concluded that people may delay ART initiation because they are unwilling



to accept anticipated lifestyle changes, including avoiding alcohol and smoking and eating healthy food etc. But the role of alcohol was rarely mentioned by the participants in the entire paper and does not appear to be a major contributor to the behaviour of women according to the study's participants.

Sanjobo et al. (2008) conducted a study in Zambia to determine the barriers to and facilitators of ART adherence.<sup>21</sup> The data collection was conducted between August and December 2006. The participants included ART patients and key informants. The study involved FGDs with 50 ART patients (5 groups with 10 patients each), and IDIs with 10 ART patients. The patients were recruited from 5 district health facilities (3 urban and 2 rural). Eligible participants were 20-49 years old, had used ART, and were not too ill to participate. IDIs were conducted among 12 health professionals. The main barriers that were identified included patient-related factors, health service factors, and socio-economic and cultural factors. Excessive alcohol consumption was put forward as a patient factor that was a barrier to ART adherence but no discussion of this issue was offered in the paper.

Dahab (2008) conducted a study in a large work place programme in the mines in South Africa. All employees were offered free ART, if needed<sup>4</sup>. Pre-counselling and then counselling following initiation on ART was provided. The aim of the study was to explore patients' and health care providers' perspectives on barriers to and enablers of adherence in a work place setting. The KIIs were conducted among ART patients, which included 6 men who had been ART patients for at least six weeks and who were particularly "poor adherers". The KIIs were also conducted among 6 key informants who comprised providers of treatment, care and support in HIV wellness clinics, as well as a mine human resources manager and one traditional healer. Patients were asked about their experiences of taking ART, what helped and what hindered adherence, and their perceptions of other people's use of ART. Health care workers were asked about their perceptions of the factors that hindered or assisted patients in taking ART regularly. The data were collected between June and July 2005. Among the main barriers, most participants said that alcohol leads to forgetting to take ART, and made one dizzy when consumed in conjunction with ART. Other factors mentioned as barriers were health system-related factors and various patient-related factors including their beliefs and denial of their HIV status or of the existence of HIV.

Table 4. Number of studies finding significant (Sig), non-significant (NS) associations, and inconclusive (IC) results between alcohol use and ART non-adherence

	Alcohol use and missed doses			Alcohol use and ART interruptions			Alcohol use and pharmacy refill records			Alcohol use and Visual Analogue Scale			Alcohol use and ACTG			Alcohol use and combined adherence indicator*			Missed dose and/or clinic attendance		
	Sig	NS	IC	Sig	NS	IC	Sig	NS	IC	Sig	NS	IC	Sig	NS	IC	Sig	NS	IC	Sig	NS	IC
<b>Analytical studies</b>	2	-	-	1	1	-	-	1	-	-	1	1	1	1	-	-	-	1	2	-	-

Note: The same study is counted more than once if it reports on more than one association.

\* The indicator is calculated from dose, food and time adherence.

## Discussion

In this chapter we have reviewed 21 studies: descriptive (n=2), analytical (n=11), and qualitative (n=5). The studies reviewed have findings that are in line with studies from mostly high income countries (Hendershot et al., 2009). The current review of SSA studies (analytic, descriptive and qualitative studies) illustrates that most of the studies published to-date point to a negative association between alcohol use and ART adherence. Nevertheless, one of the analytic studies which purports the negative relationship between alcohol use and ART adherence did not cite statistics to substantiate the claim.<sup>5</sup> Moreover, like some North American studies (e.g. Liu et al., 2006; Berg et al., 2008), no association between alcohol use and ART adherence was found in two of the analytic SSA studies reviewed (e.g. Farley et al., 2010, Peltzer et al. 2010),<sup>7,11</sup> while one of the findings was inconclusive,<sup>13</sup> though there was a trend for an association between alcohol use and poor adherence.

The studies also revealed significant associations between alcohol and uptake of and enrolment on ART treatment services. Specifically, alcohol use seems to delay the uptake/initiation of ART (Hendershot et al., 2009; Martinez et al., 2008). Alcohol reduction interventions may be urgently needed to facilitate early uptake and/or enrolment in ART services.

The qualitative studies provide some explanations of why alcohol use may be associated with ART adherence. The role of alcohol use for self-medication emerges, with individuals reporting that alcohol enables them to cope with stress associated with being HIV+. The five qualitative studies identified a number of explanations for the role of alcohol use in uptake, maintenance and adherence to ART. They suggested that individuals who drink alcohol may delay reporting to ART-related services due to their belief that alcohol use is contraindicated, ambivalence about giving up a particular lifestyle involving alcohol use and other unhealthy behaviours (with cigarette smoking and unhealthy eating also being mentioned), and their consequent desire to give up drinking first. Most studies identified alcohol use as barrier to adherence, and specifically via the mechanism of forgetting to take one's medication. Finally, the role of gender dynamics was an important element of some studies. Alcohol use was shown to be associated with constructions of masculinity in many cases, which served to maintain the behaviour, whereas many of the behaviours associated with the use of HIV services (going to clinics, waiting in queues) were associated with constructions of femininity. A focus on gender transformation (or alternations of their constructions of male identity) is needed to enable men to moderate their drinking and to take part in HIV services without feeling emasculated. Indeed, the likely role of alcohol in the uptake of HIV services and ART non-adherence

was most evident from the studies involving men, while in the studies involving women, alcohol use was seldom mentioned and other factors contributed more greatly to non-adherence.

It is noteworthy that many of the studies were conducted in the mid-2000s and the extent to which the results would currently be applicable is not clear. Some of the findings relate to stigma (which may have reduced since the studies were conducted), while it is clear that there has been an expansion of ART programmes throughout SSA over the past 5 years, which could have been accompanied by increased familiarity, and less apprehension about enrolment in such programmes as they become more common and normalised.

### **Limitations of the Studies**

The studies that were reviewed had a number of limitations. First, most of the studies did not employ standardised/validated measures of either adherence or alcohol use which could facilitate comparability of studies in future meta-analyses and other forms of quantitative synthesis. For instance, some studies used dichotomous measures for alcohol use (yes/no), while some employed the 10-item AUDIT, and others the 3-item AUDIT-C. The difficulty posed by measurement of constructs extends to adherence, whose first complicating factor is its multidimensional nature. Most of the studies measured only one aspect of adherence (e.g. pill taking, rather than also assessing dietary or storage instructions regarding taking the ART regimen, retention in care, presenting for clinic appointments etc.) which could potentially explain the discrepancy in the findings. For instance, alcohol use may pose a problem for pill taking but not necessarily for the other dimensions of adherence, which then makes it difficult to compare research findings.

Second, most of the studies relied on self-report measures of ART adherence and alcohol use. Nonetheless, as demonstrated by Hahn et al. (2010), it is possible that the participants could have under-reported alcohol use due to social desirability factors or to please health care providers. Patients are likely to under-report alcohol use given that they are counselled that heavy alcohol consumption could lead to suboptimal adherence and consequent treatment failure. The limitation due to the probable under-report/denial of alcohol use is most likely to impact quantitative studies where effect sizes or other quantitative measures of magnitude associations are an important outcome. Given that adherence to ART is a desired behaviour, over-reporting of adherence levels may have applied in the reviewed studies.

Third, the heterogeneity of measures of both alcohol use and adherence to ART is another limitation rendering the studies incompatible. For instance, some measures might have poor sensitivity; but most of the reviewed studies did not cite sensitivity statistics.

Fourth, most of the studies reviewed did not set out to study the alcohol and ART adherence association but alcohol was evaluated among a host of other factors which could impact ART adherence or treatment outcomes. The downside of having most of the studies evaluating the alcohol and ART adherence association post hoc (after the fact) is that alcohol and adherence are not measured in a standardised manner in these studies.

Fifth, a significant majority of the studies report alcohol drinking frequency, yet drinking quantity has been cited as a more robust predictor of ART adherence than drinking frequency (Hendershot et al., 2009). It is conceivable that stronger associations may have been uncovered in those studies that measured drinking frequency only.

Sixth, most of the studies reviewed are cross-sectional in nature, yet the dynamic nature of adherence (Spire et al., 2002) is probably better studied in longitudinal studies. Therefore more prospective studies are needed.

### **Suggestions for Further Research**

Alcohol-ART adherence research is in its infancy in SSA and there is still a need for further research in the area. To get around the potential issue of social desirability in self-report of adherence, future studies should employ more objective measures of adherence to the extent possible (e.g. Medication Event Monitoring System; MEMS) as well as the use of Computer Assisted Self Interviewing (CASI). This recommendation is put forth with the recognition that in resource-limited settings it might not be viable to do research employing the suggested methods.

The adoption of more objective measures of alcohol use (such as biological markers in future studies) could further advance our understanding of alcohol and ART adherence in SSA (Hahn et al., 2011). This is because there are many biases inherent in self reports such as social desirability factors. Moreover, individuals are less likely to be forthcoming in a clinical context where one of the salient messages is that alcohol should not be used concurrently with ART, and in some contexts abstinence from alcohol could be one the prerequisites to the initiation of ART. However, it is debatable whether or not biological markers of alcohol use should be used. In a study conducted in South Africa, Kader et al. (in press) found that self-report of alcohol performed well enough to conclude that the cost of biological markers might not be justifiable. Rather, it may be more advisable to fine tune existing self-report inventories, and use ACASI or other such tests to enhance self-reports.

Under-reporting of alcohol use may result from some residual societal stigma in some communities regarding the use of alcohol (Fortney et al., 2004). A recent SSA cohort study conducted in Uganda

by Hahn et al. (2010) with 500 HIV infected adults initiating ART, revealed that heavy alcohol consumption is under reported via denial of consumption and under reporting of quantity of alcohol consumed (that is, those reporting abstaining from alcohol and current drinking potentially under-report alcohol intake). This under reporting can only be appropriately handled if the biological markers of alcohol consumption or methods to promote alcohol consumption disclosure which are implemented are not only sensitive but also specific.

Given the findings of dose-related effects of alcohol on ART adherence in studies conducted in North America (Braithwaite et al. (2005), more studies in SSA should include measures of alcohol quantity. Furthermore, since what has been shown to be particularly problematic is hazardous alcohol consumption, more SSA studies ought to adopt standardised measures of alcohol consumption such as the AUDIT, which has a clear cut-off for hazardous alcohol consumption and has been normed and validated across cultures (Saunders et al., 1993). Employing standardised/validated measures (for alcohol use, and ART adherence) confers the advantage of easing the comparability of studies for meta-analyses and other forms of quantitative synthesis.

Finally more studies are needed with more complete designs than previously used. In order to better capture the dynamic nature of adherence, more longitudinal studies are necessary. In addition, such designs will support research which goes beyond examining the basic associations between alcohol and ART uptake and adherence, by assessing moderators and mediators (e.g. demographic variables, alcohol expectancies and motives) of these associations. These findings could then be used to inform intervention targets.

## **Conclusion**

This review has revealed that overall, higher levels of alcohol consumption are associated with reduced uptake of ART services and more non-adherence to ART. Numerous mechanisms explain these associations, including patients' beliefs, service provider advice, and actual effects of alcohol on forgetting to take medication. One implication from this review is alcohol use should not delay people's uptake of ART services, although they should be encouraged and assisted to minimise or stop drinking once they are on treatment. In addition, service providers need accurate information about the effects of alcohol use on ART, to enable them to impart accurate knowledge to their patients. Finally, interventions are clearly needed to ensure that individuals using ART do not drink at high (hazardous) levels such that they compromise their ability to adhere to their HIV treatment regimen.

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## CHAPTER 4: INTERVENTIONS TO REDUCE ALCOHOL-RELATED HIV RISK BEHAVIOUR

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The focus of this chapter is on intervention studies that have been conducted to evaluate interventions to reduce alcohol related HIV risk. The studies had to meet the following criteria for inclusion in the review: (1) one goal of the intervention was to reduce HIV transmission or ART non-adherence; (2) the intervention programme under evaluation had to have an alcohol use reduction component.

### Description of Studies

Eleven of the 72 papers included in this review reported on interventions conducted to reduce HIV risk and ART non-adherence associated with alcohol consumption. Two of these papers were published in 2011;<sup>1,2</sup> two were published in 2010;<sup>3,4</sup> two in 2009,<sup>5,6</sup> and five in 2008.<sup>7-11</sup> Table A.3 in the Appendices summarises the included papers. The references for each of the reviewed papers can be seen at the end of this chapter.

### Aims of the various studies

All the studies aimed to determine the effectiveness of their intervention in reducing or increasing particular outcomes. The outcomes of interest were varied among the studies, and included: (a) HIV-related sexual risk behaviours and/or HIV alcohol risk,<sup>2,4-5,9-11</sup> (b) gender-based violence,<sup>5</sup> and (c) HIV-related knowledge, motivations, and behaviours.<sup>7</sup> One study aimed at determining the effectiveness of its intervention on HIV risk reduction, as well as the intervention's feasibility and fidelity.<sup>6</sup> Two studies aimed to adapt and integrate two interventions to ensure its cultural relevance.<sup>1,8</sup> One study aimed to evaluate the intervention's acceptability, and further train the counselors, fine tune the treatment manual, and refine procedures.<sup>3</sup>

### Locations

Eight interventions were conducted in South Africa.<sup>2,4-6,8-11</sup> One intervention was conducted in Kenya,<sup>3</sup> one in Angola,<sup>7</sup> and one in Nigeria.<sup>1</sup>

### Designs

Seven of the studies were randomised trials, five of these were clinic-based trials,<sup>1-2,7-8,11</sup> and two were community trials.<sup>4,10</sup> One study was a quasi-experimental field trial.<sup>5</sup> Three studies were longitudinal in their design.<sup>3,6,9</sup>

## **Settings**

Three interventions were conducted in health care settings.<sup>2,3,6</sup> Four interventions were conducted in community settings.<sup>4,5,10,11</sup> Two interventions were conducted at workplace settings, specifically in the military,<sup>1,7</sup> and two were conducted in learning environments, specifically schools.<sup>8,9</sup>

## **Sampling approaches**

Two papers reported using random sampling to recruit their participants.<sup>7,9</sup> Two others reported using a chain referral method; of these one paper did not specify the method<sup>5</sup> while the other reported snowball sampling.<sup>10</sup> One paper reported using cluster sampling,<sup>8</sup> and another reported convenience sampling.<sup>1</sup> Five papers did not report on the sampling strategy used in their studies.<sup>2,3,4,6,11</sup>

## **Samples**

Seven papers reported about the mean ages of their studies' samples. The mean ages ranged from 14.0 years to 37.3 years.<sup>2-3,6-7,9-11</sup> One paper reported a median age of 15 years for its study's sample.<sup>8</sup> Three papers did not report any information regarding their studies' samples' age.<sup>1,2,4</sup>

With regard to gender distribution, five papers reported samples that comprised of only one gender (three studies had females only<sup>1,4,11</sup> and two comprised of males only<sup>5,7</sup>). Five papers reported minor to moderate difference in their samples' gender distribution.<sup>2,6,8-10</sup> One paper did not report on the gender distribution of its study's sample.<sup>3</sup>

## **Procedures**

Nine papers reported the use of a questionnaire to collect data from respondents. Five of these papers report their questionnaire to have been respondent-administered (three by means of paper and pencil<sup>1,5,10</sup>, and two by means of personal digital assistant (PDA)<sup>8,9</sup>). Two papers reported that the questionnaires were interviewer-administered.<sup>6,7</sup> One paper reported use of a computer administered assessment,<sup>2</sup> and another reported conducting urine screen and a paper and pen interview.<sup>4</sup>

## **Measures**

Three studies measured alcohol use before sex.<sup>1,5,7</sup> Two other studies also measured alcohol use before sex, however they incorporated other alcohol use measures, i.e. frequency of alcohol use,<sup>11</sup> and the AUDIT.<sup>10</sup> One study measured frequency of alcohol use,<sup>3</sup> another measured lifetime alcohol use,<sup>8</sup> and another measured both frequency and lifetime alcohol use.<sup>9</sup> Two other studies also measured alcohol using the AUDIT.<sup>2,6</sup> One study did not measure alcohol use separately from other drug use.<sup>4</sup>

## **Analytical methods**

Six papers reported about the statistical software they used to analyse their studies' data. Three papers reported using SPSS,<sup>1,2,11</sup> and three reported using SAS.<sup>4,7,9</sup> Of the seven aforementioned randomised trials and one quasi-experimental trial, three analysed the data using the intention to treat (ITT)\* approach,<sup>2,5,7</sup> and another three used the per protocol (PP)<sup>†</sup> approach<sup>1,4,10</sup> and two papers did not report their studies' analytic strategy.<sup>8,11</sup>

The main statistical analyses conducted were varied among the studies. These included chi-square tests, z-tests, ANOVA, and ANCOVA.<sup>1,4,5,7,10,11</sup> Most studies used logistic regression.<sup>1,4,5,7,8,9,10</sup> One paper reported using generalised equation modelling.<sup>2</sup>

## **Findings**

In this section we describe the findings of the evaluation studies in terms of the intervention's effects in changing participants' alcohol consumption (general use and initiation); sexual risk behaviour (unprotected sex, multiple partners, and transactional sex); sex under the influence of alcohol; and HIV testing. We describe the findings for each of the four different settings (namely, military, educational, community, and healthcare) separately. The main findings that are reported concern alcohol use, sexual risk behaviours (including condom use/unprotected sex, number of sexual partners, transactional sex) and HIV testing.

### **MILITARY SETTINGS**

Two studies were conducted in military settings.<sup>1,7</sup> Bing et al.'s study (2008) was conducted among 568 male soldiers recruited from 12 military bases in Angola.<sup>7</sup> These bases were selected by region and each pair was geographically separated to avoid contamination between the intervention and control bases. Within each pair, one base served as a control and the other as an intervention base. In total, 280 participants were randomly assigned to the interactive HIV prevention intervention programme, and 288 to the control group. The participants' ages ranged from 18 to 51 years (mean = 29 years). The participants were interviewed at baseline, and followed up three and six months after the initial interview.

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\* Intention to treat analysis is an analytical strategy where all the participants are included in the final analysis, irrespective of completion of their allocated treatment (Shah, 2011).

† Per protocol analysis is an analytical strategy where only participants who complete the treatment are included in the final analysis (Shah, 2011).

The intervention was a five-session HIV prevention programme based on the Information, Motivation and Behavioural Skills (IMB) model of behaviour change. It covered the dimensions of the IMB model and addressed soldiers' concerns about their lack of HIV/AIDS knowledge, including the effects of alcohol on sexual decision-making. The control intervention was also a five-session program but was a non-HIV focused malaria prevention program. While the last session of the control condition entailed a one hour presentation on HIV prevention, it did not include the motivation and condom negotiation which constituted an essential part of the HIV prevention delivered to the intervention group.

Information was elicited from participants regarding their sexual partners in the past three months, particularly in relation to four mutually exclusive categories, namely, live-in partners, girlfriends, occasional partners and commercial partners. Further information was obtained regarding whether they had sex with the partner, the frequency of vaginal sex that they had with the partner, the frequency of anal sex that they had with the partner and the frequency of condom use during vaginal and anal sex acts.

The key outcomes in terms of HIV risk were: (1) the frequency of condom use during vaginal sex with any of the non-live-in partners, (2) the frequency of unprotected vaginal sex acts per month across all the partners, (3) the number of people engaging in unprotected anal sex with live-in partners and girlfriends, (4) the total number of occasional and commercial partners. One alcohol-related outcome (alcohol use before sex) was measured as the frequency of having consumed alcohol less than 2 hours before sex in the past month.

There were three and six month follow-up retention rates of 87% and 86% respectively, for both the intervention and control groups. The key outcomes of the intervention can be seen in Table 5. At three months, the outcomes of the intervention group were better than those of the control group in terms of: (a) condom use during vaginal sex; and (b) the number of unprotected anal sex acts with live-in partners. However, there were no significant differences between the groups in terms of (a) alcohol consumption before sex; (b) the number of unprotected vaginal sex acts; (c) the number of unprotected sex acts with girlfriends; and (d) the number of occasional and commercial partners.

At six months, the intervention group had better outcomes than the control group in terms of only one variable: the number of unprotected anal sex acts with live-in partners. However there were no differences between the groups in terms of (a) alcohol consumption before sex; (b) condom use during vaginal sex; (c) number of unprotected vaginal acts; (d) the number of unprotected anal sex acts with girlfriends; and (e) the number of occasional and commercial partners.

Table 5. Effects of intervention in military setting at 3 and 6 month (Bing et al., 2008)<sup>7</sup>

Domain	Measured outcome	Three months	Six months
<b>Sex under the influence of alcohol</b>	Alcohol consumption before sex	+ve, NS	+ve, NS
<b>Unprotected sex</b>	Condom use during vaginal sex	+ve, Sig	+ve, NS
	Number of unprotected vaginal acts	+ve, NS	+ve, NS
	Number of unprotected anal sex acts with live-in partner	+ve, Sig	+ve, Sig
	Number of unprotected anal sex acts with girlfriend	+ve, NS	+ve, NS
<b>Multiple partners</b>	Number of occasional and commercial partners	+ve, NS	+ve, NS

+ve, Sig: Positive significant effect; +ve, NS: Positive, Non-significant effect.

Essien et al. (2008) conducted a study in Nigeria, using a convenience sample (participants could invite friends to participate as well) of female military personnel (n = 346).<sup>1</sup> The inclusion criteria for the sample were: i) being aged 18 years and older, ii) being able to converse in English, iii) a recent (six-months) history of unprotected sex with two or more sexual partners, and iv) having been diagnosed with, or been treated for, an STI in the previous year. Study participants were randomly assigned to either an intervention group (n = 174), or a control group (n = 172). Outcomes relating to HIV/AIDS-related knowledge and sexual behaviour were assessed at baseline before the intervention or control programme, and again three and six months after completing the intervention/control programme.

The intervention was a five-session, small group, video-based HIV-prevention programme, based on the IMB model. The control group received a 5-session HIV education programme. Each session lasted 90 minutes. In the intervention group, the sessions addressed issues relating to HIV education/risk sensitization, situation cue identification and management, triggers, risk avoidance and risk management (for example, male and female condoms, communication with sexual partner, substance use), sexual assertiveness and socio-cultural factors (for example, differing cultural and religious backgrounds, cross-cultural sex role norms, polygamy, extra-marital sexual relationships, rape, transactional and coercive sex, gender, material and economic inequalities) that might influence sexual behaviour in Nigeria. The control group programme included information about HIV, social and cultural risk factors for HIV, and environmental barriers to HIV prevention, but did not include a motivational component.

The results of the study are shown in Table 6. At three months the outcomes of the intervention group were better than those of the controls in terms of (a) alcohol use before sex; (b) increased

condom use; (c) vaginal sex without a condom; (d) and vaginal sex with a condom. However, the intervention group did not differ significantly from the control group with regard to the number of sexual partners. At six months, the intervention group was superior to the control group in terms of all of the outcomes except for sex under the influence of alcohol.

Table 6. Effects of intervention in military setting at 3 and 6 months (Essien et al., 2008)<sup>1</sup>

Domain	Measured outcome	Three months	Six months
<b>Sex under the influence of alcohol</b>	Alcohol use before sex	+ve, Sig	+ve, NS
<b>Unprotected sex</b>	Condom use	+ve, Sig	+ve, Sig
	Vaginal sex without condom	+ve, Sig	+ve, Sig
	Vaginal sex with condom	+ve, Sig	+ve, Sig
<b>Multiple partners</b>	Number of sex partners	+ve, NS	+ve, Sig

+ve, Sig: Positive significant effect; +ve, NS: Positive, Non-significant effect.

The results of this study have been encouraging, indicating promising use of a video-based HIV-risk reduction behaviour intervention programme that can be cost-effectively administered by lay counsellors.

### EDUCATIONAL SETTINGS

Two studies were conducted in educational settings, both in South Africa.<sup>8,9</sup> Cupp et al. (2008) conducted a study in township high schools near Pietermaritzburg (KwaZulu-Natal province, South Africa).<sup>8</sup> Grade 9 learners (n = 1095; 54% female), aged 13 to 18 years (median 15 years), were sampled from a cluster sample of eight public high schools with similar characteristics regarding fees, predominant language and ethnicity. The learners were randomised to either the intervention (4 schools; n = 325) or control (4 schools; n = 336) group.

The intervention consisted of the interactive 'Our Times, Our Choices' curriculum, with the delivery of 15 units (approximately 30-40 minutes each) over an 8-week period. This intervention programme provided information about alcohol and risky sexual behaviour, and demonstrated potential consequences of these behaviours and means of resisting peer pressure to engage in these behaviours, with a view to reducing sexual risk behaviour, HIV, other STIs and unwanted pregnancies. The control programme involved continuation of the schools' regular life orientation lessons, and included five knowledge-based units about alcohol and HIV.

Alcohol use was assessed via a single item eliciting ever having used alcohol, while sexual risk behaviour involved assessment of whether participants had ever had sex, whether condoms were used with the first and/or most recent sexual act, frequency of condom use (always-never on a 6-point Likert scale), and whether alcohol was consumed during the first and/or most recent sexual

acts. All participants were followed up four to six months, and 15 to 18 months after the baseline data collection.

The results of the study for the behavioural outcomes are shown in Table 7. Between Time 1 and Time 2, learners who were not yet sexually active at Time 1, in the intervention group were less likely to have initiated sex than their counterparts in the control group. However, intervention group learners were just as likely as those in the control group to report initiation of alcohol use. Between Time 2 and Time 3, the same two sets of results prevailed. In terms of measures of unprotected sex, at both Time 2 and Time 3, there were no significant differences between rates of condom use at last sex “among those who were sexually active and not regularly using condoms at Time 1” (page 141).

Table 7. Effects of intervention in school setting between Time 1-2 and Time 2-3; and at Time 2 and Time 3 (Cupp et al., 2008)<sup>8</sup>

Domain	Measured outcome	Time 1-2	Time 2-3	Time 2	Time 3
<b>Initiation of alcohol use</b>	Initiation of alcohol use	+ve, NS	+ve, NS	---	---
<b>Unprotected sex</b>	Condom use last time had sex	---	---	+ve, NS	+ve, NS
<b>Sexual activity</b>	Initiation of sex	+ve, Sig	+ve, Sig	---	---

+ve, Sig: Positive significant effect; +ve, NS: Positive, Non-significant effect. ---Not measured.

Smith et al. (2008) conducted a study in Mitchells Plain, a densely-populated, largely low-income residential area of Cape Town (South Africa) to examine the outcomes of HealthWise, a leisure, life skills and sexuality education intervention.<sup>9</sup> The participants consisted of Grade 8 and Grade 9 high school students (n = 2383; 86% Coloured; 51% female), of mean age 14.0 years. Schools were randomly selected for sample recruitment, and allocated to be either intervention (HealthWise) or control schools. Survey data were collected from students at baseline and in five waves approximately every six months. An attrition rate of 10% was identified between follow-up data collection periods.

The HealthWise programme aimed at reducing sexual risk behaviour and substance use, reducing rates of HIV and other STIs, and increasing positive leisure activities and experiences. The programme was adapted to the study community and consisted of 12 lessons in Grade 8 and six booster lessons in Grade 9, with each lesson conducted over approximately two to three class periods. The lessons addressed anxiety and anger management, decision-making, self-awareness, positive use of free time, attitudes, knowledge and skills regarding substance use and sexual risk behaviour (including condom use, the myths and realities of substance use), and relationships. The



control group consisted of students at schools where the HealthWise programme was not conducted.

Sexual risk behaviour questions included ease of access to condoms, ever having had vaginal intercourse, time since the last sexual encounter, frequency of condom use during sexual encounters, while substance use information included lifetime, recent (one month), and frequency of, use of cigarettes, alcohol, and marijuana. Heavy substance use was defined as four or more drinks, and 10 or more cigarettes.

The main results of the evaluation are shown in Table 8. Between Wave 1 and Wave 5, analyses among all the learners revealed that those in the HealthWise programme were less likely to report alcohol use in the past month (for all learners) and heavy alcohol use. Among non-drinkers at Wave 1, the learners in the HealthWise programme were also less likely to report alcohol use in the past month and heavy alcohol use. There were no significant differences between the intervention and control group in terms of (a) lifetime alcohol use (among Wave 1 non-drinkers); (b) rates of initiation of sex; (c) engaging in sex in the past month; and (d) consistent condom use between Wave 1 and Wave 5.

Table 8. Effects of intervention in school setting between Wave 1-5 (Smith et al., 2008)<sup>9</sup>

Domain	Measured outcome	Wave 1-Wave 5
<b>Initiation of alcohol use</b>	Lifetime alcohol use (non-drinkers at Wave 1)	+ve, NS
	Alcohol use past month (all)	+ve, Sig
	Heavy alcohol use (all)	+ve, Sig
	Alcohol use in past month (non-drinkers at Wave 1)	+ve, Sig
	Heavy alcohol use (non-drinkers at Wave 1)	+ve, Sig
<b>Sexual activity</b>	Initiation of sex	+ve, NS
	Sex in past month (sexually active)	+ve, NS
<b>Unprotected sex</b>	Consistent condom use (sexually active)	+ve, NS

+ve, NS: Positive, Non-significant effect; +ve, Sig: Positive significant effect.

## HEALTH CARE SETTINGS

Three studies were conducted within healthcare settings.<sup>2,3,6</sup> The Papas et al. (2010) study, conducted in Eldoret, Kenya, aimed to examine the feasibility, acceptability and efficacy of Cognitive Behaviour Therapy (CBT) in reducing alcohol use in HIV-infected outpatients.<sup>3</sup> The study participants comprised patients who attended HIV treatment clinics, and had consumed alcohol in the past month (Mean ages were 37.3 for men and 32.7 for women) who were recruited to take part in a group-based intervention.

The intervention programme involved culturally-adapted cognitive behaviour therapy administered in six sessions by paraprofessional counsellors. The intervention outcomes assessed treatment attendance (patients who attended the interview sessions), acceptability of the CBT treatment, and changes in alcohol consumption.

Results were recorded in terms of percentage days abstinent from alcohol before cognitive behaviour therapy sessions, rates of attendance for treatment, and patients' satisfaction with the provided CBT which had been proven to be compatible with local Kenyan drinking concepts. The intervention provided positive effects, indicating a reduction in alcohol consumption among HIV-infected men and women, and a general satisfaction with the treatment provided. Both men and women noted the motivating effect of learning about the harmful effects of alcohol, in reducing alcohol consumption. Males also reported that discussion of the costs of alcohol consumption influenced their drinking behaviour. As shown in Table 9, both women and men underwent a reduction in the percentage of days abstinent between the first and sixth sessions.

Table 9. Effects of intervention in health care setting between Session 1 and Session 6 (Papas et al., 2010)<sup>3</sup>

Domain	Measured outcome	Session 1-Session 6 (no control group)
<b>Alcohol consumption</b>	% days abstinent	+ve, Sig

+ve, Sig: Positive significant effect; +ve, NS: Positive, Non-significant effect.

The Peltzer et al. (2009) study was conducted in Mpumalanga province, South Africa.<sup>6</sup> The participants consisted of 546 HIV-uninfected patients (163 females and 383 males; aged 18 to 68 years; mean age 33.9 years) who attended routine HIV counselling and testing (HCT) at 13 clinic sites in the Albert Luthuli sub-district. Eligible patients (aged 18 years or older; diagnosed HIV-negative) who agreed to participate in the study received a baseline assessment interview immediately after post-test counselling, followed by the intervention.

The intervention involved an hour-long motivational skills-building risk-reduction HIV counselling session, based on the Information, Motivation, Behaviour (IMB) model of health behaviour change, adapted for local use. This programme assessed HIV/AIDS knowledge (including discussion on HIV transmission, alcohol and other HIV risk behaviours, local prevalence of HIV, clarified misconceptions and myths regarding AIDS, provided personal risk behaviour feedback, personal responsibility, change options and risk reduction goal setting, and discussed behavioural self-management and sexual communication skills-building exercises) and used the AUDIT to determine alcohol use, particularly hazardous or harmful drinking. Interactive information on the proper use of male and female condoms was provided, together with opportunities to role-play risk-reduction skills. Follow-

up assessments were conducted four months after the intervention session. Table 10 shows that at four-month follow-up there were significant improvements in terms of the measures of alcohol consumption, sex under the influence of alcohol (or drugs), and sexual risk behaviours, including transactional sex.

Table 10. Effects of intervention in health care setting at 4 month follow-up (Peltzer et al., 2009)<sup>6</sup>

Domain	Measured outcome	4 month follow-up
<b>Alcohol consumption</b>	Hazardous/harmful alcohol use	+ve, Sig
<b>Sex under the influence of alcohol</b>	Sex under the influence of alcohol or drugs	+ve, Sig
<b>Unprotected sex</b>	No condom used at last sex with partner	+ve, Sig
<b>Multiple partners</b>	≥2 sex partners	+ve, Sig
<b>Transactional sex</b>	Had sex with person to receive money and/or drugs	+ve, Sig
	Had sex with person to receive food or place to stay	+ve, Sig
	Given someone money or drugs in exchange for sex	+ve, Sig

+ve, Sig: Positive significant effect; +ve, NS: Positive, Non-significant effect.

Kalichman et al. (2011) conducted a study in Cape Town, South Africa, to examine the effects of a brief counselling intervention to reduce HIV risk behaviours and STIs in patients who attended one STI clinic in Cape Town.<sup>2</sup> The study sample consisted of 414 men and 203 women (total n = 617) of whom 310 were randomly assigned to a 60 minute HIV risk-reduction counselling session intervention group, and 307 to a 20 minute brief HIV/STI education session control group. Patients were included in the study if they were 18 years or older and had sought clinic consultation for STI diagnosis or treatment. All elective study participants were assessed at baseline via audio computer-assisted self-interview (ACASI) based assessment interview, and a counselling session.

The intervention programme was based on the IMB model of behaviour change. The information component of the programme discussed HIV prevalence and transmission, and general and personal potential risk behaviours for HIV transmission, as well as clarifying various aspects of HIV and AIDS that arose in the discussion. Motivational interviewing techniques were employed to encourage behaviour change and commitment to change, targeting the risk-reduction value of decreased harmful and hazardous alcohol consumption (as measured using the AUDIT). Triggers for personal risk behaviours were discussed, with a view to identifying communication and behavioural strategies to manage and reduce sexual and substance use risk behaviours. These discussions included role-plays to improve risk-reduction skills, and demonstrations of correct use of male and female condoms.

Participants were followed up after one, three, six, nine and 12 months. As shown in Table 11, the results indicated significant intervention effects with respect to alcohol use (quantity and frequency

index), number of occasions of unprotected vaginal sex, number of occasions of unprotected anal sex, and total number of occasions of unprotected sex between baseline and the end of the twelve month period. However, there were no significant intervention effects with respect to the number of occasions of use of substances in sexual contexts, condom use percentage (the percentage of intercourse occasions in which condoms had been used in the past three months), and number of sexual partners. The intervention effect appeared to be moderated by alcohol consumption, with a reduced intervention effect in heavier drinkers compared with that of lighter drinkers.

Table 11. Effects of intervention in health care setting between baseline and 12 month follow-up (Kalichman et al., 2011)<sup>2</sup>

Domain	Measured outcome	Outcome: Baseline–12 months
<b>Alcohol consumption</b>	Alcohol use quantity/frequency index	+ve, Sig
<b>Sex under the influence of alcohol</b>	Number of occasions of substance use in sexual contexts	+ve, NS
<b>Unprotected sex</b>	No of occasions of unprotected vaginal sex	+ve, Sig
	No of occasions of unprotected anal sex	+ve, Sig
	Total no. of occasions of unprotected sex	+ve, Sig
	% condom use	+ve, NS
<b>Multiple partners</b>	Number of sexual partners	+ve, NS

+ve, Sig: Positive significant effect; +ve, NS: Positive, Non-significant effect.

## COMMUNITY SETTINGS

Four studies were conducted within community settings.<sup>4,5,10,11</sup> The Kalichman et al. (2009) study was conducted among 475 African men (mean age 30.2 years; 89% unemployed), who lived in two township communities in Cape Town, South Africa.<sup>5</sup> Recruitment for the study included active and passive word-of-mouth techniques, allowing participation of socially-connected men within a community, but not across the two communities. The one community was assigned to an extensive intervention that comprised a five-session gender-based violence and HIV risk-reduction programme based on Social Cognitive Theory and geared to enhance behaviour change self-efficacy and alter risk-related outcome expectancies. The other community was assigned to a single three-hour HIV/Alcohol prevention education programme. The programmes were conducted at baseline, and participants were followed up after one, three and six months.

The gender-based violence and HIV risk-reduction intervention explored the personal and community consequences of gender-based violence and HIV/AIDS, together with potential alternative behaviour strategies to reduce risky sexual and substance use (particularly use of alcohol in relation to sexual acts) behaviour. In particular, this intensive intervention programme discussed perceived gender roles, male negative attitudes towards women, triggers for high-risk sexual behaviours, and demonstrated practical (for example, proper use of condoms) and communication

skills to reduce risk behaviour, encouraging men to advocate risk reduction behaviour changes in their community. The HIV/Alcohol prevention education and risk reduction programme was conducted similarly to the gender-based violence/HIV risk-reduction programme, but was offered in one brief (3-hour) session. The results indicated that the two communities were comparatively similar and homogeneous, but differed in terms of age and history of domestic violence.

The results can be seen for the one month, three-month and six-month follow-up periods in Table 12 below. The one-month outcomes indicated that there were significant differences between the two groups in terms of alcohol consumption before sex, percentage of condom use, and HIV testing in the past month. At three months there were significant differences in terms of unprotected intercourse, and HIV testing. At six months the only significant difference that was maintained relates to HIV testing. For the first time there were significant differences between the groups in terms of the number of partners the participants reported having had in the past month. However, there were no other significant differences on these behavioural variables.

Table 12. Effects of intervention in community setting at one, three and six months (Kalichman et al., 2009)<sup>5</sup>

Domain	Measured outcome	One month	3 months	6 months
<b>Sex under the influence of alcohol</b>	Drank alcohol before sex	+ve, Sig	+ve, NS	+ve, NS
<b>Unprotected sex</b>	Unprotected intercourse	+ve, NS	+ve, Sig	+ve, NS
	% intercourse condom protected	+ve, NS	+ve, NS	+ve, NS
	% condom use	+ve, Sig	+ve, NS	+ve, NS
<b>Multiple partners</b>	Number of sex partners past month	+ve, NS	+ve, NS	+ve, Sig
<b>HIV testing</b>	HIV testing in past month	+ve, Sig	+ve, Sig	+ve, Sig

+ve, Sig: Positive significant effect; +ve, NS: Positive, Non-significant effect.

Since some of these results were contrary to expectation and the proposed study hypotheses, it is possible that the integrated intervention programme did not sufficiently accommodate the complexity of factors involving gender-based violence, alcohol use, HIV and sexually transmitted infections. The article acknowledges the weak study design of assigning complete communities to treatment conditions and comparing the outcomes of the communities without randomisation of the participants.

Wechsberg et al. (2008) conducted a pilot randomised trial in Cape Town, South Africa. The sample comprised 112 low-income females (n = 60 Black; n = 52 Coloured), aged 18 years and older, who reported using alcohol and illicit substances on at least 13 of the last 90 days.<sup>11</sup> At baseline, pencil-

and-paper face-to-face interviews were conducted with all the participants, and urine samples were screened for substances such as cocaine, cannabis, methamphetamine, opiates, ecstasy, methaqualone and alcohol.

Substance use was assessed in terms of frequency (days) of use in the last 30 days. Sexual risk behaviour was assessed in terms of the number of times in the last 30 days that the participant had had unprotected sex, the number of different partners, the number of male sex partners, the number of times that substances were used with sexual intercourse, whether protection was used with the most recent vaginal sex encounter, and whether the participant had had transactional sex with her main partner.

The intervention involved an evidence and empowerment-based HIV programme, adapted from the Women's Co-Op project, to reduce sexual risk, substance use and victimisation. All participants received two one-hour intervention sessions that included substance use, HIV/STI and violence information and associated risk-reduction behaviour, practise in use of male and female condoms, and sexual communication and negotiation skills, concluding with a personal action plan to reduce sexual risk, substance use and victimisation. Participants were randomly assigned to receive the intervention in either a group or individual format, and were stratified by race to accommodate social and cultural differences regarding attitudes towards sex and risk behaviour.

The results obtained indicated that the format in which the intervention was conducted (group vs individual) did not significantly influence the outcomes of the intervention, with behaviour change being effected within both formats, favouring recommendation of the more economical group-format. The baseline to follow-up outcomes of "black" and "coloured" women were analysed separately. There were significant improvements in the alcohol consumption of both "black" and "coloured" women between baseline and follow-up. The other results varied for the two groups of women as can be seen in Table 13. There were no significant differences between baseline and follow-up for either the "coloured" or "black" regarding the number of sexual partners the women had had in the previous month.

Table 13. Effects of intervention in community setting at one month follow-up (Wechsberg et al., 2008)<sup>11</sup>

Domain	Variables	Black	Coloured
<b>Alcohol consumption</b>	Mean days alcohol use in past 30 days	+ve, Sig	+ve, Sig
<b>Sex under the influence of alcohol</b>	Times AOD used before sex in past month	+ve, NS	+ve Sig
<b>Unprotected sex</b>	No. unprotected sex episodes in past month	+ve, NS	+ve Sig
	Condom use at last sex	+ve, Sig	+ve, NS
<b>Multiple partners</b>	No. sex partners in past 30 days	+ve, NS	+ve, NS
	Number of sexual episodes in past month	+ve, NS	+ve, Sig

+ve, Sig: Positive significant effect; +ve, NS: Positive, Non-significant effect.

Wechsberg et al. (2010) conducted a randomised trial in Pretoria (South Africa), to examine the effects of the Women’s Health Co-Op, an intervention adapted from the Women’s Co-Op intervention geared at increasing women’s condom use with primary sex partners.<sup>4</sup> Study participants were randomly assigned to the Women-focused intervention group, in which cue cards were used to disseminate information about sexual risk reduction behaviour. All study participants received two private, one-on-one hour-long sessions, conducted within a two-week period, as well as information about community resources and a risk-reduction toiletry kit. The participants comprised 583 female sex workers and non-sex workers, assessed at baseline, and followed up after three and six months.

The results for the Women’s Health Co-Op (Women-focused) intervention programme were compared with those of a standard intervention programme. At three-month follow-up, the women-focused intervention sample were not different from those in the standard intervention in terms of condom use at the last sexual encounter, but they had better outcomes than those in the standard intervention at six months (See Table 14).

Table 14. Effects of intervention in community setting at three and six months (Wechsberg et al., 2010)<sup>4</sup>

Domain	Variable	Three months	Six months
<b>Unprotected sex</b>	Condom use at last sex	+ve, NS	+ve, Sig

+ve, Sig: Positive significant effect; +ve, NS: Positive, Non-significant effect.

Kalichman et al. (2008) conducted a randomised control trial in Cape Town, South Africa, to examine the efficacy of a brief, single-session intervention to reduce HIV/Alcohol risk among men (n=117) and women (n=236) who frequented informal drinking establishments (shebeens).<sup>10</sup> Participants were randomly assigned to either a three-hour theory-based alcohol/HIV risk-reduction intervention programme (providing skills training regarding risk-reduction behaviour and negotiating condom

use), or a one-hour alcohol/HIV education session control group. Participants were followed up at three and six months post-intervention.

The results of the study showed positive alcohol/HIV risk reduction intervention effects on most variables, with decreased risk compared to the control group at three months (see Table 15), with the exception of number of sexual partners. However, at six months these effects had diminished with respect to all of the behavioural outcomes of interest except sex under the influence of alcohol.

Table 15. Effects of intervention in community setting at three and six months (Kalichman et al., 2008)<sup>10</sup>

Domain	Measured outcome	Three months	Six months
<b>Sex under the influence of alcohol</b>	Alcohol use before sex	+ve, Sig	+ve, Sig
<b>Unprotected sex</b>	Unprotected vaginal sex	+ve, Sig	+ve, NS
	Percent intercourse condom protected	+ve, Sig	+ve, NS
	Consistent condom use	+ve, Sig	+ve, NS
	Completely protected	+ve, Sig	+ve, NS
<b>Multiple partners</b>	2+ sexual partner	+ve, NS	+ve, NS

+ve, Sig: Positive significant effect; +ve, NS: Positive, Non-significant effect.

### Summary of Results

The overall results described in this section are summarised in Table 16. As shown, the studies mainly measured the impact of the interventions on reducing unprotected sex or increasing condom use (with a total of 45 such outcomes examined across all 11 studies). The next most commonly examined outcomes were focused on reducing sex under the influence of alcohol (13 outcomes measured) and number of partners (13 outcomes measured). This was followed by reduction in alcohol use (9 outcomes); and reduction in/delay in sexual activity (6 outcomes). The outcomes: initiation of alcohol use (for learners only), reduced transactional sex and HIV testing were measured three times across the studies. A discernible pattern of results emerged.



Table 16. Numbers of significant and non-significant intervention effects for each outcome type across all reviewed studies.

Setting (no. of studies)	Initiation of alcohol use			Reduction in alcohol use			Reduction/delay in sexual activity			Reduction in sex under the influence of alcohol			Reduction in unprotected sex; increase in condom use			Reduction in number of partners			Reduction in transactional sex			HIV testing			All outcomes			
	Tot	Sig	NS	Tot	Sig	NS	Tot	Sig	NS	Tot	Sig	NS	Tot	Sig	NS	Tot	Sig	NS	Tot	Sig	NS	Tot	Sig	NS		Tot	Sig	NS
<b>Military setting (2)</b>	0	-	-	0	-	-	0	-	-	4	1	3	14	9	5	4	1	3	0	-	-	0	-	-	0	-	-	22
<b>Educational setting (3)</b>	3	0	3	4	4	0	4	2	2	0	-	-	3	0	3	0	-	-	0	-	-	0	-	-	0	-	-	14
<b>Healthcare setting (3)</b>	0	-	-	3	3	0	0	-	-	2	1	1	5	4	1	2	1	1	3	3	0	0	-	-	0	-	-	15
<b>Community Setting (4)</b>	0	-	-	2	2	0	2	1	1	7	4	3	23	10	13	7	1	6	0	-	-	3	3	0	3	3	0	44
<b>TOTAL (11)</b>	3	0	3	9	9	0	6	3	3	13	6	5	45	23	22	13	3	10	3	3	0	3	3	0	3	3	0	95

Tot: Total; Sig: Significant; NS: Non-significant.

## Discussion

This chapter reviewed recent (2008-2011) SSA published literature on studies that have evaluated the effects of interventions on individuals' HIV risk behaviour and alcohol consumption. In general the studies have indicated that interventions with alcohol use and sexual risk reduction foci have been most successful in reducing alcohol consumption, transactional sex, and HIV testing. They were least successful, however, with respect to reducing the number of sexual partners, and the initiation of alcohol use among young people. About half of the intervention effects on condom use/unprotected sex were positive.

The studies demonstrated slightly different effects within the different settings. Within the military settings, there was an increase in general risk-reduction behaviour, with a significant increase in condom use in the intervention group as compared with the control group. Of all the alcohol use and sexual risk measures, about 50% (11/22) were significantly improved as a result of the interventions within these settings.

Interventions within educational settings indicated that the two intervention programmes examined had different outcomes, with the "Our Times Our Chances" curriculum clearly producing positive intervention effects with regard to sexual risk behaviour, while the HealthWise programme's effects were less clear and with few significant differences between the intervention and control groups. A total of 6 out of 14 (43%) of the measures that were reported on yielded positive results.

Within the healthcare settings, overall positive intervention effects emerged particularly with regard to alcohol consumption relating to sexual behaviour. These studies demonstrated the efficacy of adapting Western models of HIV counselling and treatment intervention in Africa, and the feasibility of adopting these techniques to produce positive intervention effects. As many as 80% (12/15) of the outcomes that were reported on were significantly improved following exposure to the intervention programmes.

The community studies also had some positive intervention effects. They demonstrated the efficacy of cost-effective group counselling, the role that intervention can play in increasing condom use amongst sex-workers, the value of brief intervention in effecting behaviour change over the short-term (three months), and the increased sexual risk behaviours of heavy drinkers compared with lighter drinkers. In total, just under 50% (21/44) of the behaviours that were reported on in the papers were significantly improved following exposure to the interventions that were delivered within the community settings.

Promising results were obtained most consistently in the health care environments (80% of the outcomes measured were significant); whereas the least promising outcomes were obtained in the learning environments (43%). This finding could be due to the nature of the interventions that were implemented in those respective environments, and/or the nature of the individuals concerned (i.e. health-seeking individuals rather than learners and members of the general population). More research is needed to develop interventions that may be feasible, acceptable and effective for the general population.

The interventions that were evaluated by the studies varied from group interventions to those delivered individually. Weschberg et al.'s study showed that results of group versus individually-delivered interventions can be similar. Papas et al., also demonstrated the potential value of a group-delivered intervention, which was an adaptation of a counselling method (CBT) originally developed to be delivered individually. Knowledge that group as well as individual interventions can be effective is of particular value in environments with staffing and other capacity and resource constraints. The observation that many of interventions were delivered effectively by non-professionals is also a positive finding for contexts with capacity limitations.

The studies also demonstrated the potential value of interventions based on the IMB model in different settings. Those instances of negative results with use of the IMB may be due to inappropriate and/or poor implementation of the intervention. However, few of the studies referred to the fidelity of implementation of the interventions, so the extent to which they were implemented as intended is not clear from the descriptions in the research articles.

The finding that many of the intervention effects diminished over time, particularly in the shorter term, suggests a need for more intensive programmes or the provision of booster sessions to ensure that changes are sustained over the longer term. Further work is needed to develop longer term, sustainable interventions for implementation in SSA.

Of notable absence were studies focusing on interventions in settings in which HIV risk may be enhanced due to alcohol consumption, such as bars and other alcohol serving environments. Specific interventions are clearly needed for patrons and bar staff who have a heightened vulnerability to high risk sexual behaviours. Only one study focused on HIV positive people, with a view to reducing their alcohol consumption. However, there is a clear need for interventions to reduce ART non-adherence among HIV positive high risk drinkers particularly in health care and other environments in which they may be feasible.

### **Strengths of the Studies**

The studies had a number of strengths. First, a number of the studies used randomised controlled designs.<sup>8,10</sup> Second, very high follow-up rates of about 70% or above were obtained in some studies.<sup>10-11</sup> Finally, the studies have highlighted the nature and forms of intervention programmes and approaches that can potentially be effective in reducing alcohol-related HIV transmission risks in various settings in the SSA continent.

### **Limitations of the Studies**

There are a number of reasons to be circumspect about the results obtained in this review. First, the pre-post test intervention designs employed by some of the studies limited the reliability of their results.<sup>11</sup> Second, the duration of the follow-up period was extremely short in some cases (i.e. one month<sup>11</sup>), thus limiting the generalisability of the results to the longer term. As seen in Kalichman et al.'s (2008) studies, for example, it is possible that short-term intervention gains disappear over time.<sup>10</sup> Third, the high attrition rates of the two studies conducted within educational settings could have played a major role in the results obtained from these studies. Fourth, a limitation of some of the studies (most notably those conducted within healthcare settings) was the lack of representativeness of the study samples, implying that the results obtained in each of these studies were not generalisable beyond the samples examined. Fifth, design limitations, particularly with regard to the targeted samples<sup>5</sup> and sample size<sup>11</sup> diminish the conclusiveness of the results obtained from these studies. Sixth, the use of self-reports to obtain potentially sensitive information regarding sexual behaviour and alcohol use might have compromised the reliability of the findings of the relevant study data. Finally, the comparability of the studies is limited due to the studies' differing methods (including their aims, samples, sample sizes, study designs) and the intervention programmes conducted. Each of the studies had limitations that might have influenced the measurement of the effects of the intervention programmes. Given the limitations of the studies, conclusions regarding the overall positive (and negative) intervention effects in these studies should be drawn with caution.

### **Suggestions for Further Research**

The reviewed studies provide examples of research that can be replicated in other areas of SSA, bearing in mind potential study limitations. We would recommend more high quality studies using RCT designs, biological outcomes and large and representative samples. Thus future studies could be designed to illustrate the value of these interventions optimally.

Given that in some studies where the intervention programmes had seemingly positive effects, the effects diminished in the longer term (usually after 3 months), there is a strong suggestion that

interventions should have refresher/booster components to sustain, or possibly even increase, the intervention effects. Future studies should evaluate intervention programmes of this nature. Future research is also needed to evaluate interventions in bar and other drinking settings, since these are settings where patrons and workers have a heightened HIV risk. Finally, more research should be conducted to evaluate interventions to reduce ART non-adherence, given the paucity of review studies of this kind.

## **Conclusion**

This review has indicated the potential of selected intervention programmes to be effectively adapted cross-culturally and to have a positive influence on alcohol use and sexual risk behaviour within various settings and among various populations. Interventions can have a positive effect on alcohol consumption and some sexual risk behaviours. Interventions can be delivered in a variety of settings and potentially influence a variety of population groups. However, the very few studies that we were able to uncover suggest a need for more work on the further development, pilot testing and implementation of effective interventions to mitigate the HIV-related risks that result from heavy alcohol consumption in SSA.

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## **CHAPTER 5: RECOMMENDATIONS FOR REDUCING ALCOHOL-RELATED HIV TRANSMISSION, DISEASE PROGRESSION AND ART NON-ADHERENCE**

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The aims of this report were to systematically review studies of (a) the associations between alcohol use, sexual risk behaviour and HIV infection; (b) the associations between alcohol use and HIV disease, including uptake of HIV treatment services, ART non-adherence and HIV outcomes; and (c) evaluations of interventions that have been implemented to address the links between alcohol use and HIV. The final goal of this review is to provide recommendations on how to mitigate the effects of alcohol on the acquisition and progression of HIV disease.

The focus of this chapter is on making recommendations for addressing alcohol-related HIV risk behaviours and HIV infection, based on the key findings of the reviewed studies described in Chapters 2, 3 and 4 of this report. The reviews described in the preceding chapters of this report build upon previous reviews (Fisher et al., 2007; Hahn, Woolf-King & Muyindike., 2011, Kalichman et al., 2007; Pithey & Parry, 2009; Shuper et al., 2010), and included studies conducted in SSA between 2008 and 2011. This chapter has four parts. We first provide recommendations for interventions for HIV prevention. We then outline our recommendations regarding the areas of treatment, care and support. The third part of the chapter presents recommendations for alcohol reduction at the population level. The chapter concludes with recommendations for further research.

### **HIV Prevention**

#### **Key findings**

The studies in Chapter 2 provided overwhelming, but not complete, support for the association between alcohol use, sexual risk behaviour and HIV transmission. There were several key findings of the reviews that have implications for HIV prevention interventions. These include the following:

- First, most research on alcohol consumption and unprotected sex, multiple partners, and HIV infection has yielded positive significant findings in most settings, viz. health care, learning environments, alcohol drinking environments, and community settings.
- Second, individuals with HIV infection who drink alcohol are also more likely than their non-alcohol using counterparts to report unprotected sex with HIV sero-negative partners or partners whose HIV status is unknown. They have an increased risk of re-infection.
- Third, most at risk populations (MARPs) are in need of urgent attention with regard to HIV prevention interventions. These populations include men who have sex with men (MSMs), male and female commercial sex workers (CSWs), men and women who engage in



transactional sex, and women who work in hotels, restaurants and other alcohol drinking venues.

- Fourth, adolescents who consume alcohol are more likely than their counterparts who do not drink to engage in sex, experience their first sexual encounter at a younger age, and engage in sexual encounters with multiple partners.
- Fifth, high risk/problem drinkers seem to have the greatest vulnerability regarding HIV infection and engagement in sexual risk behaviours. This risk is followed by that of non-problem drinkers, and finally by those who are abstinent from alcohol. The risk of non-problem drinkers is sometimes no different from that of non-drinkers, suggesting that non-hazardous/non-harmful drinking may be a viable goal to be achieved by current high risk drinkers who are seeking to minimise their alcohol-associated risk of HIV infection.
- Sixth, there is an increased risk for engagement in sexual risk behaviours associated with alcohol consumption among individuals who drink alcohol and/or work in alcohol serving and drinking settings.
- Finally, there is emerging evidence that alcohol use may delay HIV testing.

### **Recommendations**

The results of the review suggest that alcohol-related HIV prevention interventions and programmes are needed in various settings. Interventions are urgently needed to address the key findings highlighted above. Table 17 provides a summary of aspects of the recommended interventions, including intervention targets, service deliverers, types of intervention services, and training and resource needs. These are outlined for each of the following settings: health care, learning, drinking, community and workplace settings (Table 17).

*Health care settings:* As shown in Table 17, the health care settings in which HIV prevention interventions may be delivered include primary health care, alcohol and other drug treatment facilities, psychiatric facilities and HIV, STI, and TB clinics. Interventions in these settings should be delivered to patients or clients seeking health care services, primarily by health care workers within those environments. Four types of services may be appropriate for delivery in those settings.

- First, individual screening, brief intervention and referral to treatment (SBRIT) should be conducted among clients and/or patients by health care workers who have been trained in conducting screening and basic counselling. Standardised screening tools, such as the CAGE or AUDIT, should be used to screen for alcohol use, and screening needs to determine individuals' HIV risk-related information including (a) drinking before and/or during sex; (b) correct condom use during sex; (c) choice of sexual partners when drinking in high risk

contexts such as bars; (d) numbers of sex partners when drinking, among others. The service provided should be tailored to the individual's risk profile. Specifically, (a) the provision of simple information about alcohol and HIV transmission would be appropriate for people with a low-risk profile; (b) VCT, which includes an alcohol-related HIV risk reduction component, may be more appropriate for people with a medium-risk profile; and (c) people with a high-risk profile may be offered the same intervention as people with a medium-risk profile, supplemented with more active case management or intensive alcohol and other drug (AOD) treatment.

- Second, information should be provided to communicate the link between alcohol and HIV transmission, and may be achieved via the distribution of information sheets or brochures and/or information sessions given by health care workers who are appropriately trained and knowledgeable to impart accurate information.
- Third, counselling should be available for individuals and couples. HIV positive individuals may benefit from individual counselling to address the risk of alcohol-related HIV transmission or re-infection to their undisclosed and/or prospective partners. Couples counselling may address alcohol-related HIV transmission and HIV re-infection among (disclosed) sero-discordant and HIV positive sero-concordant couples, respectively.
- Finally, HIV testing facilities should be readily available to all patients and clients whose HIV status is unknown. Specific effort should be made to encourage testing among individuals who engage in high risk alcohol use.

*Educational settings:* HIV prevention interventions may be delivered in learning environments including primary, secondary and tertiary institutions. Such interventions may be delivered by peers, educators, and health care professionals, depending on the type of programme involved and the environments' available resources. The following activities are recommended:

- First, SBIRT should be used to identify 'high-risk' learners, by well-trained educators and/or health care workers, using appropriate standardised screening tools, to obtain risk profile information pertaining to HIV or sexual risk behaviour. Risk-specific interventions should then be available (as for health care settings), ranging from provision of simple/basic information to low-risk individuals, to active case management and intensive AOD treatment for high-risk individuals. Learners or students with medium- and high-risk profiles should be referred to external health care facilities where they can receive alcohol-focused VCT and treatment services.

- Second, similar to health care settings, information, education and awareness programmes may be useful to alert learners or students to the links between alcohol and HIV transmission. Appropriate information brochures and fact sheets may also be distributed.
- Tertiary institutions may have in-house wellness clinics and counselling services, including HIV testing services, where those with a 'high-risk' profile may be referred. Primary and secondary institutions are more likely to need to source services outside of the school environment.
- Harm reduction activities (such as the provision of condoms and discussion of alcohol and HIV transmission in school-based sex education programmes) are also important activities for consideration within learning environments.

*Alcohol serving/drinking settings:* HIV prevention interventions should target patrons and staff within bars, shebeens, taverns, nightclubs and other settings where alcohol is served and consumed. Similar to health care settings and learning environments, potentially useful intervention activities include the following:

- First, SBIRT should be delivered by well-trained counsellors, using appropriate and standardised screening tools. Appropriate risk-specific interventions should then be applied.
- Second, education and awareness activities should be delivered via information sessions and the distribution of information fact sheets or brochures.
- Third, the provision of training to staff in drinking venues (server interventions) to serve alcohol more responsibly and adhere to alcohol trading policies, may help to reduce levels of alcohol consumption and indirectly, sexual risk behaviour.
- Fourth, the widespread distribution of free condoms may facilitate safer sex behaviour among bar patrons.
- Fifth, HIV testing services should also be made available to bar patrons, and patrons should be encouraged to get tested.

*Community settings:* Community-based HIV prevention interventions should also be available and delivered by appropriately trained individuals. Among recommended programmes for communities are the following:

- First, SBIRT should be possible within community settings to enable community members to assess their alcohol-related HIV risk and be referred to appropriate services.
- Second, education and awareness programmes may benefit community members. In addition, information regarding facilities where people can access alcohol treatment, and HIV testing and HIV treatment services should be more readily available.

- Third, gender empowerment and transformative interventions are needed to reduce women's risk, and address constructions of masculinity that potentially promote excessive drinking, risk-taking behaviour, and prevent health-seeking behaviour among men.

*Workplace settings:* Very few studies based on participants in work environments were uncovered by this review. However, such environments are appropriate for delivering HIV prevention interventions, particularly through employee assistance programmes (EAPs) or employee wellness programmes. SBIRT can be appropriately delivered via workplace interventions, as can general information sessions on alcohol and HIV infection, and VCT services.

Table 17. Summary of proposed HIV prevention interventions

Setting	Target	Service Providers	Services	Training	Resources
<b>Health Care:</b> • Primary health care • Alcohol and other drug abuse treatment facilities • Psychiatric facilities • HIV/STI/TB clinics	Clients	Health care Workers	<ul style="list-style-type: none"> <li>• Screening, brief intervention and referral to treatment (SBIRT)</li> </ul>	<ul style="list-style-type: none"> <li>• Training in SBIRT</li> <li>• Links between alcohol and HIV</li> <li>• Sensitivity training</li> </ul>	<ul style="list-style-type: none"> <li>• Guidelines on alcohol and HIV</li> <li>• Treatment centre guidelines</li> </ul>
	Patients		<ul style="list-style-type: none"> <li>• Education &amp; awareness</li> <li>• Counselling (individual and couples)</li> <li>• HIV testing</li> </ul>		<ul style="list-style-type: none"> <li>• Standardised screening tools (e.g. CAGE; AUDIT)</li> <li>• Information sheets/brochures on links between alcohol and HIV transmission and prevention messages</li> </ul>
<b>Educational</b>  (Primary, Secondary & Tertiary)	Learners	Educators	<ul style="list-style-type: none"> <li>• Screening, brief intervention and referral to treatment (SBIRT)</li> </ul>	<ul style="list-style-type: none"> <li>• Training in SBIRT</li> <li>• Links between alcohol and HIV</li> <li>• Sensitivity training</li> </ul>	<ul style="list-style-type: none"> <li>• Guidelines on alcohol and HIV</li> <li>• Treatment centre guidelines</li> <li>• Standardised screening tools (e.g. CAGE; AUDIT)</li> <li>• Information sheets/brochures on links between alcohol and HIV transmission and prevention messages</li> </ul>
		Peers	<ul style="list-style-type: none"> <li>• Education &amp; awareness</li> <li>• HIV testing where feasible</li> </ul>		
		Health care workers	<ul style="list-style-type: none"> <li>• Condom distribution</li> <li>• Life orientation/sex education</li> </ul>		
<b>Alcohol drinking/serving</b>	Bar patrons/ bar staff	Peers	<ul style="list-style-type: none"> <li>• Screening, brief intervention and referral to treatment (SBIRT)</li> </ul>	<ul style="list-style-type: none"> <li>• Training in SBIRT</li> <li>• Links between alcohol and HIV</li> <li>• Sensitivity training</li> </ul>	<ul style="list-style-type: none"> <li>• Standardised screening tools (e.g. CAGE; AUDIT)</li> <li>• Information sheets/brochures on links between alcohol and HIV transmission and prevention messages</li> </ul>
		Servers	<ul style="list-style-type: none"> <li>• Education &amp; awareness</li> <li>• Condom distribution</li> </ul>		
		Counsellors	<ul style="list-style-type: none"> <li>• Server interventions</li> <li>• HIV testing</li> </ul>		
<b>Community</b>	Community members	Community members	<ul style="list-style-type: none"> <li>• Screening, brief intervention and referral to treatment (SBIRT)</li> <li>• Education &amp; awareness</li> </ul>	<ul style="list-style-type: none"> <li>• Links between alcohol and HIV</li> <li>• Sensitivity training</li> </ul>	<ul style="list-style-type: none"> <li>• Standardised screening tools (e.g. CAGE; AUDIT)</li> <li>• Information sheets/brochures on links between alcohol and HIV transmission and prevention messages</li> </ul>
		Community leaders	<ul style="list-style-type: none"> <li>• Gender-focused programmes</li> <li>• HIV testing</li> </ul>		
<b>Workplace</b>	Workers	Employee Assistance Programmes (EAPs)	<ul style="list-style-type: none"> <li>• Screening, brief intervention and referral to treatment (SBIRT)</li> <li>• Education &amp; awareness</li> <li>• HIV testing</li> </ul>	<ul style="list-style-type: none"> <li>• Training in SBIRT</li> <li>• Links between alcohol and HIV</li> <li>• Sensitivity training</li> </ul>	<ul style="list-style-type: none"> <li>• Standardised screening tools (e.g. CAGE; AUDIT)</li> <li>• Information sheets/brochures on links between alcohol and HIV transmission and prevention messages</li> </ul>

## **Treatment, Care and Support**

### **Key findings**

There were several key findings of the review which have implications for treatment, care and support. The key findings based on the present review of SSA studies on alcohol and ART adherence as well as key findings of non-SSA studies on alcohol and disease progression are presented below, since both ART adherence and disease progression are subsumed under the general category of treatment, care and support. The key findings include the following:

- First, alcohol abuse in family members and close others influences the decision to withhold sero-status disclosure in some people living with HIV & AIDS (PLWHA).
- Second, alcohol use is associated with constructions of masculinity, which serves to maintain alcohol use among men and, hence delayed uptake of ART services.
- Third, stigmatisation (resulting from being HIV infected) is a barrier to the uptake of HIV services, as well as being a barrier to ART adherence.
- Fourth, alcohol use minimises the uptake/initiation of antiretroviral therapy (ART). In particular, alcohol delays ART uptake due to the perception that one must have quit alcohol use before being enrolled on ART.
- Fifth, most studies have found higher levels of alcohol consumption to be associated with more non-adherence to ART. Numerous mechanisms explain these associations, including patients' beliefs about potential alcohol and ART interactions, service provider advice, and actual effects of alcohol on forgetting to take ART.
- Seventh, although the extent to which alcohol use unfavourably impacts on disease progression is yet to be fully elucidated, there is strong biological plausibility that heavy alcohol consumption might accelerate disease progression. Fairly strong evidence suggests that heavy alcohol consumption results in biological and behavioural processes likely to increase HIV disease progression.
- Eighth, based on the few studies reviewed, the effect of alcohol on CD4 cell decline appears to be independent of ART, through a direct action on CD4 cells. The effect of alcohol abuse on viral load, however, appears to be through reduced adherence to ART.
- Ninth, there remains a paucity of primary research on alcohol and disease progression in SSA.

### **Recommendations**

The adoption of multi-disciplinary and integrated approaches to the treatment, care and support of HIV patients who use alcohol is recommended. Such services should ideally be delivered in settings

with co-located (one-stop) centres, to facilitate patients' ability to access core medical, as well as ancillary psycho-social services (including psychologists and adherence counsellors). The recommendations emanating from the literature review are highlighted in Table 18, and focus on health care services for HIV, TB and STI (since these are common co-infections).

### *Services*

Within health care settings there is a need to address alcohol and HIV issues via the provision of the following services:

- First, individual screening, brief intervention and referral to treatment (SBRIT) should be conducted among clients/patients by health care workers who have been trained in conducting screening and basic counselling. Standardised screening tools, such as the CAGE or AUDIT, should be used to screen for alcohol. Brief sensitive screening tools for non-adherence to ART should also be used; biological markers for disease progression (viral loads, CD4 counts etc) should be employed routinely where possible. The service provided should be tailored to the individual's risk profile. Specifically, as it relates to alcohol consumption (a) the provision of simple information about alcohol and all pertinent aspects of HIV disease (via brochures, factsheets) would be appropriate for people with a low-risk profile; (b) Brief interventions for persons (5 minutes risk reduction counselling/Motivational Interviewing; MI) and boosters at subsequent visits may be more appropriate for people with a medium-risk profile; and (c) people with a high-risk profile may be offered the same intervention as people with a medium-risk profile, supplemented with more active case management to reduce the risk of re-infection or non-adherence to ART or disease progression or to promote alcohol treatment and aftercare ( e.g. Alcoholic Anonymous). As it relates to ART adherence, all service users identified as having poor ART adherence due to alcohol use, should be imparted information on the role of alcohol in ART non- adherence, as well as on conditions under which ART's effectiveness could be compromised by heavy alcohol consumption (e.g. co-morbid HIV/HCV infection). Regarding disease progression, information should be provided to all HIV service users (whether treatment naive or whether already on ART) on the effect of alcohol on disease progression.
- Second, group psychotherapy for PLWHA or support groups for PLWHA should address the concerns regarding sero-status disclosure to family members or close others who abuse alcohol.
- Third, gender transformative interventions are needed to address the role of constructions of masculinity in the maintenance of alcohol use, which in turn delays health seeking behaviour among men.

- Fourth, stigma reduction programs should specifically tackle the role played by stigma in the delayed uptake of HIV services and poor ART adherence.
- Fifth, there is urgent need for general awareness among users of HIV services that alcohol use should not delay people's uptake/initiation of ART services.
- Sixth, there is an urgent need for awareness among health care providers that even if people are alcohol drinkers they should not be taken off ART; rather they should be tapered off alcohol and tested regularly for alcohol use and ART adherence using biomarkers. Service providers urgently need accurate information about the effects of alcohol use on ART, such that the appropriate knowledge is provided to the users of HIV services.
- Seventh, more primary studies are needed on alcohol and disease progression in SSA.

#### *Health care providers*

The issue of alcohol and HIV is most pertinent to a range of health care providers, inclusive of adherence counsellors, social workers, nurses, medical doctors, pharmacists/pharmacy technicians, patient advocates, and psychologists. The effectiveness of health care workers can be enhanced by reducing their case loads, increasing their exposure to information about alcohol's effects on HIV (Strauss et al, 2009), and exposing them to elements of stigma reduction programs (e.g. ICRW, 2010).

#### *Training*

Specific guidelines are needed for health care providers to enhance their knowledge and skills on exactly how to manage patients who are using alcohol and enrolled on ART programmes. Health care providers need ongoing in-service training to update them on the latest scientific advances and findings on the areas of HIV disease that are impacted upon by alcohol consumption. Alcohol and HIV issues should also be included in the curricula of training courses for all HIV lay counsellors, who play a crucial role in supporting HIV patients. Health care providers should be provided with training to:

- Increase their knowledge about ART, alcohol use and HIV, e.g. how alcohol affects the immune system, ART adherence, and sexual risk behaviour.
- Enhance their capacity to conduct screening and brief intervention, and referral to treatment (SBIRT) services.
- Enhance their skills to manage their clients effectively.
- Increase their awareness about resources and potential sources for referral.



### *Resources*

For those health care providers who will be conducting SBIRT there is a need for specific guidelines and standardised materials on screening and brief intervention, and referral to services. The relative lack of information on alcohol and HIV (Morojele et al., 2010) suggest the need for the development of informational factsheets and brochures on all aspects of the link between alcohol and HIV to enable health care providers to manage their patients effectively.

Table 18. Summary of Proposed Interventions for Treatment, Care and Support

Setting	Clients/ Patients	Treatment, care and support services required	Health Care Providers	Training needs of health care providers	Resources for health care providers and patients
Health care (e.g. community health centres, district hospitals, tertiary hospitals, NGO clinics, wellness clinics in various settings)	HIV, TB and STI patients	<ul style="list-style-type: none"> <li>• Screening, brief intervention &amp; referral (SBIRT)</li> <li>• Group psychotherapy and support groups for PLWHA</li> <li>• Gender transformative interventions</li> <li>• HIV stigma reduction programs</li> <li>• Provide information on the role of alcohol on ART adherence</li> <li>• Provide information on probable interactions of alcohol with ART (conditions under which interactions exist and do not)</li> <li>• Provide information on conditions under which ART's effectiveness could be comprised among heavy alcohol users (e.g. comorbid HIV/ HVC infection)</li> <li>• Provide information on the effect of alcohol on disease progression</li> </ul>	<ul style="list-style-type: none"> <li>• Adherence counsellors</li> <li>• Social workers</li> <li>• Nurses</li> <li>• Doctors</li> <li>• Pharmacists/Pharmacist Technicians</li> <li>• Patient advocates</li> <li>• Psychologists</li> <li>• Traditional healers</li> </ul>	<ul style="list-style-type: none"> <li>• To increase capacity to conduct Screening and Brief Intervention, and Referral to services</li> <li>• To be aware of available resources and potential sources for referral</li> <li>• To enhance skills to manage patients effectively</li> </ul>	<ul style="list-style-type: none"> <li>• Guidelines on screening and brief intervention, and referral to services</li> <li>• Factsheet/brochures on all one needs to know about alcohol and HIV for patients</li> <li>• Availability of standardised materials for intervention and training</li> </ul>

## **Recommendations for Alcohol Use Reduction**

The overwhelming majority of the studies in this review indicate a need to reduce levels of alcohol consumption among individuals in order to prevent HIV transmission and minimise adverse outcomes among individuals with HIV infection. This is particularly important for the SSA region where high levels of alcohol intake and heavy episodic drinking is in evidence (WHO, 2011). According to reviews of effective evidence-based interventions (Babor et al., 2010; Parry et al., 2010), the policy and legislative measures that are most likely to be effective in reducing consumption, and especially heavy drinking, involve regulating the availability, price and marketing of alcohol. The availability of alcohol can be regulated through reducing the density of alcohol outlets and the hours and/or days of alcohol sales to the public. Price, which may also affect alcohol availability (affordability), can be regulated through increasing alcohol excise taxes. Lastly, the marketing of alcoholic beverages should be regulated to ensure minimal exposure to advertising particularly among youth. This can be done through restricting hours of alcohol advertising, banning alcohol advertisements on billboards, and banning alcohol companies' sponsorship of sports programmes and activities.

## **Recommendations for Further Research**

This review has highlighted areas in which research has been conducted, and points to numerous areas in which further research is needed. Of primary importance are studies to address the association between alcohol use and disease progression, as our review has identified a dearth of research on this topic in SSA. Second, where possible, objective measures of both alcohol use and ART adherence (such as biological markers) should be adopted in order to minimise reliance on self-reports of alcohol use, sexual risk behaviour and ART adherence. All these behaviours may be under-reported due to social desirability factors. Third, more qualitative and theoretically-driven research is needed. Studies using complex modelling approaches can better explain the interrelationships among the variables of alcohol use, sexual risk behaviour and HIV infection. Moderators and mediators of the associations between alcohol consumption and sexual risk behaviour, and alcohol consumption and ART adherence need to be identified further. Fourth, further development and evaluation of HIV prevention programmes with an alcohol reduction focus, are urgently needed among all potentially vulnerable populations in a range of settings. Fifth, more research on alcohol and HIV transmission is specifically needed on adolescents, MARPS and the workforce, since relatively few studies have been conducted among these populations. Finally, we would recommend the development of a handbook, with guidelines for investigators who are interested in studying the links between alcohol and HIV. Such guidelines would outline suggested research methods, designs,

instruments and tools to use that would help to ensure that future studies are able to respond more definitively to currently unanswered questions regarding alcohol's role in HIV infection, sexual risk behaviour and ART adherence.

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## APPENDICES

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Table A.1. Characteristics of the studies on the association between alcohol use and HIV transmission

Study No.	Author (date)	Location	Aim(s)	Design	Setting	Sample & sampling	Data collection, tools and/or measures	Statistical software & main analyses
1	Agardth et al. (2011)	Uganda	To assess the association between the experience of sexual coercion and risky sexual behaviour among university.	Cross-sectional	Learning environment	Sampling strategy not reported. N=980 university students. Females=633, Males= 347. Mean, median and/age range not reported.	Self-administered questionnaire covering socio-demographic and religious factors, social capital, mental health, alcohol use, and sexual behaviour. A validated scale of six items was used to assess the experience of sexual coercion. Sexual behaviour variables: previously had sex, number of lifetime sexual partners, condom use at latest occasion of sexual intercourse.	SPSS v. 16.0 Logistic regression
2	Dessie et al. (2011)	Ethiopia	To assess risky sexual practices and related factors among HIV-positive ART attendees in public hospitals of Addis Ababa.	Cross-sectional	Health care	Purposive sampling. N=601 ART attendees. Females=331; Males=270 Mean age=33.4 years	Questionnaire-based face-to-face interviews. Solicited socio-demographic characteristics (age, sex, ethnicity, education, religion, marital status, occupation and income status), relationship factors (number and types of sexual partners, discussion about condom use, partner's HIV status and their disclosure status), medically related factors (safer sex beliefs, duration of HIV diagnosis and start of ART, safe sex beliefs about ART, and safer sex knowledge, pleasure and effectiveness. Psycho-social factors (stigma, and substance and alcohol use) behavioral factors (condom use elf-efficacy and general social support)	SPSS v. 16 Logistic regression analyses
3	Hoque & Ghuman (2011)	Umlazi, South Africa	To find out the sexual behaviour and knowledge of STIs of Mangosuthu University students.	Cross-sectional	Learning environment	Multistage sampling: stratified random sampling (faculties) and probability proportional to sampling strategy (students). N=752 university students. Females=391; Males=361 Mean age=21.57 years.	Self-administered questionnaire. Questions on behavioural profile, sexual behaviour, knowledge of STIs and prevention methods of STIs.	SPSS v. 12.0.1 Chi-square test.
4	Kalichman & Simbayi (2011)	Cape Town, South Africa	To examine the combined risks of multiple recent sex partners and alcohol use among people seeking treatment for an identified STI in Cape Town South Africa.	Not reported	Health care	Sampling strategy not reported. N=739 STI patients Females= 210; Males=529	Surveys of sexual behaviours and substance use over a two-month retrospective period. Sexual risk was defined by frequencies of unprotected intercourse and drinking alcohol before sexual intercourse. Sexual behaviours and multiple recent partners: number of sexual partners,	Software not reported T-test. Logistic regression.

Study No.	Author (date)	Location	Aim(s)	Design	Setting	Sample & sampling	Data collection, tools and/or measures	Statistical software & main analyses
							frequency of vaginal and anal sexual episodes with and without condoms. Multiple recent sex partner included those reporting 2 or more partners in past 2 months, with concurrent and non-concurrent partners. Substance use: frequency of alcohol use and whether had consumed 6 or more drinks in one drinking episode in past 2 months, adapted from frequency and quantity items of AUDIT.	
5	Lane et al. (2011)	Soweto, South Africa	To assess HIV prevalence and risk factors in a population of sexually active MSM in Soweto, South Africa.	Survey	Community	Respondent driven sampling. N=378 MSMs (including 15 seeds). Mean/median and /or age range not reported.	Questionnaire assessing demographics, alcohol use with AUDIT, partner-by-partner sexual behaviour and condom use for up to five partners within past 6 months-sex of partners, whether regular or casual, position in anal sex, and number of unprotected. HIV testing.	RDSAT v 5.6 for weighting. Multivariate logistic regression (Odds ratio)
6	Luchters et al. (2011)	Mombasa, Kenya	To investigate which alcohol indicator (single item measure of frequency vs AUDIT) can detect associations between alcohol use and unsafe sexual behaviour among male sex workers.	Cross-sectional	Community	Probability proportionate to size of venue. 65 venues sampled. N=442 MSW Mean age=24.6 years	Interview using hand-held computers. Information collected on socio-demographics, substance use, sexual behaviour, violence and STI symptoms. Alcohol behaviours assessed using AUDIT and two single item measures of alcohol use: frequency of use and binge drinking.	Intercooled Stata v. 8. Chi-square tests. Separate multivariate models.
7	Lundberg et al. (2011)	Uganda	To investigate whether depression, psychological distress and alcohol use are associated with sexual risk behaviours in young Ugandan adults.	Cross-sectional	Community	Purposive selection of study areas. A modified cluster sampling method, of households and shops and businesses N=646. Female=312; male=334 Mean/median and/or age range not reported.	Hopkins Symptoms Checklist-25 used to assess depression and psychological distress. Alcohol use was assessed using a question about self-reported heavy-episodic drinking. Information on sexual risk behaviour was obtained on number of lifetime sexual partners, ongoing concurrent sexual relationships and condom use.	STATA Logistic regression (Odds Ratios)
8	Maher et al. (2011)	Uganda	To assess the prevalence of concurrency and investigate its association with socio- demographic and behavioural factors and with	Not reported	Community	N=7343 Females=4052; Males= 3291	Structured questionnaire used to collect socio-demographic and behavioural factors to measure standard indicators of concurrency using the recommended method of obtaining sexual-partner	Stata v. 10.0 Logistic regression



Study No.	Author (date)	Location	Aim(s)	Design	Setting	Sample & sampling	Data collection, tools and/or measures	Statistical software & main analyses
			HIV prevalence, using the new recommended standard definition and methodological approaches.				histories.	
9	Njue et al. (2011)	Kisumu, Kenya	To deepen understanding of the dynamics of sexual interactions of adolescents in order to explain the high HIV prevalence among Kisumu youth in general and specifically among girls.	Qualitative	Community	Convenience sampling for in-depth interviews. N=150 adolescents Females=75; Males=75. Age=15-20 yrs. Quota sampling used to diversity in age, SES and education. No information re sampling for FGDs. N=4 groups of 8 to 12 participants (in- and out-of-school youth) No information re sampling for observations. Total of 48 observations, but number of venues observed not reported.	In-depth interviews using a qualitative interview guide. Focus group discussions using a topic guide concerned with youth's attitudes, risk perception and socio-cultural norms regarding sexuality. Observations of young people's behaviour at places where they spend their free time (including night clubs/bars, video halls, shopping malls, local brew dens, and funerals).	Atlas ti. software. Data analysis of all 3 data types followed Grounded Theory principles, i.e. allowing for analytical themes to emerge during the process of (re)reading transcripts and exploring and coding responses.
10	Ruzagira et al. (2011)	Masaka Uganda	To determine the incidence of and risk factors for HIV acquisition in a cohort of HIV-un-infected partners from HIV discordant couples in Masaka, Uganda, and to establish its suitability for HIV vaccine trials.	Not reported (conclude longitudinal, analytical)	Community	Sampling strategy not reported. N=495 HIV-un-infected individuals in discordant couple relationships. Mean age=36.2 yrs	Interviews, medical investigations, HIV counselling and testing, syphilis and urine pregnancy (women) tests were performed at quarterly visits. Sexual risk behaviour data were collected every 6 months.	Stata v. 10 Poisson regression.
11	Singh et al. (2011)	Mongu, Zambia	To explore the associations of age, alcohol use and poverty with two risk factors for HIV – multiple partners and transactional sex.	Not reported, but mention that full description of PLACE methodology is reported elsewhere.	Community	Convenience sampling (Phase 1: selection of community informants) Venue selection for Phase 3: systematic fixed interval sampling strategy with the probability of selection proportionate to the size of the venue. Participant selection for Phase 3: no information re sampling strategy. N=343 females,	Priorities for Local AIDS Control Efforts (PLACE) method with 3 phases. Phase 1: community informants to list the public venues where people in that area meet new sexual partners. Phase 2: interviewers visit the venues listed in the study area and interview a venue representative, such as an owner or manager, and obtain characteristics of venue. Phase 3: individuals socializing at a sample of the venues are interviewed.	Software not reported Logistic regression (odds ratios)

Study No.	Author (date)	Location	Aim(s)	Design	Setting	Sample & sampling	Data collection, tools and/or measures	Statistical software & main analyses
						Age is stratified into two groups 18-24 and 25+ (202/207 vs 157/159).	<p><i>Alcohol consumption</i> in the past 3 days is described as none, 1-2 days, 3-5 days, 6-10 days, and 11 or more days to study the effects of dose-response.</p> <p><i>Transactional sex</i> is defined as giving or receiving money in exchange for sex, in the past year.</p> <p><i>Multiple partners</i>: Having two or more partners in the past year.</p>	
12	Townsend et al. (2011)	Cape Town, South Africa	To explore the dynamics of social and sexual relationships in which alcohol use and risky sexual behaviors co-occur among high-risk heterosexual men	Exploratory/qualitative	Bars	Purposive sampling of 20 men from RDS recruited from sample of 421 men (Median age=28 years; range=18-62 yrs)	In-depth interview using a thematic question guide obtaining info re sexual behaviours, friendship networks, new sexual partner acquisition, and alcohol consumption	Latent content analysis suggested by Graneheim and Lundman (2004).
13	Avalos et al. (2010)	Cape Town, South Africa	To assess the relationship between stress, substance use and sexual risk behaviours in a primary care population in Cape Town, South Africa.	Cross-sectional	Health care	Multi-stage cluster, stratified random sampling. N=2618 primary care patients. Females=1490, Males=1128. Mean/median and/or age range not reported.	<p>Questionnaire assessing demographics and sexual risk behaviour.</p> <p>Used ASSIST to assess hazardous alcohol use and drug use: 6 questions about alcohol use and each type of drug and tobacco.</p> <p>Considered 3 main stressors: Personal Threats, Lacking Basic Needs, and Interpersonal Problems, with questions taken from International Classification of Primary Care, Second Edition (ICPC-2).</p>	Software not reported Chi-square. Binomial regression model
14	Essien et al. (2010)	Nigeria	To examine HIV/AIDS knowledge and sexual risk behaviours in military personnel sample.	Cross-sectional	Military	Sampling procedure not reported. N=346 female military personnel. Mean/median and/or age range	Administered assessment in group format, using overhead projectors. Measures included demographic characteristics, HIV/AIDS knowledge, HIV prevention self-efficacy, condom use attitudes and barriers, substance use and sexual behaviours and peer norms.	Software not reported. Logistic regression.
15	Mapingure et al. (2010)	Harare, Zimbabwe, and Moshi, Tanzania	To identify risk factors that could explain the large differences in HIV-1 prevalence among pregnant women in Harare, Zimbabwe, and Moshi,	Cross-sectional	Health care	Sampling strategy not reported. Pregnant women enrolled at antenatal clinics. Zimbabwe N=691 (of which 177 HIV+)	Interviewer-administered questionnaires soliciting info about socio-demographics, sexual behaviour, and current and past medical history. A doctor or midwife conducted an overall	STATA v. 10. Chi-square T-test Logistic regression

Study No.	Author (date)	Location	Aim(s)	Design	Setting	Sample & sampling	Data collection, tools and/or measures	Statistical software & main analyses
			Tanzania	protocol.		Mean age 24.2 yrs Tanzania N=2654 (of which 184 HIV+) Mean age 24.6 yrs	physical and gynaecological examination of the women. The women were tested for HIV-1, syphilis, HSV2, Trichomonas vaginalis, bacterial vaginosis and candidiasis.	
16	Kalichman et al. (2010)	Cape Town, South Africa	To examine behavioural characteristics of STI clinic patients who sero-convert for HIV.	Longitudinal	Health care	Sampling strategy not reported. N=616 STI patients (106 at follow-up of which Females= 34 Males= 72)	Audio-computer assisted structured interview (ACASI) AUDIT for alcohol	Software not reported. T-test Chi-square Fisher's exact Logistic regression ANOVAs
17	Peltzer et al. (2010)	Mpumalanga, South Africa	To identify determinants of HIV counselling and testing uptake in the PMTCT program at Gert Sibande district PMTCT sites in a rural clinic setting in Mpumalanga, South Africa.	Cross-sectional	Health care	Systematic sample of 35/72 health facilities offering PMTCT services. N=930 pregnant women. Mean/median and/or age range not reported.	Adapted instruments from previous research. Measures: Knowledge of mother to child transmission, 15 item Attitudes towards HIV-antibody Testing Scale, HIV risk perception, selected items of Sexual Risk Behaviour Questionnaire, AUDIT, partner physical abuse, group HIV information or counselling.	Software not reported. Logistic regression
18	Townsend et al. (2010)	Cape Town, South Africa	To answer 3 questions to further knowledge about links alcohol use and HIV infection: (a) "Are problem drinkers more likely to have multiple concurrent partners than those who are not?"; (b) "Are condoms applied less effectively and less consistently by problem drinkers compared to those who are not?"; (c) "Are the female sexual partners of problem drinkers different from those who are not?"	Cross-sectional	Community	Respondent-Driven Sampling. N=848 men who had concurrent sexual partners. Age range 25-55 years.	<u>Survey</u> : participants' and female sexual partners' demographics, participants' current and past sexual risk behaviours, concurrency, history of sexually transmitted infections and alcohol use.  Problem drinking (CAGE, total score of 0-4, score of 3 and above =problem drinking).  Serum for HIV testing, using ELISA test and western blot.	Respondent-Driven Sampling Analysis Tool 6.0. for weighting. STATA, 10.0 Chi-square. Logistic regression.
19	Armonkul et al. (2009)	Kenya	To estimate HIV prevalence and characterize risk factors among young adults in Asembo, rural western Kenya.	Cross-sectional	Community	Stratified random sampling by sex and age. N= 1822 Female=930; Males: 832 Median age= 19 years.	Interview on risk behaviour and tested for HIV and HSV-2.	SAS v. 8.2 through 9.13 and STATA 8.2. Logistic regression.

Study No.	Author (date)	Location	Aim(s)	Design	Setting	Sample & sampling	Data collection, tools and/or measures	Statistical software & main analyses
20	Ghebremicheal et al. (2009)	Moshi, Tanzania	To assess covariates of alcohol abuse and the association between alcohol abuse, high-risk sexual behaviors and sexually transmitted infections (STIs).	Cross-sectional	Community	2-stage cluster sampling 2019 women Age range 20-44.	Structured interview, HIV testing and blood and urine sample testing for other STIs Measures: Alcohol abuse measured by CAGE (alcohol abuse defined as score between 2-4), sexual behaviours, symptoms of STIs, testing for STIs.	SAS v. 9.0 Pearson chi-square tests. Logistic and proportional odds regression models.
21	Kalichman et al. (2009a)	Cape Town, South Africa	To examine the sexual practices and risk behaviours of men and women living with HIV/AIDS being treated for a co-occurring sexually transmitted infection (STI).	Cross-sectional	Health care	Convenience sampling. N=1732 HIV positive STI clinic patients. Females= 679, Males= 1052 Mean age=29.6 yrs.	Computer-administered behavioural assessment (ACASI). Sexual 30-day retrospective recall on number of sexual partners and sexual behaviours, particularly vaginal and anal intercourse with and without condoms. Alcohol and drug use in sexual contexts: Number of times drank alcohol, and used drugs before sex. Alcohol and other drug use: completed AUDIT.	Software not reported. Logistic regressions.
22	Kalichman et al. (2009b)	Cape Town, South Africa	To examine condom failure and associated behavioural risk factors among men at high-risk for HIV transmission	Cross-sectional	Health care	Sampling strategy not reported 413 men Mean age=30.3 (SD=7.2)	Computer-assisted interviews- demographics, Alcohol and other drug (AOD) use, sexual risk and protective behaviours, AOD use in sexual contexts- and review of patients' STI charts	Analysis software not reported Bivariate and multivariate logistic regressions
23	Lightfoot et al. (2009)	Namibia	To investigate the links between alcohol use and higher-risk sexual behaviours in a remote southern Namibian mining-town community	Qualitative	Community	Social worker recruited participants according to researchers' set categories. Focus groups: supervisors/ foremen, mineworkers, Oshiwambo-speaking workers, workers who had undergone treatment for substance abuse, workers' spouses, and youth Ages range=17-20 years N=46 Gender distribution not reported	Structured interview guide: participants asked to discuss to what extent they felt that people working and living in the mining-town community understood the link between HIV/AIDS and alcohol consumption Focus-group guide: included general questions about the link between HIV and alcohol use.	Researchers independently reviewed detailed notes and debriefing forms, coding raw data for key themes. Each researcher developed themes, then team met numerous times to reconcile, collapse and organize key themes.
24	Luseno et al. (2009)	Pretoria, South Africa	To better understand testing behaviours in a sample of South African women who practice high-risk behaviours.	Randomized Control Trial	Community	Eligibility: female, age 18 and above, alcohol use on at least 13 of the past 90 days, either trading sex for money or drugs	Urine drug screens (cocaine, cannabis, opiates, amphetamines/ methamphetamine and ecstasy use). Breath alcohol testing.	SPSS v 14.0. Chi-square statistic T-test Logistic regression

Study No.	Author (date)	Location	Aim(s)	Design	Setting	Sample & sampling	Data collection, tools and/or measures	Statistical software & main analyses
						or had unprotected sex in the previous 90 days, provided written consent and verifiable locator information for Gauteng Province. N=425 high risk women Age range 18-55 years	Pre- & post-test counselling and Oraquick Rapid HIV-1 antibody testing, confirmation for reactive samples with Pareekshak for willing participants. 2-part baseline paper and pencil interview collecting information on demographics, substance abuse, sexual risk variables, physical and sexual abuse (ever physically or sexually abused), HIV testing behaviours, health status, healthcare utilization.	
25	Page & Hall (2009)	6 sub-Saharan countries: Botswana, Kenya, Namibia, Uganda, Zambia, and Zimbabwe	To examine the relationship between sexual behaviour, alcohol use, and indicators of psychosocial distress (mental health) among adolescents	Survey	Learning environments	2-stage probability sampling technique N=22,949 No female: male ratio reported. No mean/median and/age range reported.	Global School-Based Student Health Survey (GSHS). Respondent-administered questionnaire collecting information on sexual behaviour, alcohol use and psycho-social distress.	SAS v 9.1. Logistic regression.
26	Tassiopoulos et al. (2009)	Moshi, Tanzania	To identify situation-specific factors associated with condom use among female bar and hotel workers in Moshi, Tanzania	Case-crossover	Bars	Sampling procedure not clear, recruitment through visiting registered establishments N=465 female bar and hotel workers. Mean age=26.2 yrs.	Women who reported inconsistent use of male condoms within the past 5 years were asked to recall the most recent sexual event in which a condom was used (protected event) and the most recent event without a condom (unprotected event), and were asked detailed questions about both events (including subject and partner alcohol use)	Software not reported Logistic regression
27	Zatblotska et al. (2009)	Rakai, Uganda	To examine the association between self-reported alcohol use before sex, physical violence/sexual coercion in the past and prevalent HIV	Cohort	Community	Individuals eligible for enrolment were identified by annual censuses. N= 3,422. Age range=15-49 years. Gender distribution not reported.	Venous blood sample for HIV testing Structured questionnaire: socio-demographics, sexual behaviours, sexual network information, condom use, number and characteristics of sexual partners, sex for money/gifts, alcohol use, IPV and non-consensual sex.	Software not reported. Logistic regression.
28	Coldiron et al. (2008)	Rwanda & Zambia	To examine how alcohol may influence the risk taking process and lead to the non-use of condoms among	Cohort	Health care	Participants were discordant cohabiting couples. <u>Eligibility</u> : (i) cohabitation in a sexual relationship for at least 6	HIV status: three rapid antibody tests and ELISA confirmation. Alcohol use: binary "ever/never" drank during the previous year, & battery of six	SAS v 9.0 Chi-square Fisher's Exact tests Logistic models

Study No.	Author (date)	Location	Aim(s)	Design	Setting	Sample & sampling	Data collection, tools and/or measures	Statistical software & main analyses
			sero-discordant couples.			months and residence in Kigali, or Lusaka at time of enrolment; (ii) discordant HIV sero-status between members of the couple; and (iii) age 18–48 years for women and 18– 65 years for men. N=990 couples in Rwanda and 947 couples in Zambia. Gender distribution not reported.	questions about frequency of alcohol behaviours, e.g. drinking >6 drinks on one occasion	
29	Fisher et al. (2008)	Moshi, Tanzania	To examine the relationship between patterns of alcohol use and HIV infection. To assess the association between problem drinking and prevalence of risk factors for HIV among a sample of high-risk African women.	Cohort	Community	Sampling strategy not reported N=1050 high risk women Mean/median and/or age range not reported.	Information obtained on demographic and employment characteristics, sexual behaviours, and drinking patterns through interviews. CAGE questionnaire used to assess problem drinking (4 questions, problem drinkers defined as those who answer yes to 2 or more of the questions) Blood and genital samples were collected for detection of STDs and other genital infections.	Software not reported Logistic regression
30	Frank et al. (2008)	Wentworth, South Africa	To identify risky sexual behaviours and demographic factors among a cohort of South African high-school pupils, that predispose them to HIV and AIDS.	Cross-sectional	Learning environments	Sampling strategy not reported N=805 Grade 10 pupils Mean age=15.4 years (SD=1.11) Gender distribution not reported	Structured respondent-administered questionnaire, adapted from original Youth Risk Behaviour Surveillance System from Johns Hopkins Bloomberg School of Public Health Sexual Behaviour Survey. Sexual risk behaviour questions/ measure: Ever had sex, age at first sex, preference of older partners, transactional sex experience of coerced sex, use of alcohol at last sex, condom use at last sex, condom use at every sex episode.	SPSS v 11.5 Chi-square
31	Geibel et al (2008)	Kenya, Mombasa	To identify social and behavioural characteristics associated with sexual risk behaviours among male sex workers who sell sex to men in Mombasa, Kenya.	Descriptive	Community	Time-location sampling. First stage sampling involved mapping locations to identify places where male sex workers sought clients. Locations served as primary sampling units or clusters. Second stage selection	Structured questionnaire was administered using handheld computers. Socio-demographic characteristics, sexual behaviours, prevention knowledge and practices, reported STI symptoms, discrimination, violence, and health service usage. Questionnaire adapted and combined	Stata v. 9.2 Chi-square Wilcoxon rank test Logistic regression .

Study No.	Author (date)	Location	Aim(s)	Design	Setting	Sample & sampling	Data collection, tools and/or measures	Statistical software & main analyses
						based on probability proportional to no. of sex workers at each venue in enumeration database. N=425 male sex workers. Mean/median and/or age range not reported.	indicators from both the female sex worker and MSM surveys developed by Family Health International for Behavioural Surveillance Surveys.	
32	Genberg et al. (2008)	Thailand, Zimbabwe, Tanzania, South Africa	To explore sexual risk behaviours and HIV testing histories by sex to examine the differential HIV risk profiles within each country; to determine the socio-demographic and sexual risk factors related to condom use within the past six months by sex across the five research sites in an attempt to determine the main risks for heterosexual HIV transmission	Randomised Control Trial	Community	Multi-stage sampling strategy by enumeration of households. Various enumeration strategies: door-to-door census, mapping, and aerial photography. Just over ½ (52.6% to 58.6%) of sample female across all sites. Mean age ranged from 22.9-25.8 years.	Interviewer-administered questionnaire. Concurrent partnerships were defined as having reported any sexual activity in the past 30 days with at least two regular or non-regular partners.	Software package R Logistic regression.
33	Kalichman et al. (2008a)	Cape Town, South Africa	To test the prospective relationship between risk-taking personality, alcohol outcome expectancies, alcohol use in relation to sex, and sexual risk behaviour.	Longitudinal	Health care	Participants referred by clinic staff. Criterion for referral: patient was being seen at the clinic for STI diagnostic or treatment services.  N=221 at baseline Female=64; males=157 Mean/median and/or age range not reported.	Information obtained regarding descriptive characteristics and substance use, sensation-seeking, alcohol-sex outcome expectations, drinking contexts, HIV-risk related behaviours.	Software not reported Path analysis
34	Kalichman et al. (2008b)	Cape Town, South Africa	To examine HIV transmission risk behaviours of men and women who patronize shebeens in Cape Town South Africa; particularly interested in behavioural risk characteristics associated with meeting sex partners in the shebeens.	Cross-sectional.	Bars	Adapted snowball sampling procedure (owners of shebeens referred patron who in turn referred their friends) N=330 Female=248, males=91 Median age=34 yrs	Respondent-administered paper-pencil survey obtained information on global use of alcohol through AUDIT, drinking in sexual contexts, whether met sexual partner at shebeen and whether in past month, whether had sex with partner in shebeen, HIV risk history, sexual risk behaviour and transactional sex. Problem drinking detected by a score of 9 on the AUDIT.	Software not reported. Logistic regression.

Study No.	Author (date)	Location	Aim(s)	Design	Setting	Sample & sampling	Data collection, tools and/or measures	Statistical software & main analyses
35	Kiene et al. (2008)	Cape Town, South Africa	To assess the prevalence of unprotected sex and examine the association between alcohol use before sex and unprotected sex among HIV+ individuals in Cape Town, South Africa.	Descriptive	Health care	Purposeful sampling N=82 HIV positive patients Females=58; Males=24 Mean age=32.2 years	Measures adapted from previous studies validated Respondents' daily report on drinking and sexual behaviour for previous night.	SPSS v. 15.0 Generalised Estimating Equation (GEE)
36	Lane et al. (2008)	Various townships in Gauteng province, South Africa	To determine sexual risk behaviours and attitudes towards HIV testing among MSM in low-income peri-urban "township" communities in Gauteng Province.	Not reported	Community	Snowball sampling Eligible criteria: over 18 yrs and had ever had manual, oral or anal sex with another man. N=199 MSMs Mean/median and/or age range of sample not reported.	Interviewer administered pen-and paper standardized questionnaire. Survey instrument adapted from a survey for MSM (Family Health International 2000) Information obtained regarding alcohol use and unprotected anal intercourse	STATA v. 9.0. Chi-square tests. Logistic regression analyses.
37	Lurie et al. (2008)	Soweto & Bushbuckridge, South Africa	To explore determinants of and factors associated with safe sexual behaviour.	Survey	Health care	Sampling strategy not reported.  N=3819 HIV+ patients  Mean/median and/or age range of participants not reported. Gender distribution not reported.	Questionnaire solicited information regarding socio-demographics (age, education, marital status, income), STI symptoms, sexual behaviour, disclosure, alcohol use and sexual risk behaviour.  Blood samples collected for CD4 cell count and rapid plasma reagin (RPR) and full blood counts and were analyzed on-site according to standard laboratory procedures.	SPSS v. 14.0 T-tests Logistic regression.
38	Mwaba et al. (2008)	Cape Town, South Africa	To establish the perceptions of men and women attending an STI clinic with regard to high-risk sex.	Exploratory/Qualitative	Health care	Purposive/convenience sample N=21 (12 female, 9 male) Mean age=27 yrs (range 16-35)	In-depth interviews conducted to obtain data on knowledge of HIV/AIDS, and beliefs and practices of high-risk sexual behaviour.	Thematic content analysis
39	Urassa et al. (2008)	Dar es Salaam, Tanzania	To understand factors that may facilitate STI acquisition and suggest preventive strategies.	Not reported	Health care	Sampling strategy not reported N=304 youth attending an STI clinic Females=157, Males=147 Mean age= 21.5 and 20.3 for males and females, respectively.	Structured standard questionnaire obtaining social, sexual and socio-demographic data. Blood samples tested for syphilis and HIV infections. Urethral, high vaginal and cervical swabs screened for common STI agents.	SPSS v. 12.0 Chi-square T-tests.
40	Uthman & Kongnyuy (2008)	Nigeria	To examine factors associated with extra-marital sex among women in Nigeria; to investigate how much variation in reported extra-marital sex can be attributed to individual-	Cross-sectional	Community	Two-stage cluster sampling N=6362 sexually active women Mean/median and/or age range not reported.	Structured interviews obtaining demographic characteristics, wealth, anthropometry, female genital cutting, HIV knowledge, and sexual behaviour. Past alcohol use defined as number of days drank alcohol in last three months.	MLwiN software v. 2.0.2 Logistic regression



Study No.	Author (date)	Location	Aim(s)	Design	Setting	Sample & sampling	Data collection, tools and/or measures	Statistical software & main analyses
			and community-level factors.				"High risk" sexual behaviour defined as having two or more sex partners in the last 12 months.	

Table A.2: Characteristics of the studies on the association between alcohol use and ART adherence

Study no.	Author (date)	Location	Aim(s)	Design	Setting	Sampling & sample	Data collection, tools and/or measures	Statistical software & Main analyses
1	Abeynew et al. (2011)	Northern Ethiopia	To examine factors related to late presentation to HIV/AIDS care	Analytical, Case-control	Hospitals	N=320 participants – 160 cases and 160 controls. Cases: people living with HIV/AIDS who had a WHO clinical stage of III or IV or a CD4 count of less than 200 at first presentation at ART clinic Controls – people living with HIV who had Stage I or II or a CD4 count of more than 200, irrespective of clinical staging at the time of first presentation to the ART clinics No participant age mean/median/range reported.	Interviewer administered structured questionnaire Alcohol use measured in terms of frequency of use.	Bivariate and stepwise multiple regression analysis
2	Skovdal et al. (2011)	Manicaland province, Eastern Zimbabwe	To examine how local constructions of masculinity in rural Zimbabwe impact on men's use of HIV services.	Exploratory	Health centres	N=78 (53 antiretroviral drug users, 25 healthcare providers) Males=35 (22 interview, 13 FGD) Females=43 (15 interview, 28 FGD) No participant age mean/median/range reported.	Interviews Focus groups incorporating role plays	Atlas.Ti Attride-Stirling's thematic network analysis
3	Bhat et al. (2010)	Eastern Cape, South Africa.	To determine factors associated with poor ART adherence among patients in a rural setting.	Descriptive and analytical study.	ART clinic in a rural setting	Volunteer sampling N=168 ART recipients at an ART clinic in a rural setting. Female=101; Male= 67 Mean age= 33.9	Interviewer-administered questionnaire No full information regarding how adherence and alcohol use were defined nor measured	Microstat Statistics Software by Ecosoft Analysed statistical significance of various parameters on adherence.
4	Dahab et al. (2010)	South Africa	To examine baseline factors potentially predictive of poor treatment outcomes in 2 ART programs.	Analytical, Observational cohort	Tertiary public health sector hospital and mining company hospital	Medically eligible ART naïve general community and workplace samples. Purposive sampling Median ages: 37.5 years for community sample, and 46 years for workplace sample.	Semi structured questionnaire at baseline At the 6 week visit, brief interim assessment of adherence. At 6-month visit, short questionnaire on modifiable behavioural factors potentially related to adherence, viral load, (proxy for adherence; from clinical records). Those missing 6 -month visit by 1 month or more were considered as having discontinued care. Alcohol use measured in terms of units per week (high consumption defined as >20 units)	Stata v. 10.0  Logistic regression analysis

Study no.	Author (date)	Location	Aim(s)	Design	Setting	Sampling & sample	Data collection, tools and/or measures	Statistical software & Main analyses
5	Do et al. (2010)	Gaborone, Botswana	To evaluate a large group of combination ART (cART) treated adults in urban Botswana in receipt of ART treatment for (1) less than 6 months, (2) 6-12 months, and (3) greater than 12 months to determine which factors were negatively correlated with overall ART adherence.	Descriptive, prospective	Outpatient adult infectious disease care clinic	N=300 HIV-1 infected patients assigned into 3 treatment groups. Female= 229; Male= 71 Participants had to be 18 years and older and on ART for at least 1 month. Most respondents were within the 24-35 years age range.	87-item respondent-administered questionnaire Patients asked about frequency & quantity of alcohol use, and whether they continued with ART when consuming alcohol (using 4-point Likert-style response options). Adherence measured with a culturally sensitive and modified version of the Morisky score for adherence.	SAS v. 8.0 Chi-square tests Fishers exact tests
6	Ettienne et al. (2010)	5 African countries (Kenya, Uganda, Zambia, Nigeria and Rwanda)	To identify adherence indicators that will ensure long-term treatment success.	Descriptive and analytical	ART sites	N=921 patients receiving ART at study sites. Female= 602; Male= 319 Median age = 38 years	Completed a 6-component respondent administered questionnaire Other indicators included: (1) quality of life and (2) mental health. Adherence defined as missed doses in past week or missed appointments in past 3 months.	Stata v. 9.0 Bivariate analyses. Logistic regression for multivariate analyses.
7	Farley et al. (2010)	Nigeria	<b>Aim 1:</b> To screen ART-naïve- and experienced HIV-infected adults to (1) determine the prevalence of positive screens for hazardous alcohol use (and depressive symptoms) and (2) identify related patient characteristics <b>Aim 2:</b> To evaluate the association of positive screens for hazardous alcohol use (or depressive	Descriptive and analytical	HIV specialty clinic at teaching hospital	N=399 (222 ART-experienced and 177 ART-naïve) patients at a large HIV care program in central Nigeria Female= 272; male= 127 49% of participants were within the 30-39 age range.	Screening tools by interviewer AUDIT for assessment of alcohol use. CES-D for depression assessment Pharmacy refill records were used as the measure of adherence.	SAS v. 9.1.3 Cronbach's alpha, multivariate regression models.

Study no.	Author (date)	Location	Aim(s)	Design	Setting	Sampling & sample	Data collection, tools and/or measures	Statistical software & Main analyses
			symptoms) with ART adherence.					
8	Fitzgerald et al. (2010)	KwaZulu-Natal, South Africa	To determine the ways in which gender influences health behaviours, and health care experiences	Exploratory	Hospital	Participants: ART newly enrolled recipients (n=30 (8 men and 20 women) at first interview, n=26 (8 men and 22 women) at second interview). Treatment supporter family members (n=9) Health care providers (n=5) No participant age median/mean/range reported	In depth interviews and ethnographic techniques (participant observation and daily log of informal discussions).	Detailed analysis performed.
9	Jacquet et al. (2010)	West Africa (Benin, Cote d'Ivoire and Mali)	To investigate the association between alcohol use and treatment (HAART) adherence in an HIV clinic network in West Africa (Benin, Cote d'Ivoire and Mali).	Analytical	8 adult HIV/AIDS clinics; part of the HIV clinic network in West Africa	All consecutive HIV-infected patients on HAART attending the network of IEDEA clinics during a 4-week period were enrolled. One-stage cluster sampling in 2 Cote d'Ivoire clinics which could not recruit exhaustively. N= 2920 HAART patients. Male: Female ratio = 0.41:1 Median age=38 years.	Respondent-administered standardised questionnaire Current alcohol use defined as any alcohol use within the past year; hazardous drinking defined as an AUDIT score $\geq 8$ . Non-adherence to HAART defined as taking <95% of HAART doses in past 4 days.	SAS Version 9.1 Logistic regression analysis
10	Kunihira et al. (2010)	Rakai, Uganda	To investigate barriers to use of ART	Exploratory & descriptive	Treatment centres	Purposive (n=38 key informants) and Probability proportionate to size sampling (n= 384 PHAs) More than 2/3 of PHAs were female. PHAs age range 19-65 years	Semi-structured interview schedule In-depth interviews	Frequencies in SPSS Thematic content analysis
11	Peltzer et al. (2010)	Kwa-Zulu Natal, South Africa	To assess factors (including the IMB model) contributing to ART adherence 6 months after starting ART.	Analytical, prospective	ART outpatient departments from 3 hospitals	Systematic random sampling N=519 patients who had initiated ART in KZN, South Africa. Female= 370; Male=139 The largest group of patients (42.9%) fell within the age range 30-39 years.	Interviewer-administered questionnaire. Alcohol use measured using AUDIT-C; adherence to ART measured with 30-day VAS and the ACTG. Dose adherence defined as having missed at least all doses on at least one day during past 4 days. Schedule adherence defined as having missed scheduling in past 4 days. Food non-adherence defined as not having followed special instructions over past 4 days.	SPSS Version 17.0 Multivariate logistic regression analyses.
12	Usman	Plateau State,	To identify factors	Survey	Hospital	Simple random sampling (n=50) of patients	Questionnaire validated by the	Data analysed using

Study no.	Author (date)	Location	Aim(s)	Design	Setting	Sampling & sample	Data collection, tools and/or measures	Statistical software & Main analyses
	(2010)	Nigeria	that determine optimal adherence to ART with a view to making recommendations to improve the quality of care amongst PLWHAs.			on First Line ARVs. Age range 24-49 years. No gender composition reported.	University of Maryland School of Medicine-Institute of Human Virology termed Version 2008 was utilized.	SPSS – student version No mention of main analyses.
13	Van Geertruyden et al. (2010)	Democratic Republic of Congo (DRC).	The purpose of this letter to the editor was to put on the agenda (for sub Saharan African studies), the issue of alcohol use and ART adherence.	Analytical, prospective study	ART treatment centers	Participants were 1953 male and female ART patients treated at different treatment centers across the DRC.	Adherence was defined as not missing ART >2 consecutive days in the last month. No information is available at this time on how alcohol use was measured. No further information available in this brief correspondence to the editor re: tools/questionnaires used	No clear statement on analyses, but could be surmised that logistic regression was done since the results allude to odds ratios
14	Kip et al. (2009)	Botswana	To identify factors influencing patients' ART adherence.	Descriptive	4 ART clinics	Random sampling of clinics and patients. N= 400 patients Female= 275; Males=125 Mean age = 38.4 yrs	Structured interview schedule.	SPSS version 13.0 Chi-square tests.
15	Murray et al. (2009)	Zambia	To gain local insight into potentially important factors affecting HIV-infected women's decision to accept or continue with ART.	Exploratory	Not mentioned	Free Listing (FL) and Key Informant (KI) interviewees were physically located with the help of local staff working with Zambia Exclusive Breastfeeding Study (ZEBS). Freelisting: N=47 (question 1); 45 (question 2) Key Informants: N=33 No participant age median/mean/range reported. No gender composition reported.	Free listing technique Key Informant interviewing method	Summary lists Domain analysis technique
16	Peltzer et al. (2009)	Eastern Cape, South Africa	To assess the prevalence of hazardous alcohol use and its correlates with socio-economic characteristics, disease variables and ART adherence in	Descriptive	Health centres & community	Convenience sampling (n=607 PLHIV) Females=475; males=132 Most participants fell between 26-45 years age range.	Interviewer administered questionnaire.	SPSS version 12.0 Chi-square Tests

Study no.	Author (date)	Location	Aim(s)	Design	Setting	Sampling & sample	Data collection, tools and/or measures	Statistical software & Main analyses
			South Africa.					
17	Amberbir et al. (2008)	Ethiopia (South west area)	To investigate the rate and predictors of ART adherence among HIV infected persons in south west Ethiopia	Descriptive	ART therapy unit of University Specialised Hospital	400 HIV infected people (383 followed up at 3 months) Females=239; Males=161 Age range 19-58 years	Pre-tested interviewer-administered structured questionnaire at baseline (M0) and at 3 month follow-up (M3) Adherence measure: self-reported >95% dose, time and food adherence in past seven days.	Bivariate analyses of predictors of adherence  Forward and backward stepwise multiple regression analysis
18	Dahab et al (2008)	South Africa	To qualitatively explore patients' and health care providers' perspectives of barriers to and enablers of adherence in a workplace setting	Exploratory	Workplace ART programme setting.	1) 6 Patients who had received ART for at least 8 weeks – with poor adherers purposively sampled as much as possible 6 male participants (4 classified as poor adherers) Eligibility criteria: being 18 or above, and willing to share views on adherence to ART 2) Group of individuals involved in or supporting provision of treatment and care for ART patients who are 5 health care providers and 1 human resource manager (4 female and 2 male.)	In-depth interviews for both groups.	Thematic content analysis
19	Marcellin et al. 2008	Cameroon	To identify correlates of self-reported ART interruptions among PLWHA in Cameroon	Analytical	6 hospitals which provide HIV care	Random sampling N=533 ART treated PLWHA in Yaounde', Cameroon and its neighbourhood. Female= 70.9% Median age=36.6 yrs	Questionnaire Adherence = self-reported ART interruptions longer than 2 consecutive days during past 4 weeks. Binge drinking defined as drinking > 3 large (65 cc) bottles of beer and / or > 6 glasses of other alcohol drinks on one occasion.	SAS Logistic regression models
20	Martinez et al. (2008)	Southwest Uganda	To examine the association between alcohol use, depressive symptoms and the receipt (or uptake) of ART.	Descriptive and analytical	Outpatient HIV clinic	Participants were randomly selected. N=421 HIV-positive persons presenting for primary care services at an outpatient HIV clinic in Uganda. Female= 266; Male=155 Median age= 36 years.	Screening tools by interviewer. Alcohol use measured with the AUDIT Participants regarded as receiving ART if ART prescription documented in their medical record at their last clinic appointment.	SPSS Version 12.0.1 Chi-square Mann-Whitney U test Multivariate logistic regression
21	Sanjobo et al. (2008)	Copperbelt Province of Zambia	To explore patients' and health care professionals'	Exploratory	Local clinic or a local non-governmental	12 health professionals who had experience with ART, 60 patients who met inclusion criteria: between 20 and 49 years,	Interview guides	Giorgi's (1985) phenomenological analysis.

Study no.	Author (date)	Location	Aim(s)	Design	Setting	Sampling & sample	Data collection, tools and/or measures	Statistical software & Main analyses
			perceived barriers and facilitators to patients' adherence to ART.		organisation's training centre	HIV positive and used ART, and not too ill to participate in the study. Key informants=12 (3 men and 9 women) health care professionals and 10 (3 men and 7 women) patients. Focus group participants=50 (27 men and 23 women) patients. Age range 20-49 years.		

Table A.3 Characteristics of the studies on interventions to reduce HIV risk and ART non-adherence associated with alcohol use

Study No.	Author (date)	Location	Aim(s)	Setting	Sample and sampling	Design	Measures and intervention	Analyses performed
1	Essien et al. (2011)	Nigeria	To replicate a successful videotape-based HIV prevention intervention among Nigerian female military personnel in an effort to establish the cross-cultural stability, feasible and cost-effectiveness of this approach in resource-limited countries.	Military	Convenience sampling Inclusion criteria: (1) 18 years of age or older; unprotected sex with 2+ partners in past 6 months or an STI diagnosis in past year, ability to communicate in English, willingness to participate. N=346 women (174 I, 172 I) Age mean/ median or age range not reported.	Randomised Clinical Trial Assessment at baseline, then 3-month and 6-month post-intervention.	Respondent-administered questionnaire Intervention: a 5-session video-based, small group, cognitive-behavioural, HIV prevention condition Control: a 5-session, video-based, contact-matched, HIV education condition. Outcomes: HIV/AIDS-related knowledge, condom use, negative condom attitudes, HIV preventive behaviours, and behavioural intentions. Measured HIV/AIDS-related knowledge and sexual behaviours (including alcohol use before sex)	<b>SPSS v. 16</b> <b>Per protocol analysis</b> <b>McNemar's chi-square</b> <b>Logistic regression.</b>
2	Kalichman et al. (2011)	Cape Town, South Africa	To determine whether brief theory based risk reduction counselling sessions would reduce unprotected vaginal and anal intercourse and prevent STIs during 12 months of observation and test alcohol and other drug use as moderators.	Health care	Sampling strategy not reported. Referred by nurse Inclusion criteria: 18 years old or older and to have been seen at the clinic for STI diagnostic or treatment services. N=617 (310 I, 307 C) 414 men; 203 women Age mean/ median or age range not reported.	Randomised Clinical Trial Assessment at baseline then at 1, 3, 6, 9, and 12 months post-intervention.	Computer-assisted self-assessment. Intervention: experimental 60-minute behavioural skill-building HIV risk reduction counselling session Control: 20-minute HIV educational control intervention. Outcomes: STI diagnoses HIV knowledge, alcohol outcome expectancies, and self-efficacy for risk reduction. Measured descriptive information (demographics, HIV testing ever and latest results, alcohol use with AUDIT), sexually transmitted infections, sexual risks and protective behaviours, HIV prevention knowledge, alcohol outcome expectancies, risk reduction efficacy.	<b>SPSS version 18.0</b> <b>Intent-to-treat approach</b> <b>Generalized equation modeling-poisson and linear for continuous count and scale data respectively.</b>
3	Papas et al. (2010)	Eldoret, Kenya	a) To further train the counsellors, fine-tune the treatment manual and to refine recruitment and treatment procedures.  b) To evaluate acceptability	Health care	Sampling strategy not reported Inclusion criteria were: having drunk any amount of alcohol in the past month, residing and planning to stay within 1 h	Longitudinal Assessment intervals not reported.	Data collection method not reported. At every visit assessed alcohol consumption (resulting in elimination from sessions) and withdrawal symptoms) Outcomes: Percent days abstinent. Measured treatment attendance, acceptability (assesses through post treatment group debriefings), and alcohol use (estimated use of	<b>Software not reported</b> <b>Cohen's d</b>



Study No.	Author (date)	Location	Aim(s)	Setting	Sample and sampling	Design	Measures and intervention	Analyses performed
			and whether the treatment had an impact on alcohol use.		travel distance time from the clinic during the pilot study, willing to participate in a group treatment, and able to speak Kiswahili or English Sample size and gender distribution not reported. Mean ages 37.3 men (SD=6.3), 32.7 women (SD=5.6).		local brew and commercial alcohol in past 7 days prior to CBT sessions).	
4	Wechsberg et al. (2010)	Pretoria, South Africa	(a) To determine whether a Woman-Focused intervention based on gender and empowerment theories increased condom use with main male partners. (b) To examine whether women who reported greater condom negotiation, communication about sexual risk with main male partners, self-efficacy in sexual assertiveness, and sexual control were more likely to use condoms with main partners. (c) To determine whether outcomes differ based on a woman's HIV status.	Community	Sampling strategy not reported. Adaptation process, recruitment techniques, eligibility criteria, and study protocol described elsewhere N=583 women (number of participants within each treatment condition not reported) Age mean/ median or age range not reported.	Randomised community trial. Assessments at baseline, then 3-month and 6-month post-intervention.	Data collection method not reported. Intervention: two private one-on-one, hour-long sessions held within a 2-week period, designed to reduce sexual risk, substance abuse and victimisation. Session includes imparting information and session 2 involved personalised action plans. Control: adapted National Institute on Drug Abuse (NIDA) Standard Intervention, providing information on HIV, drug and sexual risk, HIV antibody test, steps to preventing spread of HIV. Outcome: use of male or female condom the last time had sex with main partner Measured condom negotiation, communication with partners about risk, self-efficacy in sexual assertiveness, sexual coercive experiences.	<b>SAS v. 9.1.3</b> <b>Per protocol analysis (results based on women who for whom baseline, 3 ad 6 month follow-up assessments and HIV results were available.)</b> <b>T-test</b> <b>Logistic regression</b>
5	Kalichman et al (2009)	Cape Town, South Africa	To determine whether an intensive integrated gender-based violence and HIV risk-reduction intervention would demonstrate reductions in HIV risks as	Community	Methods of chain recruitment (active and passive word of mouth) N=475 men (242 Intervention; 233 Control)	Quasi-experimental field intervention trial  Assessment at baseline and then 1, 3 and 6 months post-intervention.	Respondent-administered questionnaire. Intervention: a 5-session gender-based violence (GBV) and HIV prevention intervention Control: a single 3-hour alcohol and HIV risk reduction session. Outcomes: sexual	<b>Software not reported</b> <b>Intent to treat approach</b> <b>Chi-square</b> <b>T-tests</b> <b>ANCOVA</b>

Study No.	Author (date)	Location	Aim(s)	Setting	Sample and sampling	Design	Measures and intervention	Analyses performed
			well as reductions in violence against women, relative to a brief alcohol/HIV risk-reduction intervention.		Mean age 30.2 years (SD=9.5)		risk, sexual protective, and gender-based violence behaviours Measured demographics, AIDS knowledge, AIDS stigma, risk reduction intentions, acceptance of violence against women, alcohol use (before sex), sexual risk, sexual protective, and gender-based violence behaviours.	<b>Logistic regression</b>
6	Peltzer et al. 2009	Mpumalanga, South Africa	To evaluate the feasibility, fidelity, and effectiveness of an HIV prevention intervention delivered to HIV-uninfected patients by lay counselors during routine HCT service.	Health care	Sampling strategy not reported Referred by nurse. Referral criterion: 18 years or older, diagnosed HIV negative. N=534 HIV negative participants; 383 male, 163 female. Mean age 33.9 yrs (SD=13.9).	Longitudinal  Assessment at baseline then 4 months post-intervention.	Interviewer-administered questionnaire Intervention: single 60-minute session motivational/ skills building HIV risk reduction counselling. Outcomes not outlined. Measured demographics, substance use (AUDIT for alcohol use), and HIV risk history, Information Motivation, Behavioural Skills constructs, and sexual behaviour.	<b>Software not reported</b> <b>Paired samples t-tests</b>  <b>McNemar chi-square</b>
7	Bing et al.(2008)	Angola	To assess the impact over time of an HIV-focused prevention intervention (treatment) and a non-HIV-focused health promotion intervention (control) on HIV-related knowledge, motivations, and behaviours.	Military	Random sampling within 12 bases paired by region. N=568 male soldiers (280 I; 288 C) Mean age 29 yrs (range 18 to 51)	Randomised Clinical Trial Assessment at baseline, then three and six months post intervention.	Interviewer-administered questionnaire Intervention: 5-session HIV prevention intervention Control: 5 sessions on malaria prevention with one hour session at 5 <sup>th</sup> session of a standard HIV prevention intervention. Outcomes: frequency of condom use during vaginal sex, number of unprotected sex acts with steady and occasional partners, number of people engaging in anal sex with partners, total number of occasional and commercial partners. Measured demographics, knowledge about HIV/AIDS, perceived personal vulnerability to HIV/AIDS, sexual behaviour in the past three months, and alcohol consumption before sex.	<b>SAS (version not reported)</b> <b>Intent-to-treat approach</b>  <b>Z tests</b> <b>McNemar test</b> <b>Hierarchical logistic model</b>

Study No.	Author (date)	Location	Aim(s)	Setting	Sample and sampling	Design	Measures and intervention	Analyses performed
8	Cupp et al. (2008)	KwaZulu Natal, South Africa	This study focuses on the adaptation and integration of two interventions with proven effectiveness in the US in order to ensure cultural relevance in SA and its subsequent testing in 8 high schools located in townships near Pietermaritzburg, KwaZulu-Natal province.	Learning environment	Cluster sampling 8 high schools located in townships near Pietermaritzburg, KwaZulu-Natal province. N= 1095 9th grade learners. 54 % females. Median age 15 yrs (age range: 13-18 years).	Randomised Clinical Trial assessment at baseline then both 4-6 months and 15-18 months post-intervention.	Survey at baseline, audio-assisted personal digital assistants at follow up. Intervention: Curriculum consisting of 15 units, of 30-40 minutes each, delivered over 8 weeks. About 40% of curriculum focused on alcohol related issues, and 60% on reducing risky sexual activity. Comparison: continued regular instruction in life orientation and five additional knowledge based units about alcohol and HIV developed by research team. Outcomes not outlined. Measured demographics, sexual- and alcohol (lifetime use) related behaviours and several theoretically derived mediating variables.	<b>Software not reported</b> <b>Analytic approach not reported</b> <b>Mixed model ANOVA</b> <b>Mixed model logistic regression</b>
9	Smith et al. (2008).	Cape Town, South Africa	The current study details the evaluation of HealthWise South Africa, a leisure, life skills, and sexuality education intervention for eighth and ninth grade students. It was hypothesized that, compared to controls, HealthWise participants would have delayed sexual initiation, reduced rates of current sexual activity, increased use of and perceived access to condoms, and lower rates of lifetime and past use of multiple substances.	Learning environment	Random sampling of 9 schools; 4 intervention schools, 5 control schools. N= 2,383 Mean age 14.0 (SD=0.86) years. 51% females.	Longitudinal efficacy trial. Assessment at baseline and then approx. 6 month intervals at 5 waves.	Respondent-administered questionnaire using personal digital assistant. Program consists of 12 lessons in grade 8, followed by 6 booster lessons in grade 9. Lessons cover topics typical to most social-emotional skills programs (e.g., anxiety and anger management, decision making, self-awareness) but also target the positive use of free time (e.g. beating boredom, overcoming leisure constraints, leisure motivation). Outcomes not outlined Measured sexual behavior, substance use (lifetime and frequency of use of alcohol)	<b>SAS (version not reported)</b> <b>Multiple imputation</b> <b>Logistic regression</b>
10	Kalichman et al. (2008)	Cape Town, South Africa	To measure the efficacy of a brief, single-session intervention to reduce HIV-alcohol risk among men and women at informal drinking establishments (shebeens) in SA.	Community	Snowball sampling. Four shebeens in a suburban township of Cape Town, SA. N=353 (170 I; 183 C) 117 men and 236 women.	Randomized community trial. Assessment at baseline then at 3 and 6 months post-intervention.	Respondent-administered survey. Intervention: 3-h theory based behavioural HIV-alcohol risk-reduction intervention that focused on skills training for sexual negotiation and condom use Control: 1-h HIV-alcohol information/education	<b>Software not reported</b> <b>Included participants assessed at either one or both follow ups.</b>

Study No.	Author (date)	Location	Aim(s)	Setting	Sample and sampling	Design	Measures and intervention	Analyses performed
					Mean age of 34.1 yrs (SD=10.5).		control group. Outcomes: sexual-risk and protective behaviours including drinking in sexual contexts(primary), risk-reduction self-efficacy, alcohol outcome expectancies, behavioural intentions, HIV-prevention knowledge, and AIDS-related stigma (secondary) Measured demographic and risk characteristics, alcohol (with AUDIT) and other drug use, primary outcomes, and secondary outcomes	<b>Chi-square</b> <b>ANOVA</b> <b>ANCOVA</b> <b>Logistic regression</b>
11	Wechsberg et al. (2008)	Western Cape, South Africa	a) To examine whether an adapted evidence-based intervention would be equally, more, or less effective at reducing HIV risk behaviours when delivered using an individual or group format. b) to examine differences between black and coloured South African women across pre- and post-intervention measures of alcohol and illicit drug use and sex risk behaviors.	Community	Sampling strategy not reported. N=112 women Eligibility criteria: female, aged 18 or older, self-identify as Black or Coloured, report alcohol or illicit drug use on at least 13 of the past 90 days, and report low income. Mean age 26.0 years (range 18 to 48 yrs)	Randomised Clinical Trial  Assessment at baseline then 1 month post-intervention.	Urine screens paper and pencil interview.  Intervention: two 1-h one-on-one sessions that emphasized women's risk for HIV/STIs, substance use, and violence Control: two 1-h group sessions that emphasized women's risk for HIV/STIs, substance use, and violence Measured demographics, number of days used alcohol and other drugs, unprotected sex in past 30 days, number of different partners in past 30 days, number of male sex partners in past 30 days; number of times used alcohol and/or other drugs before or during sex in past 30 days; used protection during last vaginal sex; and traded sex with main partner for money, drugs, or other goods.	<b>SPSS v. 13.0</b> Analytic approach not reported Paired samples t-tests ANCOVA

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