

**A STUDY ON THE INFLUENCE OF HIV RELATED STIGMA AND ALCOHOL  
USE ON ADHERENCE TO ANTIRETROVIRAL THERAPY AMONG ADULTS  
ON TREATMENT AT THE INFECTIOUS DISEASE CARE CLINICS IN  
PRINCESS MARINA AND NYANGABGWE REFERRAL HOSPITALS IN  
BOTSWANA**

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## **DECLARATION**

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## **ABSTRACT**

HIV-related stigma and alcohol abuse have been identified as some of the barriers to optimal adherence to antiretroviral therapy (ART) in Botswana. However, not much is known about the extent to which the two factors affect adherence to ART among adults on treatment at the Infectious Disease Care Clinics (IDCC) in the country. The overall aim of this study was to investigate the extent to which HIV-related stigma and alcohol use independently affect compliance to HIV medicine among adults on treatment and also elucidate their interactive effect on adherence.

Cross-sectional data was collected by administering a questionnaire and conducting interviews and focus group discussions with adults receiving antiretroviral treatment at Princess Marina and Nyangabgwe referral hospitals situated in Gaborone and Francistown, Botswana respectively. Participants were selected from a daily schedule list of all adult patients attending the IDCC at the two hospitals during the study period using a systematic sampling. Data gathered included information on socio-demographic characteristics of the sample population, HIV-related stigma, alcohol use and adherence to ART.

The majority of respondents were females (66%) and 69% of participants were in the age group 31-50 with mean age of 39.5 (SD= 5.5). The study showed that the average adherence rates were 98 % by self-reports and 96% by pharmacy refill pill count record. It was also found that alcohol abuse and HIV-related stigma had greatly reduced among antiretroviral (ARV) users. Chi-squared tests and two-way analysis of variance (Two-way ANOVA) showed that the ART adherence of participants reporting low levels of alcohol consumption and low stigma concerns was comparable to that of individuals not reporting experiences of stigma or alcohol consumption in the twelve months preceding the study. This was supported by the responses of the health providers and ARV users during interviews and focus group discussions. These findings suggest that any interventions to reduce stigma and alcohol abuse should be incorporated into the existing ART adherence improvement programme.

## OPSOMMING

MIV-verwante stigma en alkoholmisbruik is as een van die struikelblokke tot optimale steun tot antiretrovirale terapie (ART) in Botswana ge-identifiseer. Daar is nog min bekend omtrent die belangrikheid van die twee faktore met betrekking tot die steun van ART onder volwassenes wat behandeling by die “Infectious Disease Care Clinics (IDCC)” in die land ontvang. Die doel van hierdie studie was om die belangrikheid van MIV-verwante stigma en alkoholgebruik onderskeidelik met betrekking tot steun van MIV medisyne onder volwassenes wie behandeling ontvang na te vors, asook die interaktiewe effek van elkeen.

Dwarsprofiel data is ingesamel deur middel van vraelyste, onderhoude en fokusgroepe met volwassenes wat antiretrovirale behandeling by Princess Marina en Nyangabgwe verwysingshospitale in Gaborone en Francistown, Botswana ontvang. Deelnemers is geselekteer deur sistematiese steekproef trekking van 'n daaglikse skedulelys van alle volwasse pasiënte wat die IDCC by die twee hospitale gedurende die studie bygewoon het. Die data het sosio-demografiese inligting, MIV-verwante stigma, alkoholgebruik en steun aan ART ingesluit.

Die meerderheid respondente was vroue (66%) en 69% was in die 31-50 ouderdomsgroep, met 'n gemiddelde ouderdom van 39.5 (SD= 5.5). Die studie het getoon dat die gemiddelde steunkoerse 98% deur selfverslag en 96% deur apteek pil hervul telling rekord was. Daar is ook gevind dat alkoholmisbruik en MIV-verwante stigma grootliks onder antiretrovirale (ARV) gebruikers afgeneem het. Chi-vierkantstoetse en 2-riktig variansie-ontleding (2-riktig ANOVA) het getoon dat die ART steun van respondente wie lae vlakke van alkoholgebruik en stigma gerapporteer het kon met die van individue wie nie enige van die 12 maande voor die studie ondervind het nie vergelyk. Dit is deur die terugvoer van gesondheidsdienste en ART gebruikers in onderhoude en fokugroepe bevestig. Hierdie bevindinge stel voor dat enige intervensies om stigma en alkoholmisbruik te verminder in die bestaande ART steun verenig moet word.

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## **LIST OF ABBREVIATIONS**

HIV	Human Immunodeficiency Syndrome
AIDS	Acquired Immunodeficiency Syndrome
IDCC	Infectious Disease Care Clinic
ANOVA	Analysis of Variance
HAART	Highly Active Antiretroviral Therapy
ART	Antiretroviral Therapy
PLWHA	People Living with HIV/AIDS
ARV	Antiretroviral
PMH	Princess Marina Hospital
NRH	Nyangabgwe Referral Hospital
FGD	Focus Group Discussion
AUDIT	Alcohol Use Disorders Identification Test
WHO	World Health Organization

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## **Chapter 1: INTRODUCTION**

### **1.1 Background**

Antiretroviral therapy (ARV) has greatly improved the lives of people living with HIV/AIDS (PLWHA) by reducing morbidity and mortality. The key to successful treatment of the HIV virus and sustained viral control is lifelong adherence to medications. Non-compliance to recommended antiretroviral treatment regimens results in deleterious consequences such as treatment failures and emergence of resistant strains which are difficult to treat. These resistant strains may, in turn, be transmitted to the community thus creating a new epidemic.

Generally, factors impeding ARV adherence, in particular among PLWHA, can be divided into four broad categories: patient-related; clinician related; drug related and disease related factors. This study focuses on two patient related barriers to ARV compliance: HIV related stigma and alcohol abuse. These have been found to play a major role in poor adherence to ARV among adults in both public and private health facilities in Botswana (Rintamaki et al., 2006: 359). According to the Center for Disease Control in United States of America (CDC USA), alcohol abuse can be defined as a pattern of drinking alcoholic beverages that results in harm to one's health, interpersonal relationships or one's obligations such as ability to work, to take medications etc. This pattern of drinking includes consumption of large amounts of alcohol on a single occasion ("binge drinking") or as regular practice most days of the week.

HIV-related stigma may be defined as all unfavourable attitudes, beliefs, behaviours and policies directed towards people known or perceived to have HIV/AIDS as well as towards their associates, family, community and co-workers (Chesney, 2000). From this definition it is clear that HIV positive people suffer stigma and discrimination in one way or another at some time in their lives in various environments. For example, discrimination of people living with HIV/AIDS (PLWHA) in the workplace may result in loss of work, or isolation by co-workers. Failure to get a job may lead to rejection by

family and community. In addition, fear of stigma may prevent infected individuals from revealing their status and the fact that they are on antiretroviral therapy. Those on ARV may be non-compliant because regular visits to the clinic may inadvertently reveal their status.

Alcohol abuse has been identified to be the fifth most significant reason for non-compliance by patients on ARV after societal stigma concerns. A study conducted to identify barriers to antiretroviral therapy in 2005 in Botswana after free HIV treatment was launched in the country, revealed that alcohol use together with stigma were among the most important reasons accounting for non adherence among individuals on treatment in four public health treatment facilities with 2% and 7% respectively (Kgatlwane et al., 2005:10). However, information on the actual contribution of these factors on adherence levels is sparse.

## **1.2 Research question and Study Objectives**

### *1.2.1 Goal*

The purpose of the study was to investigate the effect of HIV-related stigma and alcohol consumption on adherence to antiretroviral therapy among adults receiving treatment at the Infectious Disease Care Clinics (IDCC) in Princess Marina and Nyangabgwe referral hospitals in Botswana and in the light of this, the research question and the hypothesis were formulated thus:

Research question: *Does HIV-related stigma and alcohol abuse affect adherence to antiretroviral therapy among HIV positive adults receiving treatment at the Infectious Disease Care Clinics (IDCC) in Princess Marina and Nyangabgwe referral hospitals in Botswana?*

Hypothesis: *HIV-related stigma and alcohol abuse independently and in combination affect adherence to ART among HIV positive adults receiving treatment at the IDCC in Princess Marina and Nyangabgwe referral hospitals in Botswana.*

The definitions of the variables being investigated, in particular alcohol abuse and HIV-related stigma, are given in section on operational definitions (1.4)

### *1.2.2 Study objectives*

The following objectives of the study emerged:

- To identify the level of HIV-related stigma among subjects taking ARV therapy at the IDCC clinics in Princess Marina and Nyangabgwe referral hospitals in Botswana
- To determine the level of influence of HIV related stigma on adherence to ART among adults on treatment at the participating hospitals
- To identify the level of alcohol use among subjects on ARV therapy at the two study sites (PMH and Nyangabwe Hospital)
- To determine the effect of alcohol use on adherence to HIV medicine among adults on treatment at the two hospitals
- To determine the interactive effect of stigma and alcohol abuse on adherence to ART
- To find out the perceptions of the health care providers and the ARV users about the study findings.

### **1.3 Significance of the study**

Although HIV/AIDS affects all age groups, it is the infection among the economically active age group 15-49 that leads to serious deleterious socioeconomic consequences such as an increase in orphans, low productivity at workplaces and worsening poverty. Keeping this group healthy longer through the use of HIV medicine greatly reduces the impact of the disease. This can only be achieved by putting in place strategies to improve adherence to antiretroviral therapy. It has been shown that stigma and alcohol abuse impede compliance to HIV medicine. Despite evidence that HIV-related stigma and alcohol use are among the most significant factors associated with poor compliance to antiretroviral therapy among individuals on HIV treatment in Botswana (Kgatlwane et al., 2005: 10; Do, 2005; Rintamaki et al., 2006: 359)), information on the extent of their influence on ART adherence is limited. Therefore, investigating the effect of these factors would provide information on their actual contribution to on ART adherence level. In addition, documenting the levels of stigma and alcohol use among individuals on ART and also finding out the perceived levels of these factors and their link to ART adherence by both health workers and ARV users would provide an insight to the extent of the problem and may suggest the need to evaluate the existing interventions in order to identify the strengths and weaknesses, strengthen and improve them.

The study was also designed to determine the independent and interactive effects of the two factors on adherence to ART. Because of this approach, the results are likely to provide evidence whether or not these factors significantly impede compliance to such an extent that adherence behaviour change could only be achieved if these factors were addressed directly as an integral part of adherence improvement programmes. However, because the study was conducted at only two sites, such findings would require further population-based studies to generate generalizable information that could be incorporated into existing interventions to fight stigma and alcohol use aimed at improving adherence among adults on Highly Active Antiretroviral Therapy (HAART) in Botswana.

#### **1.4 Operational definitions of key terms**

The key concepts are: HIV-related stigma; disclosure; discrimination; adherence to ART; alcohol abuse; ARV users; Infectious Disease Care Clinic; Princess Marina and Nyangabgwe Referral Hospital. Their operational definitions are as follows:

##### *HIV-related stigma*

HIV-related stigma in this study refers to reports by HIV infected individual of having experienced discrimination (enacted stigma) and or failure to disclose his or her HIV status and the fact that they are on antiretroviral therapy. HIV stigma was categorized as absent, low and high.

Low stigma concern was deemed present when an individual answered “yes” to less than 50% of questions on disclosure and discrimination combined while high stigma concern was considered when a participant answered “yes” to 50% or more of these questions.

##### *Disclosure*

Disclosure was deemed to have occurred whenever an HIV positive individual revealed their status and the fact that they were on treatment to at least one person e.g. spouse, family member, friend or co-worker/supervisor.

##### *Discrimination*

Discrimination was said to have occurred if an individual reported having been excluded, isolated, abandoned, teased, lost job or goods or threatened because of their HIV status.

##### *Adherence to ART*

For the purposes of this study adherence was defined as taking the prescribed HIV medicine in the correct doses at the correct times as agreed upon with the health provider at the initiation of therapy. The ability of the individual on ART to follow the pattern of taking their tablets in correct doses at the same times without failure for a 7day- recall period was defined as 100% adherence (strict adherence) while optimal adherence

referred to the ability to follow the schedule of taking tablets for at least 95% of the time during the same period. Adherence level less than 95% was considered as sub-optimal in other words as non-adherence.

#### *Alcohol abuse*

Alcohol abuse in this study is defined as drinking more than two 340mls bottles (cans), more than one glass of wine or more than one measure of spirit per day. These cut off levels were taken based on the findings of some studies that such alcohol levels confer cardio protective health benefits (Agarwal, 2002: 409) and also on the report of dietary guidelines for Americans (2005). Alcohol use was categorized into: non-drinker; light drinking, moderate drinking and heavy drinking. Individuals who had never consumed alcohol in their life were classified as life abstainers and those who stopped taking alcohol more than twelve months before enrolment in the study as ex-drinkers. Non-drinkers included lifetime abstainers and ex-drinkers during analysis. An individual consuming one to two 340mls bottles or cans beers (1-2 glasses of wine or one to two measures of spirits) or less a day or at a sitting was considered a light drinker. Moderate drinking occurred when alcohol intake ranged between 3-5 bottles or cans of beer; glasses of wine and measures of spirits whereas heavy drinking referred to alcohol consumption of more than 5 bottles (cans) of beer, glasses of wine and measures of spirits per day or occasion.

#### *Infectious Diseases Care Clinics (IDCC)*

Infectious Diseases Care Clinics are public health facilities designated to provide antiretroviral therapy to eligible HIV positive citizens of Botswana.

*ARV users* referred to adults aged 18 years and above on antiretroviral therapy at the IDCC clinic in Princess Marina and Nyangabgwe referral hospitals.

*Princess Marina and Nyangabgwe* referral hospitals are the two sites where the study was conducted.

## **Chapter 2: LITERATURE REVIEW**

A literature review was conducted and the results are summarized in the following sections: 1) adherence to ART; 2) influence of alcohol use on adherence; 3) influence of HIV-related stigma on adherence to ART.

### **2.1 Adherence to ART**

Adherence to antiretroviral therapy (ART) is a major predictor of viral suppression and success of HIV treatment that can prolong life and improve health status of the HIV infected individuals such that they remain economically productive. In addition, in resource-poor settings like Botswana, it is important to identify non-adherent individuals early before drug resistant strains develop because second line and third line medications are either non-existent or are very expensive. Although country-specific studies examining the combined effect of stigma and alcohol use on adherence were hard to find, some relevant research with valuable information on adherence, stigma and alcohol was obtained both within the country and elsewhere.

Antiretroviral therapy (ARV) is provided free to all citizens of Botswana eligible for treatment since 2002. Studies conducted after the programme was launched showed that compliance to ARV therapy among HIV positive individuals receiving treatment in public health facilities was suboptimal in most cases. ART adherence level in public health institutions was found to be about 83% (Nwokike, 2005: 12) and in private sector to be 54% (Weiser et al., 2003: 281). Such low adherence rates would lead to inadequate viral suppression since available data from previous studies has shown that an adherence level of 95% or more is essential to achieve treatment success and prevent possible emergence of resistant strains difficult to treat (Wilson et al., 2002: 530). Another study carried out in Botswana to identify barriers to antiretroviral therapy optimal adherence also reported a low composite adherence rate of 77% i.e. average of adherence levels obtained from three measures (Kgatlwane et al, 2005: 54).

This same study also identified stigma and alcohol use as the fourth and seventh most significant determinants of non adherence at 7% and 2% respectively after forgetfulness (18%), logistics (13%) and work/home duties at 12%. Despite earlier findings of poor adherence, a recent study conducted to investigate social factors that affect antiretroviral medication adherence among patients on ART at Princess Marina Hospital (PMH) in Botswana showed that adherence level was high with non-strict adherence (optimal adherence) of 99.3% and strict adherence of 81% (Do, 2005). This study showed a significant improvement in adherence rate when cost barrier was eliminated by free access to ART in public facilities when compared to earlier findings of adherence levels.

Relevant studies on adherence from other countries reviewed also provided valuable information on adherence. A prospective cohort study designed to examine the discrepancies of self-report adherence and objectively measured adherence in the USA revealed that self-report mean adherence remained high and constant at 96%, 96%, 95% for weeks 8, 24, 48 while objectively measured adherence rates were lower with 81%, 80%, 74% for the same period respectively (Liu et al., 2006). The findings support the use of several adherence measurement methods to calculate composite adherence rates so as to compensate for the inadequacies of each method. A Senegalese study examining adherence to HAART and its principal determinants found out that adherence to ART improved when cost barrier was eliminated by free or heavily subsidised low cost HIV medications (Laniece et al., 2003). Therefore, identifying the role played by factors such as stigma and alcohol use and tackling them can enhance adherence to ART.

## **2.2 Influence of Alcohol abuse on adherence to ART**

Alcohol abuse has been shown to be associated with poor adherence to medication in general. Alcohol like other illicit drugs impairs judgement making it difficult for an individual to comply with the recommended ARV treatment regimens. Studies conducted both in developed and developing countries have demonstrated that alcohol has a significant role in the non compliance to HIV medication. Recently a study conducted in the USA prospectively followed a cohort of individuals on highly active antiretroviral therapy (HAART) to investigate the independent effect of alcohol and combined effects of drug and alcohol use on ART adherence and viral suppression found that hazardous drinking defined as >12 drinks per week or >3 drinks per occasion for women and as >14 units per week or >4 units per occasion in men was independently associated with reduced adherence to antiretroviral therapy (Chander et al., 2006). In addition, a pre-intervention study conducted in four districts in Botswana to determine factors that impede or facilitate HIV medication therapy adherence demonstrated that alcohol abuse was associated with poor adherence in about 2% of respondents (Kgatlwane et al., 2005). Do in 2005 also found that very few people on ART (antiretroviral therapy) in Princess Marina Hospital Infectious Disease Care Clinic (PMH IDCC) reported alcohol use with 89.6% non-drinkers, 7.3% drinking sometimes and only 2.6% consuming alcohol regularly. However, among non-adherent population regular alcohol abuse and lack of HIV status disclosure were reported to be predictive of poor adherence by the same study (Do, 2005).

### **2.3 Influence of HIV-related Stigma on adherence to ART**

HIV-related stigma is common among ARV users and is often associated with poor adherence to HIV medication and non-disclosure of a positive HIV status. HIV positive individuals may experience stigma under different circumstances such as in the home and in the community as well as discrimination at workplace that may result in loss of work or failure to secure a job (Ngcobob, 2000; Ngwena, 2002; Dingake, 2003). Such fears of discrimination are often associated with failure to disclose status that may deny the patient the support they need to cope with the disease itself and also to comply with treatment. In fact, HIV status disclosure may also help break stigma surrounding the disease and result in better adherence to ART.

Several studies in both developed and developing countries have shown that stigma and associated non-disclosure of HIV serostatus are significant barriers to optimal adherence to ART among individuals on treatment. For example, a study conducted in Botswana to investigate the role of stigma on ART adherence among individuals receiving treatment in private clinics prior to free availability of HAART in public health institutions revealed that about 15% of patients reported stigma as a major barrier to optimal adherence (Wolfe et al., 2006). In the same study about 94% of respondents kept their status secret from the community while 69% did not reveal their status even to family members. With such a high level of non-disclosure, individuals on HAART were more likely to miss tablets when people are around for fear of being ostracized because of inadvertent disclosure of status. However, in 2004, Botswana introduced “opt out” routine HIV testing policy aimed at addressing HIV-related stigma and increasing uptake to ART. Other programmes addressing stigma directly such as advertising campaigns, educational initiatives through various media (radio, television) and annual “Miss Stigma-Free HIV competition were also put in place. At early stages of introducing routine “opt out” HIV testing, a population based study was conducted to assess attitudes, practices and human rights concerns found that 81% of participants were in favour of such testing with 60% believing that HIV-related stigma would decrease while 90% of them thought that routine testing would increase access to ART (Weiser et al., 2006). As

earlier stated, another study conducted by Do in 2005 at Princess Marina hospital (PMH), Gaborone, Botswana showed that among non-adherent ARV users, failure to disclose their HIV status together with heavy alcohol intake were predictive of poor compliance to HIV medication (Do, 2005).

Studies from other African and developed countries have also shown that stigma and discrimination, especially disclosure concerns, play a major role in non-adherence to ART therapy. Most of these studies identified rejection and or abandonment as the most feared consequences of HIV status disclosure leading to many failing to reveal an HIV positive result to family and friends in particular to sexual partners. For example, two studies in Tanzania examining disclosure issues among women both identified the most feared result of HIV status disclosure was fear of abandonment (Maman et al., 2003) and in the second study fear of social isolation was reported by 14% of participants (Antelman et al., 2001). In another study in Johannesburg, South Africa, fear of rejection and disruption of relationships was the most commonly stated reason for not disclosing to partner (Skogmar et al., 2006). This fear of rejection has also been shown to be associated with poor compliance to antiretroviral HIV medication by researchers in the USA. In their study investigating the role of HIV serostatus disclosure in antiretroviral medication adherence, they found that 19% of the study subjects reported missing medication doses in the last two months due to concerns regarding disclosure of their HIV status (Stirratt et al., 2006). Rintamaki and colleagues demonstrated that individuals who exhibited high HIV stigma were three times more likely to be non compliant to their medication than those with low HIV stigma concerns (Rintamaki et al., 2006: 359).

Hence, the literature reviewed on all three variables ART adherence, stigma and alcohol use all confirmed that HIV-related stigma and alcohol abuse adversely affected optimal adherence to ART among individuals on HIV medicine.

## **CHAPTER 3: METHODOLOGY**

### **3.1 Study design**

This is a mixed method research and cross-sectional study that was conducted at the IDCC clinics in Princess Marina and Nyangabgwe referral hospitals in Botswana over a period of one month. Qualitative and quantitative methods of data collection were utilized because of the behavioural nature of the variables being investigated. Participants completed self administered questionnaires containing both open-ended and close-ended questions. In addition, interviews and focus group discussions were conducted.

### **3.2 Sample**

#### *3.2.1 Target population and participant recruitment*

All individuals on antiretroviral treatment attending the adult Infectious Disease Care Clinics (IDCC) in Nyangabgwe and Princess Marina hospitals during the study period were the target population from which participants for the study were drawn. At the time of the study, the two participating hospitals provided ART to approximately 4,500 and 9,000 individuals respectively. The eligibility criteria required participants to be 18 years or older and on antiretroviral therapy for at least two months before enrolment in the study. Initially, it was planned to include those younger than 18 years attending the adult IDCC but this changed because the Human Research Review Board in the Ministry of Health, Botswana, required a minimum age limit of 18 years for inclusion in adult studies. Individuals younger than 18 years old, those enrolled in other studies and those who declined to give consent for participation were excluded from the study.

The available list of all adults on antiretroviral therapy in the two participating hospitals was used as a sampling frame. Potential study subjects were identified through review of daily schedule lists for their regular appointments with health providers and then selected using a systematic sampling method where the 3<sup>rd</sup> individual on the daily clinic schedule list was chosen for inclusion in the study. Once it was established that individuals were

on ART for at least two months or more, they were evaluated for eligibility to participate in the study. A written consent was obtained from the eligible potential respondents after explanation of the objectives and procedures of the study. This was done to ensure that participants fully understood the aims of the study and how it was going to be conducted to enable them make an informed decision to take part in the research.

### *3.2.2 Sample size estimation*

The study was conducted over a period of one month allocating two weeks (10 working days) to each site. On average at the participating sites physicians consulted about 60-80 and 100-120 patients at the IDCC in Nyangabgwe and Princess Marina hospitals respectively. Therefore, estimated total number of adults seen during a two-week period at each site ranged from 600-800 and 1000-1200 respectively. Adherence rates used to calculate sample size required were based on assumption that about 90% of ARV users at the IDCC achieve optimal adherence of 95% or more. The assumptions were based on the expected predicted adherence of 85% by Weiser et al., (2003) and findings of an optimal adherence of 99.3% in a study conducted by Do (2005). Using Epi Info 6 version 3.4.3 (Centre for Disease Control – CDC 2007) with expected rates of 90% and worst acceptable estimate of 85% the sample size required was estimated to be 112 and 121 for Nyangabgwe and Princess Marina respectively.

In order to assess the independent and interactive effects of alcohol use and HIV-related stigma by performing analysis of variance (ANOVA), the participants were further subdivided into four subgroups based on their responses to questions on the presence or absence of alcohol use and stigma. The sample required for a two-way ANOVA was estimated to be 80 with 20 participants in each cell and was calculated using SAS macro program (fpower.sas) taking an alpha level of 0.05, confidence level of 95%, power of 0.8 and an anticipated effect size for alcohol abuse of 0.46% based on findings (AOR, 0.46; 95%CI: 0.34 to 0.63) obtained from previous studies (Chander et al., 2006). Although the analysis involved two independent variables, HIV-related stigma and alcohol abuse, the effect size for alcohol was chosen because previous research showed that fewer ARV users identified alcohol as a deterrent of ART adherence than stigma

with alcohol accounting for 2% whereas stigma accounted for 7% of suboptimal adherence (Kgatlwane et al., 2005). It is known that the lower the prevalence of a variable the larger the sample required hence alcohol use with lower prevalence was chosen for calculation of sample size used for ANOVA.

### **3.3 Data collection methods and measures**

#### *3.3.1 Data collection methods*

Data was collected using a self-administered questionnaire and by interviewing both the health workers and ARV users. In addition, focus group discussions were also conducted among the ARV users to examine their perceptions on the preliminary quantitative findings of the study. The data collection instruments used included structured questionnaires, interview guide and FGD guide which are included as *Appendixes A, B and C respectively*.

A four-part questionnaire was administered to collect information on demographics, HIV-related stigma, alcohol use and adherence. Questions were mostly close-ended and pre-coded to ensure consistency and facilitate data entry. The developed questionnaire and the consent forms were translated into the local language (Setswana) and then pilot-tested among 15 individuals from Princess Marina IDCC in order to ascertain clarity of questions and also rephrase ambiguous ones. Participants involved with pre-testing were excluded from the main study to minimize bias due to familiarity with questions. Control of expectancy error was achieved by giving the participants written instructions to minimize interaction of the researcher with the study subjects. For those unable to read and write, the investigator read out each question and helped them complete the questionnaire. To improve response rate participants were gathered in one place at a time, given verbal and or written instructions on how to complete the questionnaires while waiting to refill their medication on the day of their clinic visits.

Qualitative data for the second phase of the study was obtained using interviews and focus group discussions (FGD). Health care providers and ARV users were interviewed

while FGDs were conducted only among individuals on antiretroviral therapy. The purpose of the qualitative data collection was to evaluate their perceptions on the findings of the current research that suggested a drastic reduction in the level of stigma and alcohol use among patients on HIV medicine and also evaluate their perceptions on the link between such observations and the adherence rates to antiretroviral therapy.

Two health workers, an ARV nurse and a doctor involved with ART patient care at the Princess Marina hospital adult IDCC were interviewed. The two workers were randomly selected from the duty roster of the day from among health care providers of the same cadre managing patients on ART at this site for a minimum of three months. The interview questions focused on the following: the trend of alcohol use and stigma levels among patients attending the IDCC; perceived reasons for any change or no change in the levels of the two factors and link between stopping alcohol use, reduction in stigma levels and adherence rates (*Appendix B- 1*).

Six patients on ART, randomly selected from the clinic's schedule of the day, were also interviewed at the Princess Marina hospital. Questions asked focused on the following: reasons for stopping or not stopping alcohol intake; the opinion of ARV users on alcohol consumption among those on ART; perceived current levels of stigma among those on ARV; link between alcohol use, stigma level and ART adherence (*Appendix B-2*). Consultation visit schedule list was used to recruit participants for focus group discussions with patients on antiretroviral therapy at Princess Marina hospital.

Two focus group discussions each made up of 8 participants on ART were conducted. To ensure similarity of respondents, one group consisted of females and another was comprised of males. The FGD was designed to find out the perceptions of ART users on the level of alcohol consumption, level of stigma and the link between the two factors and adherence to HIV medication among ARV users (*Appendix C*).

### *3.3.2 Measures*

The measures employed to assess adherence to ART, HIV-related stigma and alcohol use are as follows.

#### *3.3.2.1 ART Adherence measures*

Adherence was assessed by using the self-report method and by reviewing the pharmacy pill count refill records presented to the pharmacist by patients at each refill visit. The patients were asked the question: “How many times in the past 7 days did you miss a dose of each given medication?” Using responses to this item, self-report adherence was considered to be the fraction of the doses of medication taken divided by the prescribed doses for the seven days multiplied by 100 to express adherence as a percentage i.e. medication taken (Prescribed doses minus missed doses) divided by prescribed doses x100 (Liu et al., 2006: 43).

The pharmacy refill pill count record of the respondents for the past two months immediately before enrolment in the study was reviewed to obtain data on the issued doses at each refill date and number of tablets returned at subsequent refill visits. This study used the definition of adherence by pill count, which was previously used in another study investigating factors that impede or facilitate adherence to ART (Kgatlwane et al., 2005). Therefore, adherence by pill count was defined as the number of pills supposed to have been taken in a given month minus missed pills divided by the number of pills supposed to have been taken and the answer multiplied by 100 to express adherence as a percentage. This measure together with self-report adherence was used to calculate composite adherence rate in PMH only.

### *3.3.2.2: HIV-related stigma measures*

To assess the level of stigma, participants were asked questions on discrimination and HIV status disclosure adapted from the revised 40-item stigma scale for eliciting information on HIV-related stigma (Nyblade & MacQuarrie, 2006). Twenty of the questions dwelt on issues of enacted stigma while 6 of them elicited information on disclosure of HIV status. HIV-related stigma was defined as answering “yes” to at least one question on discrimination or disclosure. Depending on the number of “yes” responses to these questions, stigma was categorized as absent, low and high. High stigma concerns were deemed present in participants answering yes to 50% or more of the questions while those with fewer “yes” answers to these questions were considered to have low stigma concerns.

### *3.3.2.3 Alcohol use measures*

In order to assess the level of alcohol use among ARV users participants were asked 8 questions about their alcohol consumption based on questions adapted and modified from the World Health Organization’s (WHO) Alcohol Use Disorders Identification Test (AUDIT) guidelines for use in primary care (Babor et al., 2001). Depending on the responses the study subjects were then categorized as lifetime abstainers, ex-drinkers and current drinkers. Those reporting taking at least one drink of any kind of alcohol during the previous twelve months were regarded as current drinkers. Based on the amount of alcohol consumed, the level of alcohol use among current drinkers was categorised as light drinking (mild), moderate drinking and heavy drinking. Heavy drinking was defined as consuming more than two 340ml bottles (cans), more than one glass of wine or more than one measure of spirit per day.

### **3.4 Data Analysis**

Data analysis involved preparing basic descriptive statistics to assess respondents' socio-demographic characteristics, adherence rates, level of alcohol use and level of HIV-related stigma. Chi square correlations were conducted to test associations between individual explanatory variables such as alcohol use, stigma, socio-demographic factors and adherence. Using GraphPad Prism statistical software version 5.01 a two-way analysis of variance (ANOVA) was performed to assess the independent and combined effects of alcohol use and stigma on adherence to ART, ascertain whether there was a difference between the groups and also determine the degree of the difference if any.

Qualitative data was analyzed with the view to gain an in-depth understanding of the perspective of the ARV users and health care providers on the link between alcohol use, HIV stigma, and adherence to ART. The data from the research tools (interview guide and FGD guide) was summarized in themes that emerged. Analysis of obtained information captured the perspectives of the ARV users and that of the health care providers. Agreements and conflicts on issues were documented.

### **3.5 Ethical Issues**

Participation in the study was entirely voluntary, confidential, and anonymous. In order to obtain an informed consent, prospective participants were given an explanation on the purpose and aims of the study and how the information was going to be collected. They were also assured that their identity would remain anonymous and the information collected kept confidential. Study subjects were also informed that they could withdraw from the study at any time of their choice without fear of offending the researcher or jeopardizing their HIV care at the clinic.

The subjects willing to take part gave a signed written consent and also provided a written permission to allow the researcher to review their medical records to collect data on previous adherence, CD4 and viral load levels that may serve as surrogate indicators

of adherence. To ensure confidentiality and privacy of participants was respected, completed questionnaires and all data collected was kept under lock and key at the study office. Numeric identification codes were used rather than the individual patient's name. Ethical approval was granted by the Human Subjects Review Committee in the Ministry of Health Botswana and by the Ethical Review Boards at the two participating sites (Princess Marina and Nyangabgwe referral hospitals).

## Chapter 4: STUDY FINDINGS

This chapter summarizes study findings obtained from both the quantitative and qualitative methods of data collection

### 4.1 Findings of Quantitative data

#### 4.1.1 Descriptive Statistics

##### *4.1.1.1 Description of study population (demographic characteristics)*

A total of 289 HIV positive patients receiving antiretroviral therapy at the two sites (Nyangabgwe and Princess Marina referral hospitals) participated in the study. The majority of respondents (69%) were in the age group 31-50 with a mean age of 39.5 (SD = +/- 5.5). The remaining participants, about 15%, were over 50, and 16% were in the 21-30 age group. Most of the participants (66%) were females with males constituting 34% of the sample as summarized in Table 1 below and Fig 3 (*Appendix E*). This is consistent with the female to male ratio of people on antiretroviral therapy nationally. This ratio is also similar to the sample composition in previous studies on factors facilitating or constraining adherence to antiretroviral therapy in Botswana (Kgatlwane et al, 2005). Only about 43% of the respondents had attained secondary education or higher. Those with a lower educational level about 26% reported not having any formal education at all or had not completed primary schooling. The unemployment level was about 38% among the study subjects. The majority of respondents (66%) were not married and only 21% were married with the remainder being divorced, separated or widowed. Roughly equal numbers of respondents were living in rural areas and in urban suburbs at 43% and 32% respectively while 37% were town dwellers. This information is summarized in Table.1 below.

**Table 1: Socio-demographic Characteristics of the sample**

Characteristics		Frequency	Percent %	Missing
Gender	1 Male	99	34	
	2 Female	190	66	
Marital Status	1 Married	62	21.45	
	2 Single	125	43.25	
	3 Widowed, separated, divorced	38	13.15	
	4 Living together	64	22.15	
Age group	30 years or younger	45	15.6	
	30-50	208	69.2	
	>50	44	15.2	
Educational Level -	1 none	31	10.7	
	2 Primary	132	45.7	2
	3 Secondary	109	37.7	
	4 Tertiary or higher	15	5.2	
Residence	1 Urban	110	38.1	
	2 Periurban	60	20.8	3
	3 Rural	116	40.1	
Religion	1 Christian	235	81.3	
	2 African Traditional	12	4.2	
	3 Other	42	14.5	
Do you have children?	1 Yes	254	87.9	
	2 No	35	12.1	
Total		289		

#### *4.1.1.2 Adherence rates*

The average optimal adherence rates (defined as taking pills at least 95% of the time) measured using the pill count and self-report methods were 96% and 98% respectively in Princess Marina giving a composite mean adherence of 97%. The pharmacy refill record optimal adherence rate is similar to that obtained in previous studies in Botswana (Kgatlwane et al, 2005). However, self-report adherence rate has increased from as low as 54% in 2003 (Weiser et al., 2003) to 98% as shown by the findings of this study. In

Nyangabgwe, adherence was assessed using only the self-report method since pharmacy pill count is not routinely performed at this site, hence participants did not have pill count records to review. However, the mean adherence rate by self-report was similar at the two participating health facilities at 98%.

#### 4.1.1.3 Level of Alcohol use

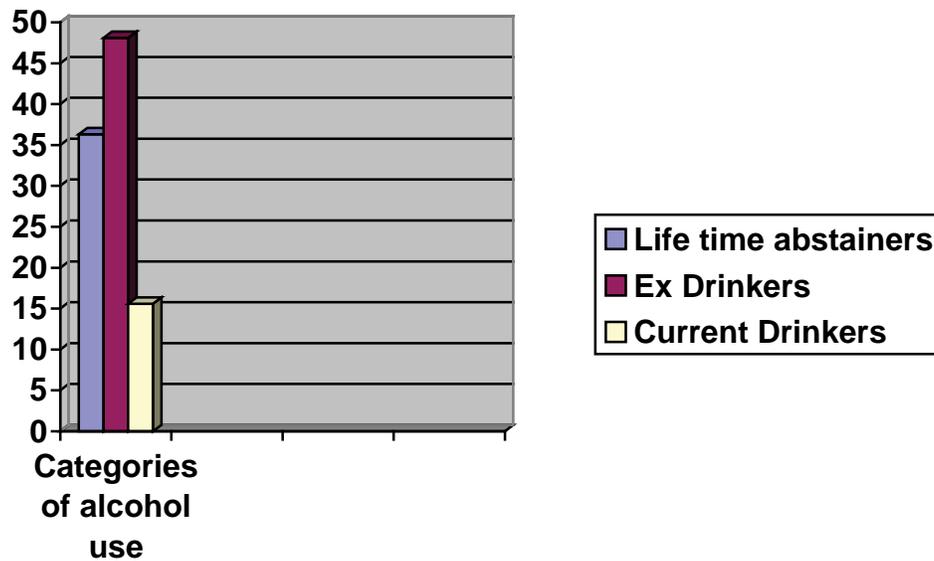
Very few participants reported alcohol use (15%) in the twelve months preceding enrolment in the study. This means that 85% of the participants were non-drinkers, which is similar to the findings of 89% in a recent study conducted by Do in 2005 in Princess Marina Botswana. Out of those currently drinking, 86% mostly consumed alcohol in moderation i.e. light drinking, defined as 1-2 drinks per day, while only 14% reported heavy alcohol intake. About 57% of those participants not reporting alcohol use in the past 12 months had stopped drinking at the onset of therapy. More males (23%) reported alcohol use in the past 12 months compared to 11% of females who continued to drink alcohol during the same period. The difference in prevalence of alcohol consumption among ARV users in Princess Marina and Nyangabgwe hospitals was insignificant with 15% and 16% respectively.

See Table 2 below and Fig 2 (*Appendix E*)

**Table 2: Distribution of respondents by alcohol use overall**

ALCOHOL USE	COUNT	PERCENTAGE
Life time abstainers	105	36.3%
Ex drinkers	139	48.1%
Current drinkers	45	15.6%
Total	289	100%

**Fig 1: Distribution of Respondents by alcohol use overall**



*4.1.1.4: Level of Stigma among ARV users*

Stigma levels among participants on HAART at the two sites was found to be low with a “yes” response to questions on discrimination and disclosure issues of less than 50%. About 49% of study subjects in Princess Marina and 35% in Nyangabgwe reported experiences of discrimination as well as the adoption of certain behaviours such as hiding pills to minimize inadvertent disclosure of their status that was reported to have occurred before or at the early stages of introduction of the public ART programme. All the participants (100%) reported low stigma levels defined as answering “yes” to fewer than 50% of questions about discriminatory experiences and HIV status disclosure. In fact, the majority of subjects answered “yes” to fewer than 30% of the questions: Nyangabgwe 94% and Princess Marina 92% which is indicative of low stigma concerns.

## 4.1.2 Statistical analysis of association between alcohol use, stigma and ART adherence

### 4.1.2.1: Relationship between alcohol consumption and adherence

Using results of the 7-day recall self-report method only for Nyangabgwe and both pharmacy pill count and self-report for Princess Marina, adherence rates among participants reporting alcohol use were assessed. As shown in table 3.1 below, out of 289 participants enrolled in the study, only 15% reported consuming alcohol in the last 12 months preceding the study with only 2% of them reporting to have missed their doses in the last seven days prior to completion of the questionnaire. In Princess Marina the adherence rate was also assessed by pharmacy pill count and only 15% reported alcohol use with 24% of them having suboptimal adherence while only 2.1% of non drinkers were non adherent to ART (Table 3.2 below). However, no significant statistical association was found between alcohol use and adherence measured either by pill count (Princess Marina) or by the 7-day recall self-report method in all sites. It should be noted that most participants reporting alcohol use consumed alcohol either infrequently or in moderation and actually could be categorized as light drinkers.

**Table 3.1: Overall Self -report adherence rate among respondents by alcohol use**

Alcohol use	Yes (44)	No (245)
Self-report adherence	No. (%)	No. (%)
Adherent	43 (97.7%)	236 (96.3)
Non adherent	1 (2.3)	9 (3.7)

**Table 3.2 Composite ART adherence rate by alcohol use (PMH only)**

<b>Alcohol use</b>	<b>Yes</b>	<b>NO</b>
Pharmacy Pill count PMH only (n= 193)	29 (15%)	164 (85%)
Adherent	20 (69%)	117 (71.3)
Non Adherent	7 (24%)	35 (21%)
Missing values pill count	2	12

*4.1.2.2 Relationship between Stigma and adherence*

Table 5 (*Appendix E*) reports the correlations between specified stigma item measures and ART adherence as measured by the chi-square test. This study found that most participants reporting low stigma levels defined as answering “yes” to fewer than 50% of questions about discriminatory experiences and HIV status disclosure had adherence rates comparable to that found among individuals without stigma. However, some discriminatory experiences such as isolation in the household (chi-squared=11.428,  $p<.001$ ), abandonment by a spouse or a partner (chi-squared=5.219,  $p<.022$ ), denied promotion or refused employment (chi-squared=7.912,  $p<.019$ ) were associated with decreased adherence irrespective of alcohol use.

Among the participants, there were very few current drinkers who also reported experiences of enacted stigma. In the study sites Princess Marina and Nyangabgwe only 7% and 8% of patients reported coexistence of stigma and alcohol respectively. There was no significant difference in adherence among current drinkers reporting experiences of discrimination or disclosure concerns and without stigma.

4.1.2.3 Relationship between adherence and socio-demographic factors

Socio-demographic characteristics such as educational level, place of residence, religion and employment status as shown in Table 4 below, did not seem to affect ART adherence levels among participants. However, having children seemed to have significant negative influence on adherence (P value = 0.043).

**Table 4: Association between Adherence and socio-demographic characteristics**  
**Pearson Chi-Square Tests (SPSS)**

		Adherence	Adherence
Sex	Chi-square	1.140	1.140
	Df	1	1
	Sig.	.286	.286
Marital Status	Chi-square	9.201	9.201
	Df	6	6
	Sig.	.163	.163
Educational Level	Chi-square	3.177	3.177
	Df	5	5
	Sig.	.673	.673
Place Of Usual Residence -	Chi-square	.425	.425
	Df	2	2
	Sig.	.808	.808
Religion	Chi-square	2.455	2.455
	Df	3	3
	Sig.	.484	.484
Do you have children?	Chi-square	.043	.043
	Df	1	1
	Sig.	.835	.835

#### 4.1.3 Analysis of Variance (ANOVA) testing

A two-way analysis of variance (ANOVA) was performed to assess the main and interactive effects of the two factors, stigma and alcohol use, on adherence to ART. The results are summarized in Table 6 below

Table 6: ANOVA Summary table for a Two-Way Analysis of Variance

Source of variation	Degrees of freedom (DF)	Sum of Squares	Mean Squares	F-Ratio	P value
Stigma	1.0	1.250	1.250	0.80	0.77
Alcohol	1.0	6.050	6.050	0.39	0.53
Interaction	1.0	0.4500	0.4500	0.03	0.86
Residual (error)	76.0	1165	15.33		
Total variation	79.0	1173			

Since the two factors, stigma and alcohol use, have only two levels for analysis (presence versus absence, each has degrees of freedom (DF) of equals to one while their interaction effect also has DF of one. DF error is 76. Using the degrees of freedom (DF 1, 76) for each source of variation to determine the critical values required to consider the difference in variation to be significant from the standard tables, it was found that a critical value of between 3.96-3.98 (for DF 1, 80; DF 1, 70) was needed for the main effects and interactive effects to be considered significant at 0.05 level. Comparing the critical value with the calculated F-ratios reported in the ANOVA summary Table 6, it is clear that all the F-ratios for stigma, alcohol use and their interaction effect did not exceed the critical value. In addition, P values of the calculated F-ratios for all sources of variation are greater than 0.05 (*Appendix E: Table 7*). Therefore, it is justified to conclude that stigma and alcohol abuse independently or in interaction did not affect ART adherence measured by the self-report method among the adults receiving HIV medicine at the Princess Marina and Nyangabgwe referral hospitals in Botswana.

Again, the graphic presentation of the findings depicts lines that virtually overlie suggesting that both the main effects and the interactive effect of the two factors, alcohol use and stigma, are not significant, as shown in Fig 4 (*Appendix E*). In the event that both main and interactive effects are significant, one would have expected to see linear graphs depicting parallel lines for significant main effects without interaction, crossing lines for significant interactive effect alone and non parallel sloping lines when the two factors independently and in combination significantly influence ART adherence.

## **4.2 Findings of Qualitative Data**

The data on the perspectives of the ART users and health care providers obtained through interviews and focus group discussions at one of the study sites (Princess Marina hospital) is summarized in four themes identified as follows.

### *4.2.1 Level of Alcohol use among ART users*

Both patients and health care workers identified alcohol abuse as a major barrier to ARV adherence. However, it has been observed that the majority of ARV users stopped drinking alcohol at the onset of ART, though some took time to finally quit drinking or drastically reduce alcohol consumption. Out of the 6 patients interviewed 4 had stopped drinking alcohol, two of them immediately, while the other two reduced the quantity consumed per week initially without reducing the number of drinks per occasion. One participant experienced delays by several hours and occasionally missed his medication whenever he joined his friends for drinks. As a result he decided to quit drinking alcohol after a year. Since he stopped drinking alcohol, the participant admitted not missing doses or delaying to take his ARV pills. The main reasons identified for stopping alcohol or reducing the quantity consumed were the advice by the therapy nurse during counseling sessions, and advice from friends and family members, in particular those already on HAART. One ARV user in a female focus group discussion (FGD) said:

*“I told my friends who continued to drink alcohol while on ART that combining HIV pills and alcohol is dangerous because alcohol can interfere with the action of drugs on the*

*virus. I also made them understand that being tipsy makes it easy for an individual to either forget or delay taking pills. Most of my friends and family members stopped drinking and their compliance to treatment improved.”*

Media messages through radio and television and advice by some church leaders were also given as some of the reasons that influenced some individuals to stop drinking well before they knew their status. Even these believed that not drinking alcohol helped them to continue with their ART. However, there are people who still continue to consume alcohol. The health care providers and the ARV users confirmed that there is still a small number on HIV medicine still consuming alcohol and that those who drink heavily have switched to other brands. One ARV user in a female FGD said:

*“I have seen and overheard people on ART either drinking or some chatting about no harm in alcohol use provided an individual takes his pills regularly. Those drinking said they switched to red wine believing that it increases blood in general in the body and especially CD4 count.”*

The same participant reported that this trend was more prevalent among the young ARV users. Another male interviewee also supported this statement that most current alcohol drinkers on ART have switched to red wine for the same reason.

#### *4.2.2 Level of HIV-related stigma among ARV users*

The participants acknowledged that stigma is lowered and that discriminatory experiences were now fewer and that most people disclose their status. Patients felt that stigma has lowered in the general population as well as among ARV users thus resulting in improved ART adherence. Most respondents reported to have witnessed the reduction of remarks about passersby and improved disclosure of HIV status to acquaintances, family members and even to co-workers. One ARV user in the male FGD clearly stated:

*“In the early days of free ART in the public health facilities, individuals found to be HIV positive and referred to the IDCC used to tear their medical cards and not attend the*

*clinic for fear of discrimination. Those on ART used to hide tablets or miss doses when people were around.”*

Another participant gave an example of her daughter who failed to disclose the HIV status to her on the advice from grandmother for fear of losing the maternal love. During this period the daughter attended traditional healers and by the time she revealed her status it was already too late for her to be helped and she died before initiation of HAART. Participants now report a significant decrease in HIV-related stigma that has resulted in friends and family members becoming more accommodating and who actually encourage and regularly remind those on treatment about their medication, thus reducing episodes of delays and missing doses. In addition, those on ART also find it easier to counsel friends and family to either get tested or to comply with medication using themselves as examples. All respondents identified stigma as one of the major obstacles to optimal adherence citing that individuals may hide pills, miss doses or delay taking tablets when people are around for fear of unintentional disclosure of their status that may lead to discrimination. However, some participants stated that the most important factor to adherence is self-acceptance of HIV status i.e. reduction in internal stigma because this goes a long way to mitigate discrimination in that the ARV user would not care what other people say or how they behave towards them. To illustrate the importance of self-acceptance by ARV users in the mitigation of stigma, a patient in the female FGD clearly said:

*“My cousin used to remove her pills from original containers and put them in a different one such as paracetamol container. She did this irrespective of acceptance and support from the rest of the family because she had not come to terms with her HIV diagnosis.*

*In most cases she missed her doses and delayed taking tablets by several hours whenever people including family members were present.”*

Although HIV-related stigma has reportedly reduced, participants and the health care providers felt that it still existed especially among men and the young. An ARV user in the male FGD said:

*“Men are reluctant to get tested for HIV and if tested they often fear to disclose status particularly to girl friends and or spouses for fear of abandonment. Again friends not on HAART often do not want to associate with old friends attending the IDCC also resulting in non-disclosure. To keep friends and sexual partners such individuals then either hide pills or delay taking medication when friends are around”.*

A 26-year old participant in the female FGD also reported that such behaviour existed among the young for fear of abandonment by friends and sexual partners.

#### *4.2.3 Link between adherence to HAART, alcohol consumption reduction and lowered stigma*

The participants all felt that heavy alcohol use and high levels of stigma represented serious barriers to optimal adherence to HIV medicine. Both the health care providers and the ARV users supported the findings of the current study that most had stopped consuming alcohol at the onset of therapy and that HIV-related stigma was lowered. They all agreed that such reduction is associated with improved adherence to ART.

##### *4.2.3.1 Link between stopping alcohol use and adherence to ART*

Based on their personal experiences and observations, the interviewed respondents, FGD participants and the health workers were of the opinion that stopping alcohol consumption and or significant reduction in the quantity of alcohol intake greatly improved adherence to ART. To emphasize this observation, one male participant clearly stated in Setswana:

*“Fa kene ke sa tlogela go nwa bojalwa ke ka bo ke sa tlhola ke nwa diritibatsi”.*

Translated in English this means that I would have long stopped taking antiretroviral tablets if I did not quit alcohol. Another patient gave two examples to demonstrate the

link between poor adherence and alcohol use. She explained how her own uncle and a neighbour's daughter who continued to drink alcohol heavily, stopped taking their tablets and eventually died of the complications of HIV infection.

#### *4.2.3.2 Link between stigma and adherence to ART*

Two important points emerged concerning the link between stigma and adherence to HIV medicine. Firstly, all participants felt that stigma in all its forms including self-stigmatization was associated with poor adherence. Respondents agreed that fear of being ostracized often results in ARV users hiding tablets to avoid inadvertent disclosure of status. One participant said that people with discriminatory attitudes are unlikely to support family members or friends on ARV. In her opinion social support, in particular treatment reminders can play a major role in adherence, especially in the early stages of therapy. Some participants said that acceptance of one's HIV status is a key factor to minimize the effects of discriminatory experiences that are often encountered by ARV users. A male participant put it succinctly in Setswana as follows:

*“O seka wa e nyenyafatsa ka go sa amogele seemo sa gago sa mogare. Fa o amogela seemo, go nna motlhofo go re o se kgathale ka dipuo le dikakanyo tsa batho ba sele ka bolwetse ba gago. Se se dira gore o kgone go nwa diritibatsi tsa gago o phuthologile”.*

This Setswana statement in English means that self-acceptance of one's HIV status enables ARV users not to be bothered by negative remarks or discriminatory attitudes from people around them which results in good ART adherence irrespective of what others think or say about them.

#### *4.2.4 Reasons for reduction in stigma and decrease in alcohol consumption*

Several reasons suggested by both the health workers and ARV users were similar. The main reasons for stopping or reducing alcohol consumption are: advice from the therapy nurse, pretreatment counseling, messages through radio and television, and advice by friends and family members already on ART. A few of the respondents had stopped alcohol when they joined churches that discourage alcohol use.

The reduction in the levels of HIV-related stigma was attributed to extensive pre-treatment counseling of prospective ARV users in the presence of their treatment partners, media messages and programmes targeting stigma reduction directly, availability of free treatment and routine HIV testing introduced in Botswana in 2004. Pre-treatment counseling was perceived to help family and friends to understand the disease, dispel misconceptions about transmission of the virus hence minimize the discriminatory practices that were common early in the epidemic such as special utensils and separate toilets for use by HIV infected individuals. Counseling was also cited as being helpful for infected individuals to accept their HIV status; and feel supported by family and friends- hence an increase in disclosure of status. One ARV user in the female FGD clearly put it that she has been counseling her co-workers to get an HIV test using herself as an example to illustrate the benefit of ARV if found HIV positive. Some stated that the spreading of the virus to affect almost any family has also played a role in the reduction of stigma. The same participants reported that free availability of HAART and the visible improvement in the health of those on therapy has encouraged more people to know their status in order to access help when needed. One participant mentioned routine testing as having had a big impact in the reduction of stigma partly because making HIV test routine has made individuals understand that the infection is not different from other chronic diseases especially now that the disease is controlled by the use of HAART.

Of note, another patient cited the example of public figures such as President Mogae's public testing as having changed people's misconception of HIV being a disease of prostitutes to a disease that can infect or affect anyone in one way or the other.

Messages on media such as radio and television are considered as one of the reasons that led to the reduction in stigma. One participant said:

*“Radio and television messages directly addressing stigma informs people in particular the youth about HIV AIDS and dangers of discriminating those affected and also help break the stigma associated with the disease thus resulting in lowered stigma in general and in particular among ARV users”.*

## **Chapter 5: DISCUSSIONS**

### **5.1 Discussions of findings of quantitative data**

The study found that stigma levels among those on antiretroviral therapy were low, alcohol consumption was reduced and adherence was good among adult patients on antiretroviral therapy (ART) at the two clinical sites in Princess Marina and Nyangabgwe referral hospitals. The adherence rates were generally high with a mean adherence of 98% by self-report that was similar to findings of previous studies. Do (2005) in a study conducted in Princess Marina hospital found that the optimal ART adherence level was high at 99.3%. The findings also revealed that lowered HIV-related stigma and reduced alcohol abuse was associated with improved ART adherence irrespective of whether these factors influenced compliance to medication independently or in interaction.

The majority of participants reported a low level of stigma defined as a total number of “yes” answers to questions on enacted stigma and disclosure of less than 50%. The decline in stigma levels may be due to several reasons that include several intervention programmes already in place in Botswana to address stigma and increase uptake of HIV testing and antiretroviral therapy. The programmes in place are aimed at addressing stigma directly such as media HIV educational campaigns (radio and TV programmes like “talk back”); the annual “Miss Stigma Free” competition, and the public announcement of personal testing by prominent figures like president Festus Mogae (Wolfe et al.2006: 933). Other programmes such as “opt out” routine HIV testing may have indirectly reduced stigma. This may be possible due the fact that making HIV testing routine coupled with the availability of HIV medication could have resulted in stigma reduction by converting the HIV disease from being a fatal disease to a controllable chronic illness. This possibility is alluded to by the findings of the study investigating the practices, attitudes and human rights concerns to routine testing in Botswana where 60% of participants reported that routine testing would reduce stigma (Weiser et al., 2006: 1013).

Pre-treatment counselling at these sites that require patients to bring treatment partners, in most cases family members, may have played a role since it also encourages disclosure of HIV status that may help break the stigma around the disease and positively affect adherence (Skogmar et al., 2006: 725).

Reporting experiences of stigma by participants did not seem to affect adherence rates among the ARV users in the sample. A previous study in USA had demonstrated that individuals with high stigma concerns were three times more likely to default on therapy (Rintamaki et al., 2006). Therefore, it follows that individuals reporting low levels of stigma, as was the case with this study, are less likely to be non-adherent; hence the findings of no significant association between reported stigma concerns and adherence to ART. However, specific reasons such as disclosure of serostatus and self-acceptance may also have played a significant role in the achievement of good ART adherence among participants despite reports of stigma. Disclosure levels among the participants were high, with 93% having revealed their status to at least one person. Such high levels of disclosure may break stigma and positively impact on adherence to ART. In 2006, Stirratt and his colleagues in New York, USA, investigated the role of HIV disclosure in adherence to antiretroviral therapy found out that 19% of participants reported missing medication due to disclosure concerns (Stirratt et al., 2006). Therefore, high disclosure levels observed among the participants in the current study may have resulted in improved adherence by eliminating the missing of medication doses due to disclosure issues.

It is also possible that patients' self-acceptance of their HIV status may have played a key role for adherence to ART rather than the overall reduction in HIV-related stigma, especially among those reporting experiences of stigma and yet their adherence level was comparable to those not reporting stigma. This reasoning is based on the information on perceptions of the ARV users obtained during interviews and focus group discussions. Similar reports by participants attributing much of their good adherence to self-acceptance of their HIV status were reported by previous studies investigating facilitators

and barriers of adherence to ART in Botswana (Kgatlwane et al., 2005). However, this variable was not specifically evaluated quantitatively in this study. The study also revealed that alcohol consumption was low among patients receiving antiretroviral therapy at Princess Marina and Nyangabgwe referral hospitals. Most participants had either stopped drinking or drank in moderation (with 90% of them drinking 1-2 drinks per occasion) at the onset of ART. Adherence rates among current drinkers, defined as those reporting alcohol use in the past twelve months before enrolling in the study, was comparable to the adherence level of non drinkers (life time abstainers and ex drinkers combined). Consistent with findings of earlier studies that mainly moderate to heavy alcohol consumption was associated with poor ART compliance in Africa and elsewhere (Chander et al., 2006; Do 2005; Kgatlwane et al., 2005), the current study demonstrated that reduced alcohol consumption among ARV users was associated with an improved ART adherence level comparable to that of life-time abstainers and those who had stopped drinking alcohol in the twelve months preceding the study.

Lack of an interactive effect on adherence between alcohol use and stigma may partially be due to low levels of stigma and mild alcohol consumption among participants. Despite lack of interaction effects between alcohol intake and stigma on adherence level, findings of an association between some discriminatory experiences, such as isolation in the household, abandonment by a spouse, or refused employment and reduction in ART compliance, irrespective of alcohol intake, suggests that some item measures of stigma may independently have influence on the level of ART adherence. In addition, the existence of programmes to mitigate stigma and pre-treatment counselling on alcohol use during therapy may partially explain lack of association of stigma, alcohol use and adherence level either independently or in interaction.

## **5.2 Discussions of findings of qualitative data**

Findings obtained using qualitative methods of data collection (interviews and FGD) were similar to the quantitative data. The health providers and the ARV users both reported that most individuals receiving HIV medicine had either stopped or significantly reduced alcohol consumption, and that HIV-related stigma was lowered. They also confirmed that lowered stigma and reduced alcohol consumption resulted in improved ART adherence among ARV users thus supporting the findings of the quantitative data of this study that failed to show the expected poor adherence rates among current drinkers and those reporting stigma. Low levels of alcohol consumption may fail to negatively affect adherence due to the fact that judgement and insight of those who stopped drinking alcohol or reduced their alcohol intake were less likely to be impaired hence improved compliance to ART. High levels of reduction or stoppage of alcohol consumption observed among participants, and also reported by both health workers and ARV users, were probably associated with improved adherence shown by the quantitative data of this study.

In addition, association of lowered HIV- related stigma and good adherence levels reported by participants supports findings of the quantitative data in the current study and is consistent with findings of previous research that demonstrated association of non-adherence to ART with higher stigma concerns (Rintamaki et al., 2006). Again, self-acceptance of one's HIV status, identified as the most important facilitator of adherence by both the health workers and ARV users during interview and FGD, may minimize the effects of stigma resulting in improved adherence among the participants. The findings are consistent with reports of an earlier study on facilitators and constraints of ART adherence in Botswana (Kgatlwane et al., 2005), where participants clearly stated that self-acceptance of HIV status has a key role to play in regard to adherence among ARV users.

It should also be noted that the participants and the health providers also reported a high tendency of patients in new relationships, in particular men and the younger patients, not to disclose their HIV status to sexual partners for fear of rejection and interruption of relationships, which often results in doses being missed. This finding supports earlier research elsewhere in Africa and developed countries (Antelman et al., 2001, in Tanzania; Maman et al., 2003; Skogmar et al., 2006 in South Africa; Stirratt et al., 2006, in USA) that demonstrated that non-disclosure of status might lead to poor adherence.

### **5.3 Limitations**

The study should be interpreted in the context of a number of limitations. The cross-sectional nature of data collection did not permit the study to assess the long-term effects of HIV stigma and alcohol use on ART adherence. Due to time and financial constraints the sample was relatively small, and this may partially account for findings suggesting lack of significant associations between stigma, alcohol intake and ART adherence. It is often difficult to demonstrate small effects in such samples. ART Adherence was measured by the self-report method, which is prone to response bias that may have resulted in overestimation of adherence levels. Another limitation was that a composite adherence rate could not be computed for participants from Nyangabgwe since pill counts had not yet been introduced to assess adherence routinely at this health facility. It was also not possible to corroborate self-report adherence with viral load (VL) and CD4 counts because the majority of participants did not have recent results - regarded as a test result not older than six months - prior to enrolment in the study. However, for those who had results, there seemed to be a correlation between the reported adherence and the viral load. Lastly, selection bias could still have occurred since the sample consisted of those currently attending the IDCC that may have resulted in exclusion of those no longer attending the clinic. Consequently, the patients in the sample may not be representative of HIV positive adults on ART. Again, the study was conducted at two sites only that limit the ability to generalize the results for the whole country.

## **Chapter 6: CONCLUSION AND RECOMMENDATIONS**

### **6.1 Conclusion**

Adherence to antiretroviral therapy is the key to treatment success and prevention of resistant strains that are difficult to treat. However, barriers such as HIV-related stigma and alcohol abuse have been shown to deter individuals from being compliant, thus canceling out the benefits that an HIV positive individual would have received. As more patients are put on ART there is pressing need to improve adherence to treatment in order to achieve prolonged viral suppression that results in improved quality of life and also prevents the development of a second epidemic due to resistant viral strains. The study showed that reduction in alcohol consumption and low levels of HIV-related stigma concerns among ARV users resulted in improved adherence to ART. The findings suggest that actively putting in place or strengthening existing interventions aimed at reduction of alcohol consumption and minimizing HIV-related stigma could further improve ART adherence. This could be an integral part of any ART programme.

### **6.2 Recommendations**

Based on the results of the study, I would recommend that a uniform adherence monitoring system be rolled out to all health facilities providing antiretroviral therapy using both pharmacy refill pill count and self-report methods. The study found that adherence monitoring in the participating hospitals was not uniform hence making comparison rather difficult. Due to the fact that because behaviour change is complex and takes time to be achieved, existing interventions addressing stigma and alcohol abuse should be strengthened putting emphasis on ongoing counselling which was identified by both the health providers and ARV users as one of the reasons that explain reduction in alcohol use and stigma among participants.

Interventions should be gender and age-specific because during interviews and FGD respondents highlighted that missing doses due to non-disclosure of HIV status was prevalent among the young and men especially when they enter into a new relationship. Lastly, the interventions in place should be regularly monitored and evaluated so as to identify constraints and facilitators of the programme implementation. This may help identify emerging new behaviours that may impede adherence to ART. For example, findings that some current alcohol users have switched to red wine believing it increases blood and CD4 count may require further investigations.

Finally, the findings suggest the need to:

- Investigate the effectiveness of the intervention programmes to raise uptake of HIV-testing and HAART. This may provide demonstrable reasons for lifestyle change such as reduction in alcohol intake among patients on ART and answer the why questions posed in the study.
- Investigate adherence using different variables such as actual progress in viral suppression as measured by viral load and CD4 progress while confounding for the level of severity of disease before start of ART and all the characteristics of the individual.
- Investigate trends in behaviour change such as switching to red wine drinking under the belief that it increases blood and CD4 count and correlate with the adherence level.

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## APPENDIXES

### APPENDIX A: QUESTIONNAIRE

#### Questionnaire to collect data on stigma, alcohol use and adherence (has 4 sections)

##### Instructions

Tick the box next to the answer of your choice

The questionnaire has four parts (socio-demographic, stigma, alcohol and adherence questions) to be filled

Researcher will interview those unable to do so

1. Center ..... Princess Marina IDCC [1] Nyangabwe IDCC [2]

2. Participant Number.....

3. Date.....

##### Sociodemographic information

4. Sex	1 Male		
	2 Female		
5. Age at last birthday			
6. Marital status			
	1. Married		
	2. Single		
	3. Widowed / divorced / separated		
	4. Living together		
7. Educational level			
	1. none		
	2. Primary		
	3. Secondary		
	4. Tertiary		

8. Place of usual residence		
1. Urban		
2. Periurban		
3. Rural		
2. African Traditional		
3. Other		
10. Do you have children?		
1. Yes		
2. No		
11 What do you do for a living? (Employment status)		
1. Government		
2. Parastatal		
3. Private		
4. Self employed		
5. Unemployed		

### Questions on enacted Stigma (discrimination)

Have you ever been treated badly and experienced the following because of your HIV status?

12.excluded from a social gathering (village meeting, family gatherings, church functions etc	
1 Yes	
2 No	
13. abandoned by spouse or partner	
1 Yes	
2 No	
14. isolated in your household	
1 Yes	
2 No	
15. family and friends stopped visiting or visited you less frequently	
1 Yes	
2 No	
16. been teased, ridiculed or insulted by people around you or by co- workers	

1 Yes	
2 No	
17. customers stopped coming to buy produce or goods	
1 Yes	
2 No	
18. driven away from the house or found it difficult to rent a place to stay	
1 Yes	
2 No	
19. been denied religious rights/services in church	
1 Yes	
2 No	
20. had property taken away from you	
1 Yes	
2 No	
21. been gossiped about or remarks passed about you	
1 Yes	
2 No	
22. noticed any change in respect given to you by family and neighbours	
1 Yes	
2 No	
23. been given poorer quality of health services	
1 Yes	
2 No	
24. denied promotion /further training or refused employment	
1 Yes	
2 No	
25. had increased visitors "checking out" how you were doing	
1 Yes	
2 No	
26. been threatened with violence or physically abused	
1 Yes	
2 No	

## Questions on disclosure of HIV status and the fact of taking ARV drugs

27. Have you told anyone of your HIV status and the fact that you are on ARV?	
1 Yes	
2 No	
28. Who did you tell?	
1 Spouse	
2 Other family members	
3 Friend	
4 Nobody	
5 Other	
29. How soon after knowing that you are HIV positive did you disclose your status to these specific individuals?	
1 Immediately	
2 Within 6months	
3 More than six months	
4 Other (specify	
30.Has your HIV status been revealed without your consent?	
1 Yes	
2 No	
31 Have you ever missed your appointment to see a health provider or collect your monthly drug refills for fear that others may find out or suspect your HIV status?	
1 Yes	
2 No	
32.Have you ever had to hide your pills from people around you or miss your doses because people were with you?	
1 Yes	
2 No	

## Questions on Alcohol use

33 In your entire life have had at least one drink of any kind of alcohol excluding sips or tastes?	
1 Yes	
2 No	
34. Which form of alcoholic drink do you take?	
1 Beer	
2 Wine	
3 Spirits (vodka, whisky, brandy etc	
4 Home brew or Shake shake	
35. During the last 12 months have you had at least one drink of any alcohol?	
1 Yes	
2 No	
36. How often did you drink any kind of alcohol in the last 12 months?	
1 Daily	
2 3-4 times a week	
3 Once a week	
4 Once a month or more	
37 What was or is the typical size of can/bottle/glass that you usually drink? During the last twelve months?	
1 Small (120ml glass or 340ml bottle or can)	
2 Medium (250ml glass or 450ml bottle/can)	
3 large (more than 250ml glass / 750ml or more bottle/can)	
38. Have you ever drunk more than 5 units of alcohol a day in the last twelve months?	
1 Yes	
2 No	
39. How often did you drink 5 or more units in the last twelve months?	
1 Daily	

2 3-4 times a week	
3 Once week	
4 Once month or more	
40. Where do you usually have your drinks in the last 12 months?	
1 Own home	
2 Friends or relatives home	
3 Public places	

## Questions on ART adherence

41. When did you find out that you are HIV positive? Specify	
42. What made you decide to get tested for HIV infection?	
1 Sickness	
2 Routine offering by health provider	
3 For PMTCT	
4 Encouragement from friend or family member	
5 Other	
43. How has your health been since you commenced ARV?	
1 Better	
2 Same	
3 Worse	
44. Can you tell me how HIV medicines affect your health?	
1 ARV prolong life	
2 ARV cure AIDS	
3 I will need to take ARVS for sometime	
4 I will take ARVS for the rest of my life	
5 ARV cannot get rid of virus completely	
6 Other	
45. How do you remember to take your pills regularly at correct doses and at the correct agreed upon time?	
1 Buddy	
2 Spouse /family	
3 Cell phone alarm	
4 Incorporate into daily routine (brushing, dinner etc	
5 TV/Radio news	
46. In the last seven days, did you perhaps miss your HIV pills or delay taking your tablets?	
1 Missed	
2 Not missed	
3 Delayed more than 3 hours	
47. If you did miss taking your tablets in the last seven days, please give reasons why this happened?	
1 Felt better	
2 Forgot	
3 Alcohol use	
4 Lack of transport money	
5 Feeling that you have to hide pills from people around you	
6 Other (specify)	
48. How many doses did you miss in the last seven days?	
1 Morning or evening dose	
2 One day	
3 Delayed by more than three hours (specify)	
4 More than one day? Specify	
49. If not missed doses in the last seven days then when was the last time you missed taking your tablets?	
1 More than one week ago	
2 More than one month ago	

3 Never	
50. What do you think happens in your body if you skip your pills?	
1 Viral load increases	
2 Health gets worse	
3 Virus becomes resistant	
4 CD4 goes down	
5 Other	
53. Have you ever stopped or ever thought of stopping HIV pills?	
1 Yes	
2 No	
54. If yes explain why you stopped or thought of stopping taking ART	
1 Felt better	
2 Thought was cured	
3 Tried alternative healing	
4 Side effects	
5 Other	
55. In the last month please try to estimate how many of your ARVS do you think you managed to take?	
1 All	
2 None	
3 Less than half	
4 About half	

## **APPENDIX B: INTERVIEW SCHEDULES**

### **APPENDIX B-1:**

#### **Interview schedule for Health providers on their perceptions about relationship between stigma, alcohol use, and adherence to Antiretroviral (ARV) therapy**

**Purpose:** to examine the perceptions of Health providers on levels of alcohol use and stigma among current ARV users and their link to ART adherence.

We found out that most patients stopped drinking at the onset of ARV therapy and that stigma was reduced. We would like to know how you feel about these findings and we request you to answer some questions.

1. Do you think most of patients on ART at the Princess Marina IDCC have stopped drinking alcohol or not since they were started on treatment? Why?
2. What has been the link between adherence and alcohol consumption among your patients on ART?
3. In your opinion has stigma become less or not among your patients since ARV was commenced?
4. What is the link between stigma and taking or not taking the pills prescribed by the health worker properly?

## **APPENDIX B-2: Interview Schedule for Antiretroviral Users**

### **Interview schedule for Antiretroviral (ARV) users on alcohol use, stigma, and adherence to therapy**

**Purpose:** To find out why most patients stopped drinking alcohol at the initiation Of ARV and also identify reasons for lowered stigma

We found out that most patients stopped drinking alcohol at the onset of initiation of therapy and that stigma reduced. We would like to know how you feel about it.

1. Did you stop drinking completely; a bit may be about 50% or less? Why?
  - Advice from therapy nurse
  - Friends, family, other
2. How long did it take you to stop alcohol? Stop immediately, took a little while
3. When you chat with your friends on treatment do you think or get a feeling that most have stopped? Why?
4. Do you and your friends find it difficult to stop drinking? Why?
5. Has stopping alcohol or drinking less helped you or not with taking your pills regularly? Why?
6. Do you think HIV-related stigma has become less or not? Please explain why this could be? Give examples
7. What do you think is the link between lowered stigma or not and adherence to ARVs?



**APPENDIX D: CONSENT FORM TO PARTICIPATE IN THE STUDY**

**Study on the influence of HIV-related stigma and alcohol use on adherence to antiretroviral therapy among patients attending the adult IDCC IN Princess Marina and Nyangabgwe Referral Hospital**

(A study conducted by Dr Grace Munyadzwe-Gabe as part of a postgraduate degree - MPhil HIV/AIDS Management at the University of Stellenbosch, Africa AIDS Centre, South Africa)

**Consent Form (adults aged 18 and above)**

Patient's CM number ..... Omang No (ID).....

Patient's Study Number..... Masa (T) No.....

I have read or have had the information read to me and explained such that I understand the above research study. I have had opportunity to ask questions that have been answered to my satisfaction. I understand that I am free to withdraw participation any time without giving any reason and that this will not affect my normal care and management at the clinic in any way. I agree to participate of my own free will in the study as described.

Participant's Name.....

Signature of Participant..... Date.....

In case the subjects consents to participate but is unable to read or sign their name, the following signature line should also be placed under the area for subjects name and signature:

Witness.....

Signature of Witness.....

Date .....

Name of Investigator .....

Signature of Investigator.....

Date .....

## APPENDIX E: LIST OF TABLES AND FIGURES

**Table 5: Association between ART Adherence and stigma**

Pearson Chi-Square Tests

		Adherence	Adherence
Excluded From A Social Gathering -Village Meeting, Family Gatherings, Church Functions Etc	Chi-square	.039	.039
	df	1	1
	Sig.	.843	.843
<b>Abandoned By Spouse Or Partner</b>	<b>Chi-square</b>	<b>5.219</b>	<b>5.219</b>
	<b>df</b>	<b>1</b>	<b>1</b>
	<b>Sig.</b>	<b>.022</b>	<b>.022</b>
<b>Isolated In Your Household</b>	<b>Chi-square</b>	<b>11.428</b>	<b>11.428</b>
	<b>df</b>	<b>1</b>	<b>1</b>
	<b>Sig.</b>	<b>.001</b>	<b>.001</b>
Family And Friends Stopped Visiting or Visited You Less Frequently	Chi-square	2.546	2.546
	df	2	2
	Sig.	.280	.280
Been teased, ridiculed or insulted by people around you or by co- workers	Chi-square	2.040	2.040
	df	2	2
	Sig.	.361	.361
Driven away from the house or found it difficult to rent a place to stay	Chi-square	.410	.410
	df	2	2
	Sig.	.815	.815
Been Denied Religious Rights or Services In Church	Chi-square	.286	.286
	df	2	2
	Sig.	.867	.867
Had Property Taken Away From You	Chi-square	.410	.410
	df	2	2
	Sig.	.815	.815

Been Gossiped About Or Remarks Passed About You	Chi-square	.028	.028
	df	1	1
	Sig.	.866	.866
Been Given Poorer Quality Of Health Services	Chi-square	2.115	2.115
	df	2	2
	Sig.	.347	.347
<b>Denied promotion, Further Training Or Refused Employment</b>	<b>Chi-square</b>	<b>7.912</b>	<b>7.912</b>
	<b>df</b>	<b>2</b>	<b>2</b>
	<b>Sig.</b>	<b>.019</b>	<b>.019</b>
Had increased visitors "checking out" how you were doing	Chi-square	.177	.177
	df	3	3
	Sig.	.981	.981

**Table 7**

**Two way ANOVA Tabular results (Self-report adherence): GraphPad Prism 5  
computed**

Parameter				
Table Analyzed	Data 1			
Two-way ANOVA				
<b>Source of Variation</b>	<b>% of total variation</b>	<b>P value</b>		
Interaction	0.04	0.8641		
STIGMA	0.42	0.5308		
ALCOHOL	0.11	0.7755		
<b>Source of Variation</b>	<b>P value summary</b>	<b>Significant?</b>		
Interaction	Ns	No		
STIGMA	Ns	No		
ALCOHOL	Ns	No		

Source of Variation	DF	Sum-of-squares	Mean square	F-ratio
Interaction	1	0.4500	0.4500	0.02948
STIGMA	1	6.050	6.050	0.3964
ALCOHOL	1	1.250	1.250	0.08190
Residual	76	1160	15.26	
Number of missing values	0			

**Table 8: Mean Adherence levels of each treatment condition**

	STIGMA PRESENT			STIGMA ABSENT		
	Mean	SD	N	Mean	SD	N
ALC PRES	98.5	4.3	20	98.6	4.4	20
ALC ABS	98.9	3.64	20	99.3	3.2	20

**ALC PRES means alcohol use present while ALC ABS stands for absent alcohol use**

List of figures

Fig 1: Distribution of Respondents by alcohol use overall

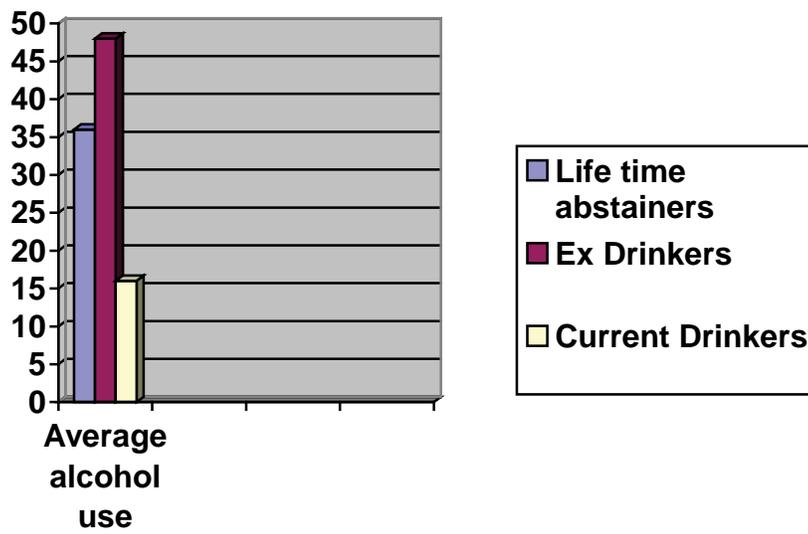
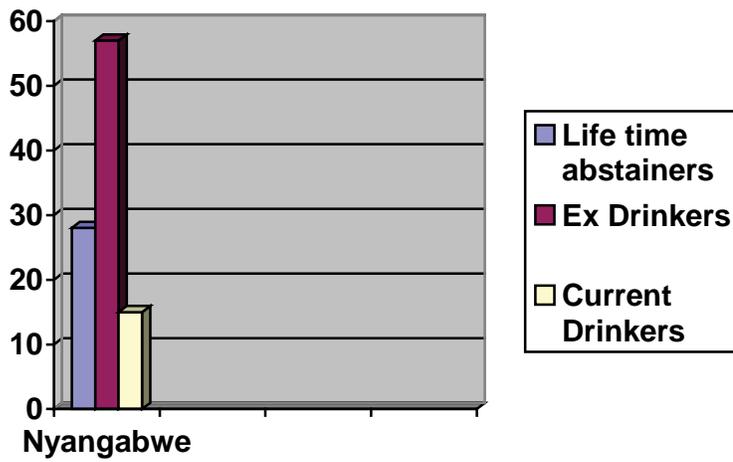
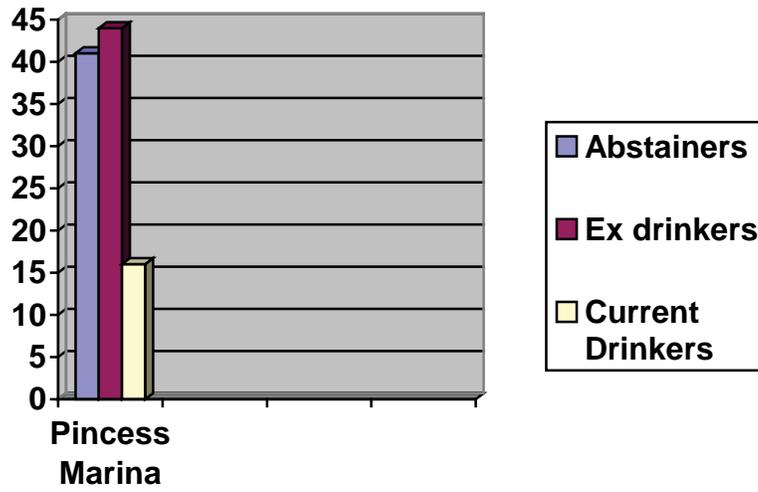
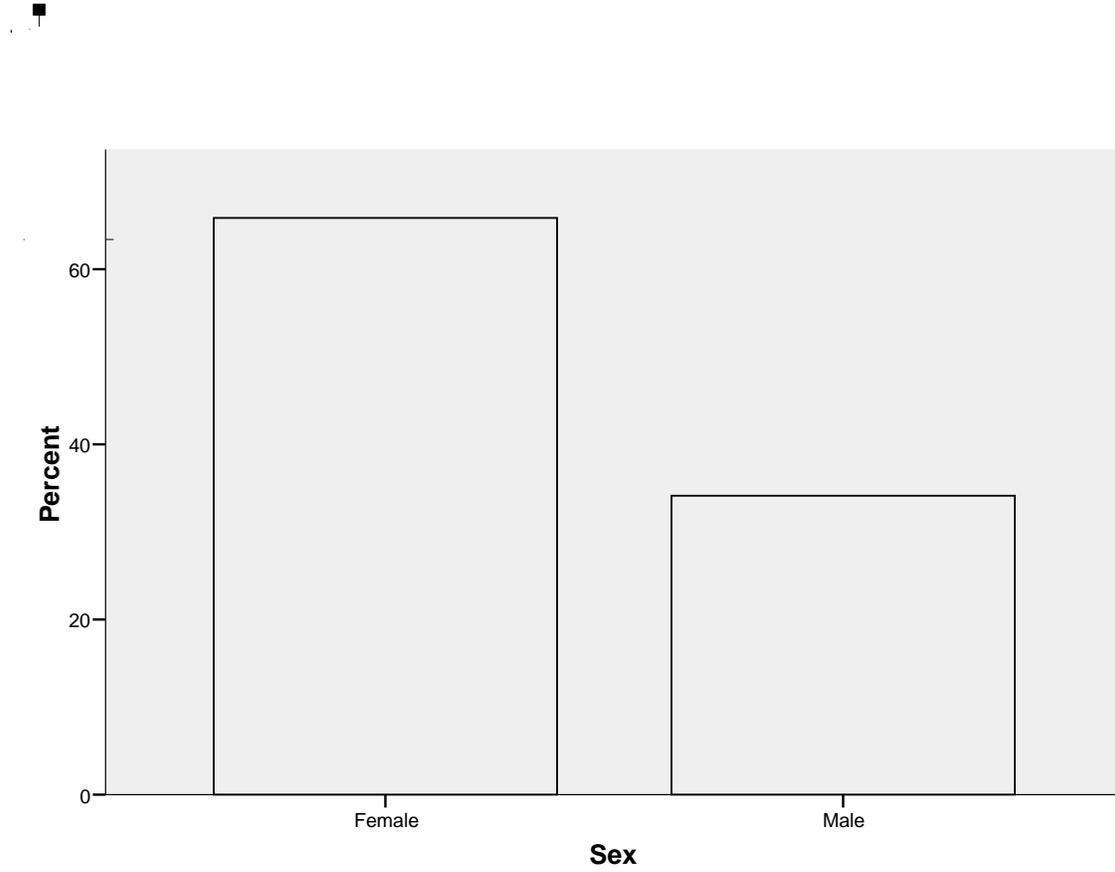


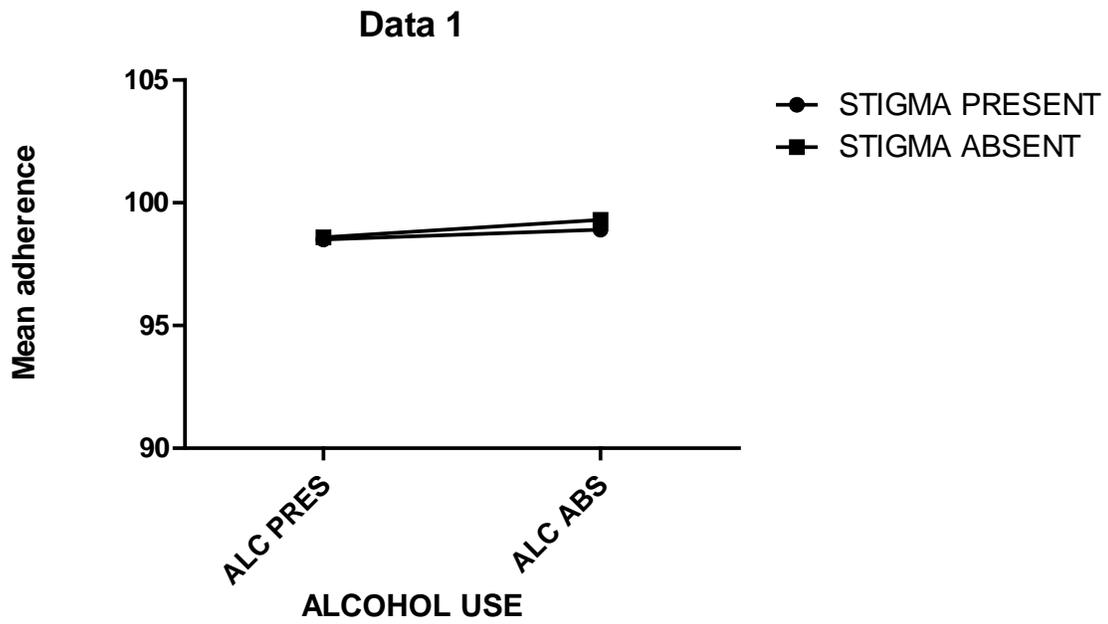
Figure 2. Distribution of respondents by alcohol use and site



**Fig 3: Distribution of respondents by gender**



**Fig 4: Graphical presentation of the effect of stigma and alcohol use on ART adherence.**



**ALC PRES stands for alcohol use present**

**ALC ABS represent absent alcohol use**