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UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

FACULTY OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

MSc (MED) POPULATION- BASED FIELD EPIDEMIOLOGY

A RESEARCH REPORT SUBMITTED TO THE SCHOOL OF PUBLIC HEALTH, UNIVERSITY OF THE WITSWATERSRAND, JOHANNESBURG, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN MEDICINE FOR THE YEAR 2008

TITLE:

Does social support affect depression in patients on antiretroviral treatment program in rural KwaZulu-Natal, South Africa?

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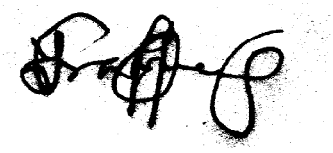
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DECLARATION

I, Francis Yeji declare that this research report is my own work. It is being submitted for the degree of Master of Science in Medicine in the field of Population Based Field Epidemiology in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

Signature: 

Full Name: Francis Yeji

5 day of November, 2009.

DEDICATION

This work is dedicated to the Almighty God for his wisdom and grace; my dear parents Mr and Mrs Yeji Annor Tigasua, my loving mother Audrey Pannier and my brother and friend Melvin Felli for their love, prayers, encouragement and support during my studies in South Africa.

ABSTRACT

Good and quality social support has been positively associated with mental health and researchers and clinicians are increasingly recognising the important protective role it plays in people living with HIV/AIDS (PLWA).

We investigated whether the mental health (depression) of patients receiving antiretroviral treatment (ART) in a public-sector treatment programme in the rural district of Umkhanyakude, KwaZulu-Natal, South Africa is influenced by social support and strategies to cope with HIV infection. Depression was assessed in a cross-section of 272 patients (mean age 38 years, age range 20-67 years) with the General Health Questionnaire 12 (GHQ12). A GHQ12 score of 4 or higher indicated mental health pathology (depression), while lower scores indicated normal mental health.

We regressed depression on sex, age, marital status, education, household wealth, social support (instrumental and emotional social support), and 6 strategies to cope with HIV infection. Holding the other variables constant, "instrumental social support" was a significant predictor of mental health pathology (OR = 0.65 P<0.001, 95% CI 0.52 - 0.81). Using "avoidance of people" as a strategy to cope with HIV increased the odds of depression almost threefold (OR = 2.79 P=0.006, 95% CI 1.34 - 5.82), "trying to keep it from bothering" one reduced it by a factor two (OR = 0.45 P=0.068, 95% CI 0.20 - 1.06). 33% of patients were depressed indicating that depression is very common in patients on ART in rural South Africa. In addition to drug treatment, interventions improving instrumental social support and changes in the strategies to cope with HIV infection may be effective in reducing this disease burden among ART patients.

ACKNOWLEDGEMENT

First, I am extremely thankful to God whose infinite grace and wisdom guided me throughout the studies, and my sponsor, INDEPTH NETWORK for the fellowship award that enabled me pursue this course. Secondly, I would like to express my deepest thanks to Professor Kerstin Klipstein-Grobusch and all the staff of the School of Public Health, University of Witwatersrand and Professor Till Barnighausen of the Africa Centre for Health and Population Studies and Harvard School of Public Health for their enormous supervision and guidance throughout this research.

I would like to express my profound gratitude to the Director and entire staff of Africa, Centre South Africa for their reception, providing me with the data which serves as the basis for this report and creating conducive learning environment that enabled me to write this report. Also, I am grateful to the director and staff of Navrongo Health Research Centre for giving me the opportunity to pursue this course here in South Africa.

Also, my gratitude goes to Rev and Mrs Eastwood Anaba (senior pastorate - FGC, Bolgatanga Ghana), Rev Stephen Koomson, and Rev and Mrs Eric Afrifa and the entire membership of FGC, Navrongo for their prayers and support throughout my studies. To Ps Themba Manana, my brother and friend in South Africa and entire membership of Let's Go to Glory Worship Centre (LGTG), Johannesburg South Africa I express my heartfelt felicitations. And to Pastors Simon Wekoli, Stephen Apotara, Roland Owusu Ansah, James Brownson, and all my friends (Charles Annan, Cudjoe Armstrong Portia, Seraphin, Marcus Sellase, Lius Yaw Afful etc) and my entire colleague at Wits, God richly bless you.

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DEFINITION OF TERMS

1. **Depression:** refers to an illness that involves the body, mood, and thoughts. It affects the way a person thinks and sleep, the way one feels about oneself, and the way one thinks about things (NIMH: AJP 2002) Depression was measured using the General Health questionnaire 12 (GHQ12) and any participants (patients) who had a score of four (4) or more on the GHQ12 scoring method was considered to have symptoms of depression.
2. **Social support:** This refers to the emotional, informational, or instrumental assistance from others (Dunkel-Schetter & Bennett, 1990)
3. **Instrumental social support:** refers to tangible services that patients receive from network members such as, get help when sick, get financial assistance, transportation, advice about problems
4. **Emotional social support:** given assurance or goodwill from network members to patients such as love and affection
5. **Coping strategies:** refers to the specific behavioural and psychological efforts that people employ to master, tolerate, reduce, or minimize stressful events (Lazarus & Launier, 1978).
6. **Socio-economic status:** Proxy measure of the wealth of households which is based on household characteristics, ownership of assets (telephone cell phone, watch, radio\stereo, electric stove plate, gas cooker, Fridge television set, video cassette recorder, car/bakkie, motorcycle/scooter, bicycle, sofa, bed nets, cattle etc.)

LIST OF ACRONYMS AND ABBREVIATIONS

ART:	Antiretroviral treatment
DAART:	Directly administered antiretroviral therapy
HAART:	Highly active antiretroviral treatment
PLWHA:	People living with HIV/AIDS
AIDS:	Acquired Immuno-Deficiency Syndrome
HIV:	Human Immunodeficiency Virus
CD4:	Cluster differentiation 4
ACDIS:	Africa Centre Demographic Information system
DSA:	Demographic Surveillance Area
DSS:	Demographic Surveillance System
SSA:	Sub-Saharan Africa
WHO:	World Health Organization
UNAIDS:	The Joint United Nations Programme on HIV/AIDS
GHQ12:	General Health Questionnaire 12

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CHAPTER ONE

1.0 INTRODUCTION AND LITERATURE REVIEW

1.1 Background Information

HIV/AIDS is one of the most pressing health problems the World is faced with in our time. The global burden of HIV/AIDS is enormous, especially in developing countries. Sub-Saharan Africa (SSA) remains the most affected region with more than two thirds (68%) of people living with HIV/AIDS (PLWHA) and more than three quarters (76%) of all AIDS deaths in 2007.[1] According to the UNAIDS, 1.7 million people were infected with HIV/AIDS in 2007 bringing to 22.5 million the total number of people living with the virus. Southern Africa accounts for 35% of all people living with HIV (the largest number of HIV infections in the world.) and almost one third of all new HIV infections and AIDS deaths globally in 2007.[1] In South Africa data indicates 29% HIV/AIDS prevalence among pregnant women and 18.8% among adults population (15-49 years) and about 12% among the general population in 2005.[2, 3, 105]

Since the launch of WHO's '3 by 5' initiative in 2003 (an initiative to put at least 3 million HIV/AIDS patients on antiretroviral treatment by the year 2005), many countries in SSA have established national antiretroviral treatment (ART) programmes. By the end of 2005, an estimated 1.3 million people in low- and middle-income countries had access to treatment, about 20% of those estimated 5-6 million currently in need of ART, including 4 million persons in Africa.[3] A significant numbers of infected people develop mental health problems, and this often adversely impacts on HIV/AIDS treatment and adherence.[9] Integrating psychiatric and psychosocial

interventions could benefit both the mental and the physical health of people living with HIV/AIDS.[4]

The expansion of AIDS treatment initiatives in resource poor settings provides an opportunity for integrating mental health care into HIV treatment. The WHO recommends that attention to the psychosocial needs of PLWHA should be an integral part of HIV care.[5] Typically, the psychological issues associated with HIV illness evolve for individuals and families over the dynamic course of HIV illness and vary depending on the stage of the illness.[6, 7] The introduction of ART has seen a shift in emphasis from coping with the disease to living with and managing HIV as a chronic health condition. This, however, has not eliminated the psychological impact of infection. Coping with the uncertainty of future health and HIV stigma remain the most difficult psychological challenges that permeate many facets of life, even in the context of optimal access to ART.[8]

In July 2004, a group of mental health professionals at a meeting in Johannesburg, South Africa, under the auspices of the WHO recommended that mental health be integrated into the '3 by 5' initiative to support the programme's goals and the need to support research on mental health and HIV/AIDS.[9] Although, over 90% of the burden of HIV/AIDS is in developing countries, little research has been conducted in these countries on HIV and mental health. Whereas mental health care has been integrated into HIV programs in developed countries for many years as a result of substantial evidence of linkages between HIV/AIDS and mental health,[10, 11] this has not been the case in developing countries, thus, the need to replicate this in SSA in general and South Africa in particular.

In 2003, population-based HIV testing was started in the Africa Centre Demographic Information System (ACDIS) through annual surveys for all resident men age 15-54 years; all resident women age 15-49 years, as well as 12.5% of non-residents of these ages.[12] This survey was the first of its kind in South Africa to investigate HIV/AIDS prevalence in a rural setting among residents and non-residents. This was complemented by an ART roll out program in 2004. However, the provision of ART without accompanying mental health and other psychosocial services will most likely not produce the true and lasting beneficial impact.[4] It is thus important to find ways to provide and sustain these necessary services for individuals and families in SSA with limited mental health infrastructure. This study aims to determine the mental health status of HIV patients who were accessing antiretroviral treatment (ART) at the KwaMsane clinic in the Hlabisa ART rollout programme in Kwazulu-Natal between 7th November 2007 and 6th December 2008.

1.2 Problem Statement

Since the introduction of ART programs in South Africa in 2004, more HIV/AIDS patients are now accessing care and treatment. Although, the ART initiation has redirected more focus from coping with the disease to living with and managing HIV/AIDS as a chronic health condition, the psychological impact of infection still remains. Coping with the uncertainty of future health and HIV/AIDS stigma remain the most difficult psychological challenges that HIV/AIDS positive individuals are still grappling with. Studies in Europe and North America have shown that significant number of infected people develops mental health problems including depression and anxiety, and this often adversely impacts on HIV/AIDS treatment and adherence. Although, a number of HIV/AIDS patients who are on ART have developed mental disorders, no study has

been carried out to examine the predictors of mental health disorders in HIV/AIDS patients on the ART rollout programs in rural South Africa.

1.3 Justification for the study

As the ART roll-out extends in developing countries, psychological factors such as stigma, disclosure, and self-efficacy and economic factors will have particular relevance for the success of these programs. Studies in developed countries revealed that HIV-positive individuals often suffer from depression and anxiety disorders as they adjust to the diagnosis, adapt to life with a chronic, life-threatening illness, anticipate and receive news of the disease's progression and witness the death of friends and family members.[13-18] The literature demonstrates that mental health morbidity is associated with poor ART adherence and that mental health care has been integrated into HIV/AIDS programs in developed countries for many years as a result of linkages between mental health and HIV/AIDS. The WHO Mental Health working group has recommended that not only should mental health be an integral part of ART roll out programs in developing countries, but also that mental health and HIV/AIDS research be given priority support if the programs are to succeed.

Although a few studies have been done on the population prevalence of mental illness in Africa in general and South Africa in particular, no study has explored the link between HIV/AIDS and mental illness (depression) in the KwaZulu-Natal (KZN) province, which has the highest HIV/AIDS infection in South Africa. The few studies that looked at mental health and HIV/AID were done in Gauteng and Western Cape provinces that could not be generalised to KZN. Thus, research will be crucial to inform the integration of metal health into the ART roll out programs and provision of HIV/AIDS care services. This research seeks to fill this gap by identifying the factors that affect mental health status (depression) of HIV patients on an ART roll out programme

in KwaZulu-Natal, South Africa. Findings from this research will add to the body of knowledge on the link between HIV/AIDS and mental health.

1.4 Literature Review

The Global Burden of Disease Survey estimates that by the year 2020, mental illness and HIV/AIDS will both be in the top 10 causes of morbidity in developing countries.[19] Since the beginning of the HIV epidemic, people living with HIV/AIDS have faced numerous psychological and behavioural challenges. The advent of antiretroviral therapy (ART) has drastically shifted from some of these key challenges and brought to the forefront new ones, prominent among which is mental health.[8]

Research from Europe and North America has suggested that HIV may affect mental health in different ways over time. Early in the course of HIV disease, the psychosocial impact of an HIV diagnosis, a universally fatal and often stigmatized disease, presents a significant stressor that may increase the prevalence of mental disorders.[13, 14] Several studies have suggested that depressive and anxiety disorders may speed the progression of HIV disease.[15, 16] Evidence from literature also suggests mental illnesses may increase high-risk behaviours for the further transmission of HIV.[17, 18] Although, there are few data on the population prevalence of mental illness in African countries, estimates from the World Mental Health Survey suggest that the burden of mental illnesses may be substantial, particularly common mental disorders of depression, post-traumatic stress disorder, and substance abuse.[20]

According to Bing and colleagues, 36% and 16% prevalence of depression and anxiety respectively was found among a large national sample of HIV-positive persons in the United States.[7] A meta-analysis of studies comparing HIV-positive and HIV-negative samples showed

that major depressive disorder occurred nearly twice as often among HIV-positive than HIV-negative patients.[21] Other studies have shown that adults and children living with HIV/AIDS and/or at risk of acquiring HIV/AIDS are at an elevated risk of psychosocial distress and psychiatric conditions, particularly depression.[22-24]

Some studies for instance, found that intermittent depressive symptoms in HIV positive women are associated with disease progression, lower CD4 cell counts, and higher baseline viral load levels; and, in general, women with chronic depression have mortality rates twice as high as those with little or no depressive symptoms.[25, 26]

Evidence from a number of studies indicates that mental disorders are a significant impediment to adherence to antiretroviral therapy.[27, 28] For instance, a recent study in Peru suggests that in addition to the treatment of specific mental disorders, several behavioural interventions derived from mental health practice may also contribute to adherence.[29] Another study in America suggests that depression can reduce the motivation to seek health care, impair adherence to treatment, and increase mortality.[25]

Cook and colleagues have found that high levels of depressive symptoms and poor mental health significantly reduced utilization of Highly Active Antiretroviral Therapy (HAART) among a cohort of HIV seropositive women in the USA.[30] Their findings are supported by other studies which indicate that depression is one of the factors that are often linked to poor ART adherence.[31, 32] Similar results were found by Olley and colleagues in a study of psychosocial determinants of HIV-related quality of life among HIV-positive patients among the military in Nigeria.[33]

Tegger and colleagues in a study in an urban clinic setting found that mental illness and substance use disorders were common among HIV-infected patients.[34] Their findings are consistent with

studies conducted on HAART that showed a delay in initiation of antiretroviral medications among patients with mental illness.[35, 36] One study found that patients with mental illness were less likely to receive antiretroviral medications.[37] Also, a study of outpatients' clinic population in Australia by Peter and Sternhell using General Health Questionnaire (GHQ) found a significant association between psychiatric morbidity and poor medication adherence.[38]

Despite the importance of HIV/AIDS and mental health because of their substantial contribution to the burden of disease, literature indicates that only a handful of studies have examined the interactions between the epidemic of HIV/AIDS infection and mental illness in SSA. Collins and his colleagues[39] who did a systematic review of literature on HIV and mental illness in developing countries, examined mental health risk factors and consequences for HIV, psychosocial interventions of relevance for HIV persons, and their relevance for HIV care and treatment programs. Among the articles reviewed 30 studies described the mental health consequences of HIV infection; and two reports described psychosocial interventions. Increased physical symptoms of HIV were related to poorer quality of life and greater anxiety.[37] The review demonstrates the need for sound studies of mental health throughout the course of HIV, including factors that support good mental health and interventions that employ identified variables (e.g. family support) for efficacy in reducing symptoms of mental illness.

Although South Africa has a high prevalence of both mental disorders and HIV infection, little is known about the occurrence of mental health illness among HIV-infected persons in general and those on ART in particular.[40-42] In a cross-sectional study among individuals enrolled into HIV care and treatment services near Cape Town, South Africa, Myer and colleagues[43] demonstrated high prevalence (19%) levels of depression among HIV-infected persons. However this prevalence

is lower than levels found in smaller studies of HIV-infected individuals in South Africa, Tanzania and developed country settings.[44-46]

In a study of 149 individuals diagnosed with HIV in South Africa, Olley and colleagues found substantial prevalence of both major depression (35%) and post-traumatic stress disorder (15%) among them.[43, 47, 48] While this study suggests that the burden of mental illness among HIV-infected individuals may be considerable, further research is clearly needed to establish the distribution and determinants of psychopathology among HIV-infected individuals in different settings as well as the mechanisms through which HIV influences mental health status. Freemen and colleagues[49] who studied factors associated with prevalence of mental disorder in people living with HIV/AIDS in South Africa found 43.7% prevalence of mental disorder among participants with depression being the most common disorder (11% major and 29% minor depression). Similarly, Nair and Pillay found 33% prevalence of depressive disorders among patients in a South African general hospital.[50]

Nachega and colleagues in a study on ART adherence in HIV-infected adults in Soweto, South Africa found the fear of being stigmatized by sexual partners to be independently associated with lower adherence.[51]

Evidence from the literature above strongly suggests that several studies that have been done in Europe and North America (developed countries) indicated an association between mental health and HIV/AIDS, which has led to the integration of mental health care into HIV programs.[4, 13-18, 20-23] However, the situation is completely different in SSA where the burden of HIV/AIDS is much felt. Although health professionals, who attended a meeting organised by WHO in South Africa in 2004 recommended mental health should be integrated into the ART roll out programs in SSA and

support be given to research on mental health and HIV/AIDS, the literature indicates that only a handful of studies have examined the interactions between HIV/AIDS and mental illness. This study addresses in part this gap by examining mental health data collected on HIV patients on a rural ART roll out program in Kwazulu-Natal, South Africa in 2008.

1.5 STUDY OBJECTIVES

1.5.1 Main Objective

The main objective of this study is to examine associates of mental health status of HIV patients enrolled in Africa Centre Demographic Surveillance Area (AC DSA) ART rollout programme in KwaZulu-Natal, South Africa between 7th November 2007 and 6th February 2008.

1.5.2 Specific objectives

1. To measure depression prevalence in HIV/AIDS patients on ART in a public-sector ART programme in rural South Africa
2. To examine whether social support and coping strategies affect the outcome of depression in HIV/AIDS patients on ART in rural South Africa

CHAPTER TWO

2.0 METHODOLOGY

2.1 Introduction

This chapter covers the background information about the study area, study design and sampling methods. Data sources, a detail description of the GHQ12 used to measure depression, data collection methods, measurements of study variables and data analysis are also covered in this chapter.

2.2 Study Area

The Africa Centre Demographic Information Systems (ACDIS) is a longitudinal Demographic Surveillance System (DSS), which is situated in the municipalities of Hlabisa and Mtubatuba, in the Umkhanyakude District of Northern Kwazulu Natal, South Africa. The ACDIS maps 10,000 inhabited homesteads in a 438km^2 area, following a total population of approximately 85 000 people who are members of about 11,000 households. Information on births, deaths, migrations, family compositions, conjugal relationships, pregnancies, parental status are collected on residents as well as non-residents who retain membership of households in the demographic surveillance area (DSA). This information is updated six monthly. The population is almost exclusively Zulu-speaking and while predominantly rural, it contains an urban township and informal peri-urban settlements. Although predominantly a rural area, the main source of income for most households is waged employment and state pensions rather than agriculture. In 2006, approximately 77% of households in the surveillance area had access to piped water and toilet facilities. There is a high prevalence of HIV in the area (21.5% among people age 15-49, 51% among women aged 25-29, and 44% among men aged 30-34), and a large proportion of the deaths in the area currently could

be attributed to AIDS.[106] In 2003, population-based HIV testing (population based cohort) was started in ACDIS through annual surveys for all resident men age 15-54, all resident women age 15-49, as well as 12.5% of non-residents of these ages.[12] This survey is the first of its kind in South Africa to investigate HIV/AIDS prevalence in a rural setting among residents and non-residents and was complemented by an ART roll out program in 2004. The ART program is a partnership between the local department of health and the Africa Centre for Health and Population Studies of the University of KwaZulu- Natal, in Mtubatuba, and delivers care and treatment to HIV/AIDS patients through a decentralized network of primary health care clinics. By July 2008, over 5200 patients were being treated at clinics within the surveillance area.[106] Measurements of CD4 counts are done every 4 - 6 months for HIV patients receiving highly active antiretroviral treatment (HAART). The Africa Centre HIV surveillance provide test results through a Voluntary Counselling Test (VCT) paradigm, as it is done in government testing services.

2.3 Study Design

This study is a secondary data analysis of an analytic cross-sectional study nested in a prospective clinical cohort at Africa Centre (AC) in rural KwaZulu-Natal, South Africa.

2.4 Study Population and Sample Size

The study population included all adults (age ≥15) HIV positive patients attending KwaMsane clinic for ART from 7th November 2007 to 6th February 2008.

The sample size comprised all 272 adult HIV positive patients on ART (age ≥15 years) who consented and were enrolled into the study from 7th November 2007 to 6th February 2008

2.4.1 Sampling

This original study adopted a convenience sampling technique of all adult HIV positive persons (age ≥15 years) who enrolled into the AC ART rollout program between 7th November 2007 and 6th February 2008 and were accessing ART at KwaMsane clinic which is the biggest among the ART clinics. ART treatment counsellors based at the clinics introduced all patients coming for a routine ART visit to the study. The patients could then choose to see one of two research assistants who provided them with further information on the study and initiated informed consent process. A total of 272 persons who consented were interviewed and enrolled into the study after going through counselling.

2.4.2 Inclusion criteria

All adult (aged ≥15 years) patients who enrolled into AC ART programme between the periods 7th November 2007 to 6th February 2008 were eligible for the study.

2.4.3 Exclusion criteria

HIV positive patients who began ART treatment for less than 4 months and women who were pregnant at the time of this study were excluded.

2.5 Data Sources

Secondary data of all the 272 patients on ART who were interviewed was obtained from the AC ART Adherence Study for analysis. For data collected as part of the HIV survey, teams of two trained fieldworkers visited each eligible individual in his or her household on an annual basis. The information was stored in a single MS-SQL Server database, in a longitudinal way. The 12-item General Health Questionnaire (GHQ12) which is used to measure both depression and anxiety in a population was used to assess the mental health status of HIV patients on the ART

program. The GHQ12 was administered together with the ART adherence questionnaire by the trained field workers in Zulu and the coded responses for each variable/participant were added up and stored in the MS-Excel database. For the purpose of this study data was extracted from these sources and exported to STATA 10 for analysis.

General Health Questionnaire (GHQ)

The GHQ was developed by Professor David P Goldberg and is a versatile screening questionnaire that is used in both general medical settings and populations to assess psychiatric disorders. It has been shown to be a valid instrument for measuring mental disorders such as depression and anxiety[52-55]. The GHQ was originally designed as a 60-item instrument but several shortened versions are now available, including the GHQ-30, GHQ-28, GHQ-20 and GHQ-12. The shortest version of the questionnaire (GHQ-12) has been extensively validated and used in a number of countries and in more than 30 different languages throughout the world.[23, 55-61]**Error! Bookmark not defined.** For example, Gureje and Obikoya in a primary care setting study in Nigeria demonstrated in their findings the feasibility of using the GHQ12 in Yoruba.[55] The GHQ12 assigns scores to each respondent according to their answers to a number of questions ranging from "better than usual" to "much less than usual" for positive response category and "not at all" to "much more than usual" for negative category. The GHQ12 has six (6) positively worded questions (items) and six (6) negatively worded questions (items) with their respective scoring methods. The 4 categories of responses are coded 1, 2, 3 and 4 and scored 0 = 1, 0 = 2, 1 = 3 and 1 = 4 (i.e. 0 0 1 1), and the scores for each participant are summed up and dichotomised into pathological (using a threshold) and non-pathological. Although a default threshold of 1 or 2 is set, the User's Guide for the GHQ (Goldberg and Williams 1988)[53] recommend that the best threshold score is determined in each country or setting in which it is intended to be used.

However, it is recommended that higher threshold be use in the case of physically ill participants (See Appendix 4 for type of questions and scoring methods).

2.6 Data Collection

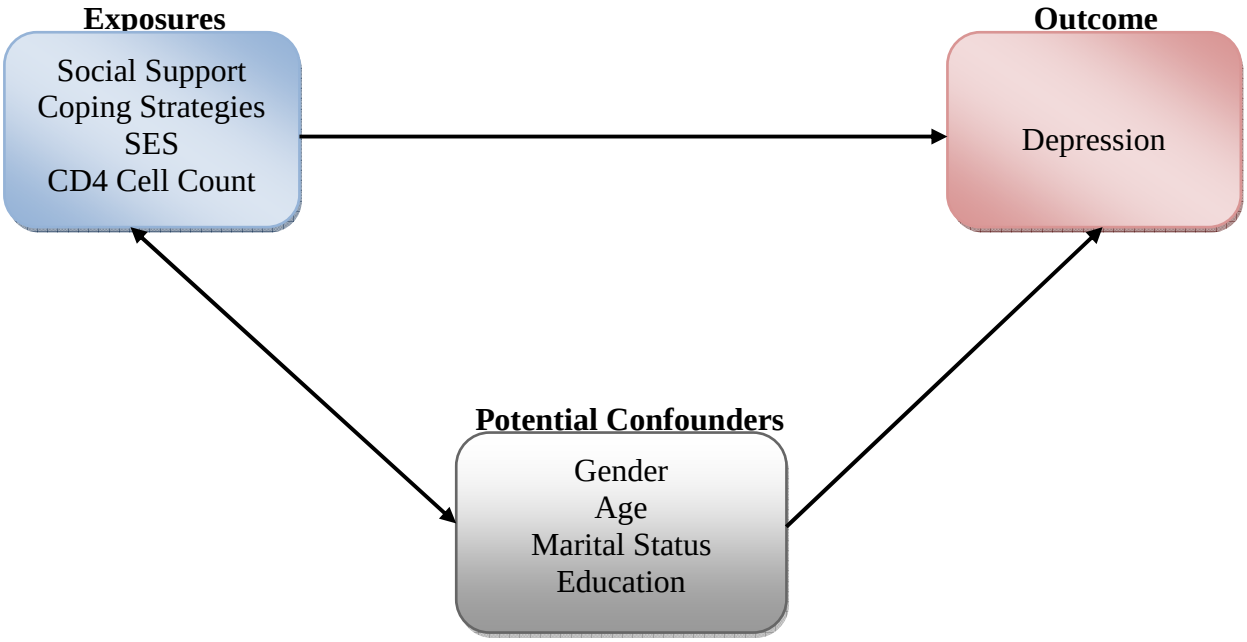
The data was collected from 7th November 2007 to 6th February 2008 in adult HIV/AIDS patients (age ≥15 years) by use of General Health Questionnaire 12 (GHQ12) to assess mental health status (depression). The GHQ12 in addition to the ART adherence questionnaire (used to collect data on other factors) was administered in Zulu by trained interviewers and HIV counsellors to 272 HIV patients who consented to be part of the study between the period 7th November 2007 and 6th February 2008. The anonymity and confidentiality of participants were protected. The Zulu version of GHQ12 was provided (and validated in a pilot study) by Professor Arvin Bhana of University of KwaZulu-Natal (UKZN).

2.7 Description and Measurement of Study Variables

2.7.1 Explanatory variables

Figure 1 below is a presentation of an epidemiological overview of variables used in the current study. Exposure variables are factors that are suspected to be associated with the outcome of interest which could be harmful or a particular behaviour or personal characteristic, and in the present study it relates to depression. The outcome is the condition which occurs as a result of the exposure and/or confounder. The confounder is a variable that is associated with the exposure of interest and a risk factor for the outcome of interest.

Figure 1: An overview of variables used in the present study



Social Support was measured using two orthogonal pc scores, the first capturing largely questions related to 'instrumental social support" (tangible services that patients receives from network members such as, get help when sick, get financial assistance, transportation, advice about problems) and the second capturing largely questions related to "emotional social support" (given assurance to patients such as get love and affection)

Six Coping strategies with HIV/AIDS infection (Avoided being with people in general, Tried to keep it from bothering you, Kept yourself from thinking too much about AIDS, Asked other people for advice and information, Talked to someone about how you were feeling about having HIV, Involved yourself in volunteer work or an AIDS community organization e.g. helping others with HIV /AIDS) with responses ranging from "all of the time" to "none of the time" were included in the analysis. Each of the coping strategies were categorised into binary outcomes of "0" for patients who are not able to cope and "1" for patients who are able to cope.

Socio-economic status (SES) was measured using a principal component analysis (PCA) score summarizing information on household ownership of assets including telephone, cell phone, watch, alarm clock, radio/stereo, primus cooker/sikeni, electric hot plate, electric stove plate, gas cooker, fridge/freezer, electric kettle, television, video cassette recorder, block maker, sewing machine, car/bakkie, motorcycle/scooter, bicycle, kombi/lorry/tractor, table/chair, sofa, kitchen sink, wheelbarrow, hoe/spade, bed nets, cattle and other livestock. These assets were categorized into "0" (patients who do not have the asset) and "1' (patients who have the asset.) The assets were combined into a wealth index using weights derived through principal component analysis (PCA) using Stata 10.

The model was based on the presence or absence of each asset i.e. each asset was dummied with the response, 0 and 1. We ran the PCA command in Stata to generate indices for all listed assets.

The asset approach was used as recommended by Filmer and Pritchett[62] who in a study in many states of India, found that the asset index produces comparable results with other measures. The author noted that the asset index significantly correlated with the state head count index as well as the domestic product per capita distributions.

CD4 cell count for patients were collected at nine (9) different times during the ART adherence study. Using Stata 10, we generated an absolute value for each CD4 cell count per patient and then grouped all the different values to get an average minimum values for each patient using the egenerate command in Stata. The average minimum CD4 cell count was then categorised into "0" for patients whose CD4 cell count ≤200, "1" for CD4 cell count>200 and "2" for missing. These categories were used in the final analysis to check for association between CD4 cell count and depression.

2.7.2 Other explanatory variables

Gender, age, marital status and education are the other explanatory variables found in the literature that was controlled for in this study. Gender was categorised "1" male and "2" females. Whereas Marital status had 3 categories namely: "1" single, "2" married and "3" cohabiting, educational status was categorised as follows: "1" none, "2" primary, "3" secondary and "4" matric/higher.

2.7.3 Outcome variable

The outcome variable is mental health status (depression) of HIV/AIDS patients on ART. We assessed depression in patients by use of the General Health Questionnaire (GHQ12). It was quantified by assigning scores to participants' based on their responses to the questions. In order to arrive at the outcome variable, the scores for each patient were summed up and dichotomised into pathological (above a threshold of 4 for cases) and non-pathological for analysis. Although, a default threshold of 1 or 2 is used in general population, it's recommended that a higher threshold be used when participants are physically sick.[53] Therefore, a threshold of 4 or more was used in this study to identify patients who had depressive disorder. From the literature we found that there are three (3) main possible methods (GHQ, C-GHQ and Likert scoring methods) of scoring the questionnaire,[52, 53, 63] the GHQ scoring method was used in the present study.

2.8 Data Management

Data handling, cleaning and statistical analysis was carried out using STATA version 10. Data in 5 tables (3 ART Adherence study datasets, 1 CD4 cell count dataset and 1 baseline dataset) were stored in Microsoft excel spreadsheet and imported into STATA 10 using the import function. After importing the 5 datasets into Stata, there were all merged into a single master table. Data cleaning was performed involving the checking of quality of the data in terms of missing values,

internal consistencies and validity of responses, recoding and generation of variable. The variables used in this study were selected from the 5 tables. The mental health (depression), gender, age (from date of birth and date of interview) SES, social support and strategies to cope with HIV infection data was obtained from the ART adherence study table 1; educational status obtained from both ART adherence study table 2 and baseline table; marital status data obtained from the baseline table and CD4 cell count data from the CD4 cell count table.

2.9 Data Analysis

2.9.1 Descriptive analysis

Frequencies and percentages for categorical variables and means and standard deviations for continuous variables were used to describe all variables included in this study at 95% confidence interval

2.9.2 Multivariate analysis

Univariate and multivariate logistic regression analysis were carried out to investigate the effects of the independent variables on the outcome variable (depression) controlling for potential confounders at the 95% confidence interval. Four (4) multivariate logistic nested models were finally built to explain the effect of social support, coping strategies, SES and CD4 count on depression holding other variables constant.

Model Selection

We used a combination of back- and forward selection to build four nested regression models in the final analysis of the present study. We included in the analysis independent variables in our regression equations based on our substantive understanding of factors affecting depression (which is based on past studies).Variables (e.g. gender, age)that we strongly believe to be confounders of

the relationship between other variables and our outcome (depression) therefore were allowed to stay in the final model to control for such confounding regardless of their significance status

Although we are not oblivious of the few penalties of including variables on the right hand side of regression equations (loss of d.f., multicolinearity, which we ruled out), the potentially penalties of excluding them (omitted variable bias) is larger and could lead to a bias towards selecting false-positive results.

In addition, it is also viewed that, the finding that some variables do not significantly affects depression (ceteris paribus) is an important one and worth sharing with our readers.

2.10 Ethical Considerations

Ethical approval for this study was obtained from the Human Research Ethics Committee of the University of Witwatersrand - Protocol number M080983 (Appendix 7) for the secondary data analysis. Ethical approval for the primary data collection was obtained by the ACDIS from the University of KwaZulu-Natal and the Harvard School of Public Health Ethics Committees (Appendix 3). Informed consent was obtained from all participants before interview were conducted during the primary data collection.

2.11 Dissemination of Results

A presentation of the results of the study shall be made to staff of ACDIS, School of Public Health (SPH) of the University of the Witwatersrand and the Navrongo Health Research Centre (NHRC). The results will also be disseminated at scientific conferences and published in peer-reviewed journals.

CHAPTER THREE

3.0 RESULTS

3.1 Introduction

This chapter presents the results of the analysis for this study in five (5) parts involving all 272 participants on ART who were included in the analysis of this study. The first part deals with the main characteristics of participants and describes the prevalence of depression among patients.

In the second part, the result of a regression model where we examined the effect of social support (instrumental social support and emotional social support) on depression outcome while holding the other variables (gender, age, marital status, education and SES) constant are presented. The third part deals with a model in which we added six (6) strategies to cope with HIV/AIDS infection (Avoided being with people in general, Tried to keep it from bothering you, Kept yourself from thinking too much about AIDS, Asked other people for advice and information, Talked to someone about how you were feeling about having HIV, Involved yourself in volunteer work or an AIDS community organization e.g. helping others with HIV /AIDS) to examine their effect on the outcome of depression while holding the socio-demographic variables as well as instrumental and emotional social support constant. In the fourth part, we investigated the effect of two other factors namely SES and CD4 cell count on depression in patients. We constructed a wealth component score that summarizes information on 27 household assets for the year 2008 using PCA to estimate socio-economic status. Further, we added a clinical factor (CD4 cell count) to the final model and investigated whether this factor affects depression in patients on ART.

Finally, we looked at the effect of the socio-demographic factors on depression as we adjusted for them in all the four models we built.

3.2 Patients Characteristics

A summary of selected patients characteristics are presented in table 1 for all 272 patients on ART who were enrolled into the current study. The mean age of patients was 38 years with a range between 20 and 67 years (SD=8.7). There was a high proportion of females 214 (78.68%) compared to males 58 (21.32%) during the period under study. Analysis of marital status revealed that majority of patients were single (73.42%), with 21.17% who were married and a further 5.42% cohabiting. The educational status profile showed that majority of patients (40.9%) had secondary education; over nineteen percent (19.3%) had matric or higher education. Whereas 29.7% had primary education, 10% of patients did not have any education. Analysis of patients CD4 cell count showed that more than half of the patients (57.4%) had CD4 cell count >200, and a further 30.9% had CD4 cell count ≤ 200. The median CD4 cell count for patients was 276 (SD = 205.6) and range between 15 and 1169.

Table 1: Descriptive summary statistics of selected variables for HIV/AIDS patients on ART by Depression status

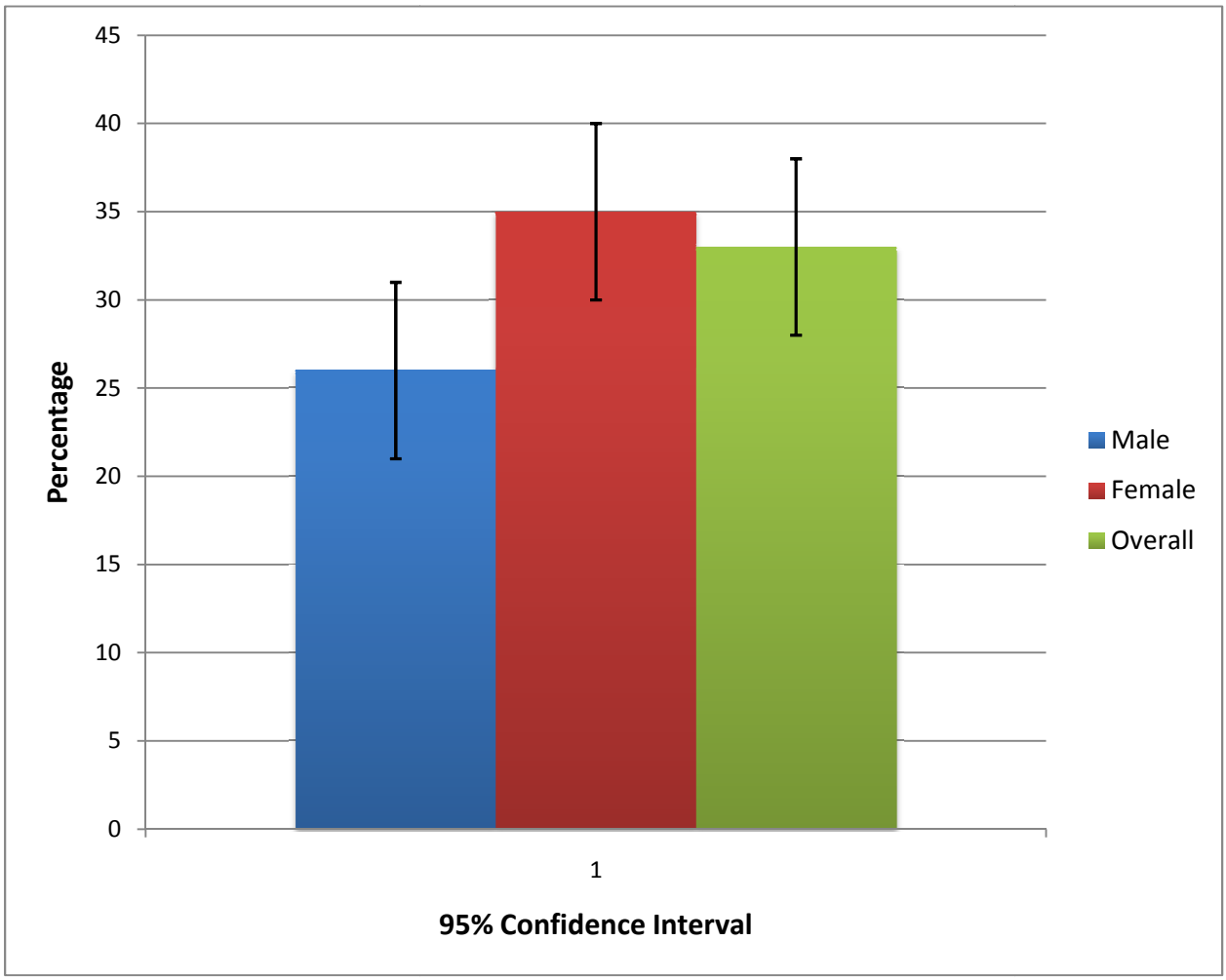
Variable	Depressed n=90	Not Depressed n=182	Total n(%) N=272
Gender n(%)			
Male	15	43	58 (21.32)
Female	139	75	214 (78.68)
Age Group			
20-29			46 (16.91)
30-39	14	32	114 (41.91)
40-49	34	80	86 (31.62)
50-59	30	56	21 (7.72)
60-69	10	11	5 (1.84)
	2	3	
Marital status n(%)			
Single	50	113	163 (73.42)
Married	19	28	47 (21.17)
Cohabiting	6	6	12 (5.41)
Education n(%)			
None	9	17	26 (10.04)
Primary	33	45	77 (29.73)
Secondary	37	72	106 (40.93)
Matric/higher	9	42	50 (19.31)
CD4 cell count n(%)			
≤200	36	48	84 (30.88)
>200	39	117	156 (57.35)
Missing	15	17	32 (11.76)

3.3 Prevalence of depression in HIV patients on ART

Figure 2 showed an overall depression prevalence of 33% among patients on the GHQ scoring method which has been used in this study. Females who constitute about 79% of the study sample had a higher depression prevalence of 35% compared to 26% male prevalence. However, the

gender difference in depression prevalence was not statistically significant as indicated by the overlapping confidence bands in figure 2 below. We found similar results when we further conducted a two-way sample proportion test to check whether there is significant difference by gender (P= 0.196).

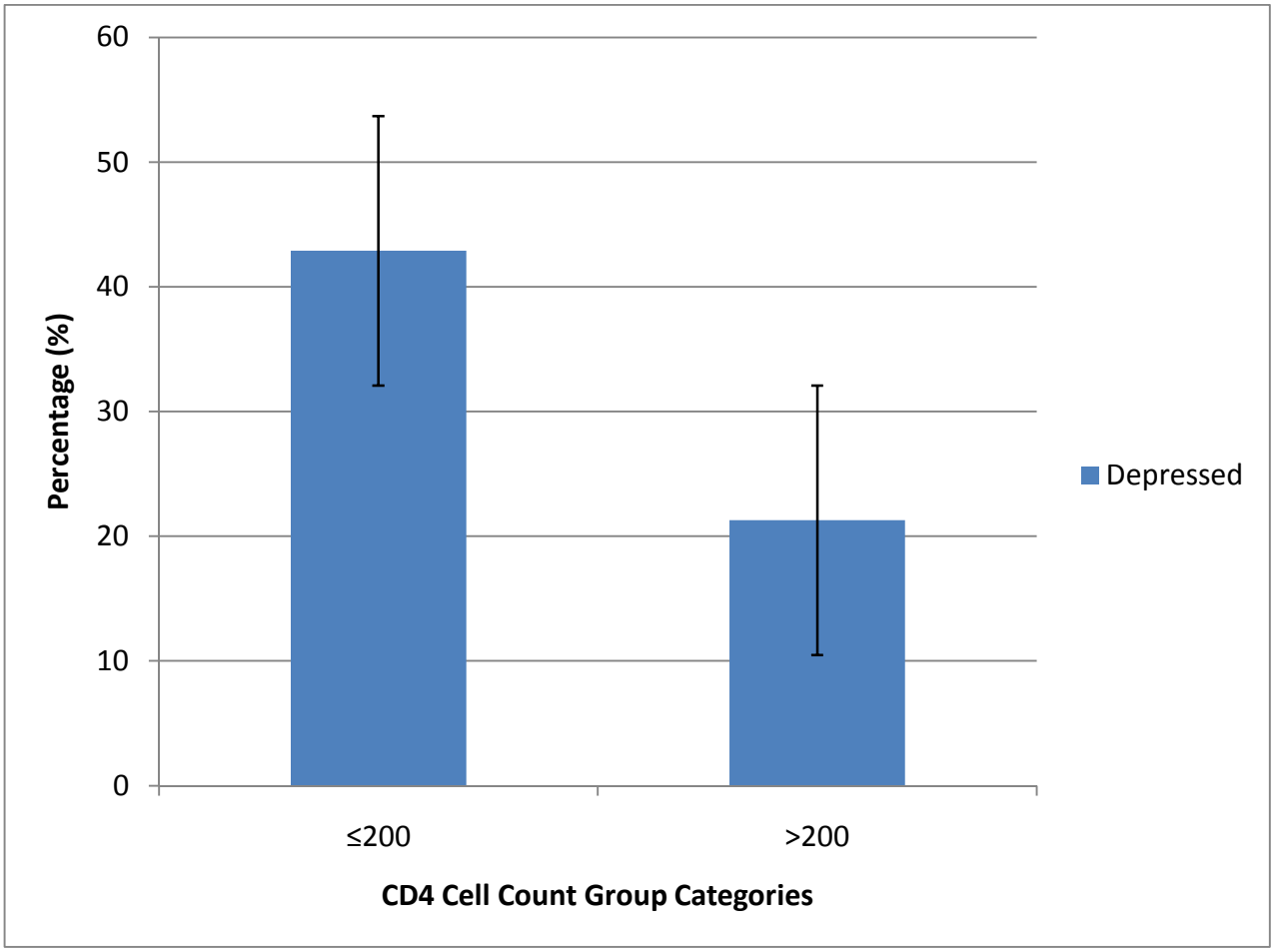
Figure 2: Gender and overall prevalence of depression in patients on ART



The results also demonstrate that there is an association between the prevalence of depression and patients CD4 cell count group. Lower CD4 cell count (≤200) was associated with higher

depression prevalence of 42.9% compared to 21.3% for patients with CD4 cell counts above 200. The differences in the depressed and not depressed group for patients with CD4 cell count >200 was significant as indicated by the un-overlapping confidence bands but not significant for patients with CD4 cell count ≤200 as is demonstrated in Figure 3.

Figure 3: Prevalence of depression in HIV-patients on ART by CD4 cell count groups



3.4 Social Support

The results of this study indicate that instrumental social support and not emotional social support significantly affect depression in patients on public-sector ART. In univariate analysis (SeeTable 2), the odds of patients to be depressed who had good instrumental social support was 40% less compared to patients who did not have good instrumental social support (OR = 0.6 P<0.001, 95% CI 0.52 - 0.74). In multivariate analysis in table 3 (Model II) where we adjusted for other factors (sex, age, education, marital status and SES) instrumental social support still remained a significant predictor of depression among patients throughout the three nested models. The adjusted odds of depression was 30% less for patients who had good instrumental social support (OR= 0.7 P<0.00, 95% CI 0.52 - 0.81) compared to patients who had poor instrumental social support. The effect of instrumental social support remained a highly significant predictor of depression (Table 3) when we added six (6) coping strategies with HIV/AIDS to the variables in Model III (OR = 0.7 P<0.001, 95% CI 0.51 - 0.83) and in the final model IV (OR = 0.7 P<0.001, 95% CI 0.52 - 0.85) where we added CD4 cell count to the variables holding other factors constant.

3.5 Coping Strategies with HIV/AIDS Infection

Both univariate and multivariate analysis showed that “avoidance of people” and “try to keep it (HIV/AIDS) from bothering you” are the two strategies in this study that are significantly associated with depression in patients among the six(6) strategies to cope with HIV/AIDS (see Tables 2 and 3). Univariate analysis results depicted in Table 2 showed that, “avoidance of people” as a strategy to cope with HIV/AIDS increase the odds of depression threefold (OR = 3.1 P<0.001, 95% CI 1.76 - 5.3) and remains significant also in multivariate analysis (See Table 3) where we held other variables constant (OR = 2.8 P=0.006, 95% CI 1.34 - 5.82). The odds of

being depressed is reduced by 40% for patients who try to keep it (HIV/AIDS) from bothering them (OR = 0.6 P=0.07, 95% CI 0.32 - 1.06) in the univariate analysis, and reduced by half (50%) in multivariate analysis (OR = 0.5 P=0.07, 95% CI 0.20 - 1.06). Although the odds of patients who do not involve themselves in volunteer work or an AIDS community organization (e.g. helping others with HIV/AIDS) is increased almost twofold in the univariate analysis (OR=1.8 P= 0.29 95% CI 0.62 – 4.91) and threefold in the multivariate analysis(OR=2.7 P=151, 95%CI 1.69 - 10.73), it was not statistically significant

3.6 Socio-Economic Status (SES)

The analysis of SES in both univariate and multivariate models revealed an association between SES and depression among HIV patients on ART. The unvariate analysis in table 2 indicates that higher SES was significantly associated with decreased depression among patients on ART. The odds of being depressed was decreased by 20% for patients who had a higher SES score (OR=0.8 P=0.001, 95% CI 0.71 – 0.92). A similar association was demonstrated in the multivariate analysis in table 3 (Model I) where SES still remained a significant predictor of depression (OR=0.8 P=0.016, 95% CI 0.70 – 0.97) among patients on ART holding other variables (sex, age, marital status and education) constant. However, it is important to add that the effect of SES was diminished (no longer significant) when we further adjusted for social support in model II and the six (6) coping strategies in Model III and CD4 cell count in Model IV.

3.7 CD4 cell count

The results of both univariate and multivariate analysis demonstrate that CD4 cell count was significantly associated with depressive outcome among patients on ART. There was an inverse

functional relationship between CD4 count and depression; higher CD4 count predicted lower depression and lower CD4 count predicted higher depression among patients. Univariate model in Table 2 demonstrated that the odds of being depressed among patients whose CD4 cell count >200 was reduced by 60% comparing patients with CD4 cell count ≤200 holding other variables (sex, age, education, marital status, SES, social support and copping strategies) constant (OR=0.4 P=0.005, 95%CI 0.25 – 0.78). The multivariate model shows an adjusted odds ratio of 0.5 for patients with CD4 cell count ≤200 in the final model constant in table 3 (P=0.038, 95%CI 0.21 - 0.96).

3.8 Socio-demographic factors

In both univariate and multivariate models, the four (4) socio-demographic variables (gender, age, marital status and education) were included in the analysis of this study and none assumed statistical significance (See Tables 2 and 3). Although in the univariate analysis females had a higher odds of being depressed compared to males, it did not assume statistical significant (OR=1.6 P=0.189, 95% CI 0.81 - 2.97). In multivariate analysis, the odds of being depressed for males was equal to the odds of being depressed for females as shown in table 3. The analysis of educational status revealed an observed trend in which higher education is associated with decreasing depression in patients on ART in both the univariate and multivariate models. The odds of being depressed for patients who attained matric/higher education is reduced by about sixty percent (60%) in the univariate analysis shown in table 2 (OR=0.41 P=0.101, 95%CI 0.14 - 1.20) and fifty percent (50%) in the multivariate analysis in shown in table 5 (OR=0.5 P=0.101, 95%CI 0.11-1.85) compared to patients who have no education. This observed trend however did not assume statistical significance as all the P-values were >0.05 and the confidence intervals included "1"

Table 2: Univariate logistic regression analysis of factors associated with depression in HIV-positive patients on ART

Variable	OR	95%CI	P-value
Gender			
Male	1		
Female	1.55	0.81 – 2.97	0.189
Age (years)	1.02	0.99 – 1.05	0.238
Marital Status			
Single	1		
Married	1.53	0.78 – 2.99	0.212
Cohabiting	2.26	0.70 – 7.35	0.175
Highest Education			
None	1		
Primary	1.39	0.55 – 3.49	0.490
Secondary	0.97	0.40 – 2.39	0.948
Matric/higher	0.41	0.14 – 1.20	0.101
SES			
Low	1		
High	0.81	0.71 – 0.92	0.001
Social Support (instrumental)			
Low	1		
High	0.62	0.52 – 0.74	0.001
Social Support (emotional)			
Low	1		
High	1.08	0.88 – 1.34	0.461
Coping Strategies with HIV/AIDS Infection			
Avoided being with people in general			
No	1		
Yes	3.07	1.76 – 5.36	0.001
Tried to keep it from bothering you			
No	1		
Yes	0.59	0.32 – 1.06	0.079
Kept yourself from thinking too much about AIDS			
No	1		
Yes	0.90	0.53 – 1.53	0.698
Asked other people for advice and information			
No	1		
Yes	1.75	0.80 – 3.82	0.159
Talked to someone about how you were feeling about having HIV			
No	1		
Yes	1.24	0.73 – 2.12	0.428
Involved yourself in volunteer work or an AIDS community organization (e.g. helping others with HIV /AIDS)			
Yes	1		
No	1.75	0.62 – 4.91	0.287
CD4 cell count			
≤200	1		
>200	0.44	0.25 – 0.78	0.005

Table 3: Multivariate regression analysis showing effect of social support, coping strategies, SES and CD4 count on depression holding other variables constant in patients on ART

Variable	Odds Ratio (95% Confidence Interval)*			
	Model I	**Model II**	**Model III**	**Model IV**
Gender				
Male	1	1	1	1
Female	1.00(0.44-2.29)	0.88(0.37-2.08)	0.97(0.38-2.43)	1.04(0.40-2.68)
Age (years)	0.99(0.95-1.04)	1.00(0.96-1.05)	1.01(0.97-1.07)	1.01(0.96-1.06)
Marital Status				
Single	1	1	1	1
Married	1.69(0.75-3.81)	1.49(0.64-3.49)	1.29(0.52-3.19)	1.42(0.56-3.58)
Cohabiting	3.05(0.75-12.33)	1.63(0.39-6.90)	1.74(0.38-7.86)	1.65(0.36-7.63)
Highest Education				
None	1	1	1	1
Primary	1.17(0.41-3.41)	1.14(0.39-3.36)	1.44(0.45-4.58)	1.71(0.51-5.74)
Secondary	0.95(0.32-2.81)	0.87(0.28-2.66)	1.13(0.35-3.69)	1.13(0.33-3.87)
Matric/higher	0.45(0.11-1.85)	0.56(0.13-2.42)	0.84(0.18-3.95)	0.91(0.19-4.38)
SES				
Low	1			
High	0.82(0.70-0.97)*	0.90(0.76-1.07)	0.86(0.73-1.04)	0.87(0.72-1.04)
Social Support (instrumental)				
Low		1		
High		0.65(0.52-0.81)***	0.65(0.51-0.83)***	0.65(0.52-0.85)***
Social Support (emotional)				
Low		1		
High		1.00(0.78-1.30)	0.99(0.75-1.31)	1.01 (0.76-1.34)
Coping Strategies with HIV/AIDS				
Avoided being with people in general. *No*			1	1
Yes			2.79(1.34-5.82)**	2.86(1.36-6.04)**
Tried to keep it from bothering you. *No*			1	1
Yes			0.45(0.20-1.06)*	0.45(0.20-1.07)*
Kept yourself from thinking too much about AIDS. *No*			1	1
Yes			0.68(0.33-1.41)	0.70(0.33-1.45)
Asked other people for advice and information *Yes*			1	1
No			1.46(0.51-4.23)	1.35(0.46-4.00)
Talked to someone about how you were feeling about having HIV *Yes*			1	1
No			1.33(0.64-2.79)	1.26(0.59-2.70)
Involved yourself in volunteer work or an AIDS community organization (e.g. helping others with HIV /AIDS) *Yes*			1	1
No			2.73(1.69-10.73)	2.11(0.54-8.36)
CD4 cell count				
≤200				1
>200				0.45(0.21-0.96)*

Note: *P< 0.05 **P< 0.01 ***P< 0.001

CHAPTER FOUR

4.0 DISCUSSION AND CONCLUSION

4.1 Discussion

To our knowledge this is the first study that examined the effect of social support on depression outcome in HIV/AIDS patients on a public sector ART programme in rural South Africa. The identification of the factors that affect depression in HIV/AIDS patients on ART is useful because they provide clues to the aetiology of depression and its pathogenesis[64]. Clinically, they also enable physicians to formulate a more accurate prognosis since predictors of response to specific medications are very important in selecting treatments. In this study, we investigated whether social support (instrumental and emotional) affects the outcome of depression in HIV/AIDS patients on antiretroviral treatment program. Participants in this study were patients assessing ART in one of the major treatment centers (KwaMsane clinic) for HIV/AIDS in the biggest cohort ART rollout program in South Africa.

Considering the fact that South Africa is one of the hardest hit by HIV/AIDS pandemic (UNAIDS 2007) and that psychiatric disorders contribute substantially to the burden of disease[65], the understanding of the relationship between the four variable (social support, coping strategies, SES and CD4 count) under discussion and mental disorders such as depression could be crucial to the mental and physical health among HIV/AIDS patients seeking treatment.

As mentioned earlier, we included the independent variables in our regression equations based on our substantive understanding of factors affecting depression based on past studies. We also checked whether duration on ART affected depression outcome and whether it was associated

with any of the explanatory variables but there was no effect or association. Variables which we strongly believe to be confounders of the relationship between other variables and our outcome (depression) therefore were allowed to stay in the final model to control for such confounding regardless of their significance status

The present study's 33% overall depression prevalence rate among HIV/AIDS patients on ART using the GHQ scoring method is similar to findings from other studies (using GHQ scoring method) done in a similar context [51, 66-70] and other places.[7] However, some researchers have found either higher (43%)[71] or slightly lower depression prevalence rates.[49, 72, 73]

In order to have a robust scoring method in measuring the outcome of depression, we assessed whether the three (3) main GHQ scoring methods (GHQ, C-GHQ and Likert) gave consistent results in this population. The results (data not shown) indicate that there are no significant differences in prevalence of depression with respect to scoring methods. We further conducted a test of two-way sample proportion and chi-square test and all the P-values were >0.05, with the corresponding confidence intervals overlapped confirming no significant difference **(**see Appendix 1**)**. Therefore, in the present study we used the GHQ scoring method which has not only been recommended by David Goldberg who developed the questionnaire, but also used by other researchers in similar context.[50, 55] Although the three (3) methods score differently, the scores are summed into pathological (depressed) or non-pathological (not depressed) using thresholds and this may explain the consistency in results.

Females (who constitute 79% of the study sample with a high HIV infection in the study area) had a higher depression prevalence of 35% compared to 26% male prevalence. Similar to most studies,

the gender difference in depression prevalence among HIV patients was not statistically significant(figure 2) in our study.[66, 74] We found similar results when we further conducted a two-way sample proportion test (not shown) to check whether there is a significant difference by gender (P= 0.196). It is of interest to note that Olley and colleagues who examined predictors of depression in recently diagnosed patients with HIV/AIDS in South Africa found no significant difference in depression prevalence by gender.[47] However, Margaret and her colleagues in a study of the prevalence of psychiatric disorder in a South African general hospital and Freeman and Colleagues who investigated the prevalence of mental disorder in PLWHA in South Africa both found significant difference in gender.[49, 50, 66] Steffens and colleagues found similar results in a study of depression prevalence among the elderly in America.[75]

The results of this study support the hypothesis that social support and coping strategies affect the outcome of depression in HIV/AIDS patients on ART in rural South Africa. The finding demonstrates strongly that instrumental rather than emotional social support is an important factor that affect depressive outcome in patients on ART as the odds of depression among patients who had adequate/good instrumental social support is 35% less compared to patients who did not have adequate/good instrumental social support (P<0.001, 95%CI 0.52 – 0.85). The other three (3) explanatory variables (SES, copping strategies and CD4 cell count) included in the analysis of this study were also found to be significant associated with depression, we discuss the details later in this section of the report.

The results of this study could have been expected because evidence from previous studies suggests an association between social support, SES and CD4 cell count and the outcome of depression.[76, 77] Our findings therefore provide further evidence to the important role of social support in particular and SES, coping strategies and CD4 cell count in general to the outcome of

depression in HIV/AIDS patients in a public sector ART program. The results particularly reveal that instrumental rather than emotional social support affect depression in patients on ART.

4.1.1 Social Support and outcome of depression

Social support**,** defined as emotional, informational, or instrumental assistance from others[78], has been associated with better health, faster recovery from illness, and lower risk for mortality[79, 80]

We measured social support using two orthogonal pc scores, the first capturing largely questions related to 'instrumental social support" (tangible services that patients receives from network members such as, get help when sick, get financial assistance, transportation, advice about problems) and the second capturing largely questions related to "emotional social support" (given goodwill and assurance to patients such as get love and affection). We analysed social support using two scores in order to allow us identify which particular aspect of social support significantly affects depression in HIV/AIDS patients on ART. This categorisation is consistent with previous studies done elsewhere which have used similar categories to examine the effect of social support on depression in patients on ART.[69, 81]

Evidence from studies of people with HIV infection suggest that social support is critical for emotional well-being and during periods of crisis, family support may become an especially important determinant of emotional well-being.[82, 83] In direct relevance to the present study, Gurung and colleagues found that higher levels of social support from friends and from family made independent contributions to lower depression in persons infected with HIV/AIDS.[84] [79, 85]

The results strongly suggest that instrumental social support rather than emotional social support is significantly associated with depression among HIV/AIDS patients on ART in a public-sector ART roll out program. Although the design of our study is cross sectional and unable to establish

causality, the findings suggest that poor social support (instrumental) may precede the onset of depressive symptoms and could be a characteristic of the social lives of patients prone to depressive symptoms. Also, showing of goodwill and giving assurance to patients may not be a sufficient antidote to prevent the onset or treatment of depression, but rather the quality of instrumental social support received by HIV patients positively impacts on the level of depression they experience. Even when non-significant variables were eliminated from the final model IV in the regression analyses; there were only minor changes in the adjusted *R*2 value and the odds ratio (See Appendix 2) for instrumental support remained the same.

Social support has several domains and some studies suggest that it operates best when matched to a particular context and situation.[108 109 110] Sometimes, people simply want companionship; they want others to participate, or join them in their excitement. But in some situations, they want others to be there to provide them with support, encouragement, or displays of love. It may be the case that instrumental social support operates best in this context. Therefore, the categorisation of social support as instrumental and emotional in this study does not necessarily means emotional social support is not an important.

The presence of quality instrumental social support protects HIV/AIDS patients against the onset of depression; thus, the probability that a patient will suffer from a depressive episode appears to be influenced by social support. The present study's finding is consistent with existing literature[69, 76, 77, 86-89]. For example, Robbins and his colleagues in a study of the protective role of family and social support network among HIV positive women found that social support is an important moderator of the relationship between changes in CD4 cell count and psychological distress (anxiety and depression).[85] Similarly, Gazmararian and colleagues in a study of multivariate

analysis of factors associated with depression in the USA demonstrated that available social support was a strong predictor of depression, and that individuals who were currently married or had better social support had lower depression.[77] Hirschfeld in a systematic review of literature on psychosocial predictors of outcome of depression found that social support offers protection against the development of depression in persons in stressful situations.[64] His findings provide evidence that individuals with low social support are at greater risk of developing depressive symptoms. Similarly Flaherty and colleagues found that patients with high social support had significantly better depressive rating scores than patients with low social support. It is important to state that instrumental rather than emotional social support is the strong predictor of depression found in this study. This means that patients are more affected by availability of tangible social support services that patients receive from network members such as getting help when sick and get financial assistance, to them when in need than emotional social support. This finding is consistent with other research that shows subjective social support as the most important dimension of support relating to depression.[69, 76]**Error! Bookmark not defined.** For example, Spoozak and colleagues in a study evaluating a social support measure that may indicate depression during pregnancy demonstrated that frequency of contact from mother or father was important to over all social support. Similar our categorisation of social support, Vyavaharkar and colleagues have reported that there is an association between social support and adherence in a study which examined social support, coping, and medication adherence among HIV-positive women with depression living in rural areas of the Southeastern United State.[81]

Further analysis showed some correlation between social support and SES (Pearson correlate = 0.36). The two factors were significantly was moderately correlated ($P < 0.05$). It may be the case

that the effect of social support is mediated through SES, but that is not clearly supported by the result of the present study.

In conclusion, the findings of the present study strongly demonstrate that instrumental social support is significantly associated with depression outcome in HIV-positive patients on ART, even when we adjusted for all other factors in the final model. The quality of social support received by patients on ART affects the likelihood of developing depression; the better the quality of instrumental social support available to a patient on ART the lesser the likelihood of being depressed, and the poorer the availability of instrumental social support the greater the likelihood of being depressed.

4.1.2 Coping strategies with HIV/AIDS infection and the outcome of depression

Coping strategies refer to the specific behavioural and psychological efforts that people employ to master, tolerate, reduce, or minimize stressful events.[90] Researchers have especially distinguished between approach and avoidance coping strategies: An individual can approach a stressor and make active efforts to resolve it or try to avoid the problem.[91] Generally, people who rely more on the approach strategy adapt better to life stressors and experience less negative effect than those who make use of avoidance strategy. Therefore, active coping strategies may represent a resource that can reduce the likelihood of depression in the context of HIV infection.

In the present study "avoid being with people in general" and "try to keep it (HIV/AIDS) from bothering you" were the two (2) important factors among the six (6) strategies to cope with HIV/AIDS infection that were found to be significantly, associated with the outcome of depression in patients on ART. Whereas "avoid being with people in general" as a coping strategy was found to negatively associated with depression, "try to keep it (HIV/AIDS) from bothering you" was

found to be positively associated with depression. Even when we further eliminated the four non-significant coping strategies from the model (data not shown) the effect of the two significant coping strategies did not change as the adjusted R2 only changed slightly and the odds ratios remained the same.

Similar to the variables used to measure coping strategies in our analysis, Vyavaharkar and colleagues who examined social support, coping, and medication adherence among HIV-positive women with depression living in rural areas of the southeastern United States measured coping responses using eight (8) variables.[87] They found, coping by denial/avoidance, were positively correlated with reasons for missed medications.

We further investigated whether there is any correlation between coping strategies and social support. The results largely showed no correlation except "tried to stop bothering" (P = 0.177) and "kept yourself from thinking too much about AIDS" (0.691) which showed little correlation. This suggests that patients who have good social support are able to cope better with HIV infection compared to those who do not have good social support.

Although, "involved yourself in volunteer work or an AIDS community organization (e.g. helping others with HIV /AIDS)" had a an OR = 2.1 indicating that patients who did not involve themselves in volunteer work or AIDS community organisations were two times more likely to experience depression compared to those who involved themselves, it did not reach significant level. This may be explained by the fact that in the study area, volunteer work and AIDS community organisations are not common.

The findings of this study suggests that avoiding being with people as a strategy to cope with HIV/AIDS infection is inversely related to depression among patients on ART, and trying to keep HIV/AIDS from bothering you was found to be positively associated with lower depression. We

found no association between the other four (4) coping strategies and depression outcome in patients on ART.

4.1.3 Socio-economic status (SES) and depressive outcome

Depression is slightly more prevalent in people of lower SES than people of higher SES. Previous studies have shown that poverty and HIV prevalence are related in South Africa and poverty and mental health are also related.[70, 92-94] It may be the case that poverty and HIV/AIDS exacerbate each other and in combination impact on mental health leading to higher prevalence of mental illness than are expected for other very poor people or those who have HIV but are not poor. The vicious circle may be further exacerbated by the possibility that poor mental health can be a risk factor for both poverty and HIV/AIDS as well as a consequence of both of them The findings of this study demonstrate that HIV patients of lower SES were more likely to be depressed than patients of higher SES (See Table 3, Model I), and these findings are similar to other findings from other studies that have suggested an association of low SES and depression.[84]

Although SES was a significant predictor of depression in patients on ART in multivariate analysis (Model I) where we adjusted for gender, age, marital status and education, the association was no longer significant when we additionally adjusted for social support in Model II. The reasons for such a development are not known in this study as further analysis showed there was a moderate correlation between SES and social support (Correlation = 0.36). It may be the case that patients who belong to higher SES have better social support. Although our findings suggest SES to be a predictor of depression among patients, the causal pathway of this association is likely through social support.

4.1.4 CD4 cell count and the outcome of depression

In the present study, higher CD4 cell count (>200) was found to be associated with lower depressive outcome compared to patients who had lower CD4 cell count (≤200). After we further controlled for socio-demographic factors (sex, age, marital status, and education), SES, social support and coping strategies, higher CD4 count (>200) was still found to be significantly associated with lower depression outcome in patients ($P<0.05$). There is conflicting evidence internationally about the association between CD4 cell count and depressive outcome in HIV/AIDS patients. The finding of the present study is supported by Ickovics and colleagues who demonstrated that depressive symptoms are associated with lower CD4 cell count and disease progression.[26, 77, 95] Furthermore, Robbins and colleagues who examined the protective role of family and social support in African American HIV-positive women demonstrated that changes in CD4 count were inversely associated with psychological distress (women with lower CD4 count showed greater psychological distress).[76] In contrast, other studies carried out in South Africa[66, 68, 94, 96] did not find any significant association between CD4 count and depression. For instance, Moosa and colleagues[96] in a study in Gauteng province in South Africa concluded that there is no significant difference in the CD4 cell counts between depressed and non-depressed groups of HIV infected people Similarly, Melvyn Freeman in a study of mental disorder in people living with HIV/AIDS in South Africa found no significant association between CD4 cell count and presence of mental disorder. It should be noted that although we found an association between CD4 count and depression, we are unable to make definitive statements/conclusions since the present study is cross sectional. For instance, since all patients are on ART it is not clear whether knowledge of improved changes in CD4 counts may have influenced the reporting of lower depression for patients with higher CD4 counts. Again, it's possible that the higher CD4

count may have influenced other biological or physiological factor not accounted for in the present study which in turn influences depression. Further longitudinal study is recommended to establish this relationship.

4.2 Implications and Recommendations

The results of this study indicate high depression prevalence in people on ART in rural South Africa and needs to be addressed in ART programmes. Our analysis suggests specific possible ways to address depression in patients on ART

Our findings demonstrate that instrumental social support influence depression in patients on ART, and these findings have practical public health implications for the development of interventions/measures to prevent the onset of depression and treatment. First, because depression is a burden adding to the already existing problems of HIV/AIDS, efforts at reducing the level of depression or treatment will help a lot in minimizing the painful experiences of patience of PLWA. Although ART has been rolled out across South Africa and other African countries, there has not been any program aimed at preventing or treating depression among patients receiving treatment.

The results of the present study therefore highlight the need for programs aimed at addressing this major health concern. The absence of clinically significant symptoms of depression is often characterized by the ability to achieve and maintain positive psychological states of mind[(97)].Since studies have demonstrated that depressive symptoms and depressed mood predict decrements in CD4 cell counts and increases in HIV viral load among HIV-positive individuals on ART , thus reduce/impair adherence public health efforts to prevent or treat depression would be particularly

beneficial in terms of adherence and improved physical health of patience. [8, 22, 23, 98-101] This could be done through:

First, group-based Interpersonal Psychotherapy (IPT) for patients on ART could be effective as evidence from studies have shown that that IPT is effective in the treatment of depression.[67, 102-104] Of particular interest to the current study is a randomized control trial done by Bolton and other researchers in rural Uganda which is similar to our setting and found IPT to be highly efficacious in depression reduction among patients.[102]

Secondly, HIV counseling may also be refocused to help patience cope with the disease while on ART because patients who had better coping strategies were found to have lower depression. The education of health professional working with patients to identify early warning symptoms of depression and integration of mental health screening and referrals into routine as being protection against depressive symptoms suggests clinicians should routinely assess patients' support networks and encourages their utilization and development.

The psychosocial role of the consultation itself, both as listening support and as potential fresh-start, should not be underestimated: if during consultation, attention is paid to the social context of a depressive episode, and adherence may thus be increased.

Mental health affects progress towards the achievement of many Millennium Development Goals (MDGs) such as reversal of the spread of HIV/AIDS, improvement of maternal health, reduction of child mortality and promotion of gender equality and empowerment of women, therefore measures to reduce/treat depression in HIV patients will help achieve the MDGs particularly reversing the spread of HIV/AIDS.

4.3 Methodological Considerations

4.3.1 Limitations of study

A number of limitations of this study need to be mentioned. First, because this is a cross-sectional study design and cannot address questions of causality we cannot claim that low social support precedes depression. In order to determine if high social support protects a subject from depression onset, the study must be longitudinal and beginning with a group of subjects who have no current symptoms of depression. Also, there was no direct control group for comparison.

Furthermore, in our model we did not control for prior history of depression. It would be important to see how a prior history of depression would influence the relationship between depression and social support, especially in a longitudinal analysis. The results may not be generalised to urban populations since our study was done in predominantly rural area.

4.3.2 Strengths of the study

Despite the above limitations, there were several notable strengths of the present study. This study was imbedded in a large ongoing prospective clinical cohort study on the biggest antiretroviral treatment roll out program in South Africa. Thus, it is a direct representation of HIV-positive patients on ART and we may be able to make generalizations in that regard.

Secondly, the GHQ12 used to measure the outcome of depression was validated and scoring method robust. We did a method comparative study of the three (3) major methods used widely in various studies demonstrating that the GHQ scoring method used in the present study is robust.[52, 53, 63]

The traditional GHQ scoring method was used to generate the outcome variable (depression). We first scored the data using the above three methods separately to get the overall and gender

prevalence of depression among patients by the various methods. We also performed one-sample test of proportion (prtesti) for overall prevalence and a two-way sample test of proportion (prtesti) for prevalence by gender to see if there are significant differences in the scoring methods. The tests showed that there are no significant differences between the various scoring methods, thus, whichever method is used will produce nearly the same prevalence (this is discussed further in the results section of this report). We chose to use the traditional GHQ scoring method recommended by Goldberg and used widely in both developed and developing countries.

Another notable strength of this study is that, unlike previous studies which examined social support generally, we differentiated between instrumental social support and emotional social support. This allowed us to investigate which particular aspect of social support affect depression in patients on ART so as to inform effective policy direction and intervention. The study clearly demonstrates that goodwill from social network of people for patients on ART is not enough to influence lower depression

Finally, the inclusion of a biological factor (CD4 cell count) in the analysis strengthens the present study because it enabled us to control for physical health status of patients which is an important determinant of depression.

4.4 Conclusions

The findings of the present study indicate high depression prevalence in patients on ART in rural South Africa and the need to address it in ART programmes. Specifically, our results demonstrate that instrumental social support but not emotional social support affects depression in HIV-positive patients on ART in rural South Africa. The availability and accessibility of instrumental

social support would therefore play a critical role in protecting HIV positive patients on ART. Further, two (2) among the six strategies to cope with HIV/AIDS infections ("avoid being with people generally" and " try to keep it(HIV/AIDS) from bothering you") were found to be significantly associated with depression among patients on ART. Whereas "avoid being with people generally" was found to be positively associated with depression, "try to keep it from bothering you" was negatively associated with depression. Our findings are consistent with other studies which found social support to be associated with depression in HIV patients.[76, 77, 86, 87]

Socio-economic status was (SES) also associated with depression but the effect becomes insignificant when we adjusted for social support. The reasons are not known in this study but the causal pathway may likely be through social support. Higher CD4 cell count (>200) was found to significantly associated with low depression prevalence and these results are similar to a study by Robbins et al who found that changes in CD4 count affect psychological distress. There was no significant difference in prevalence of depression among patients by gender.

In addition to drug treatment, interventions improving instrumental social support (or substitutes for such support) and changes in two particular strategies to cope with HIV infection may be effective in reducing this disease burden among ART patients.

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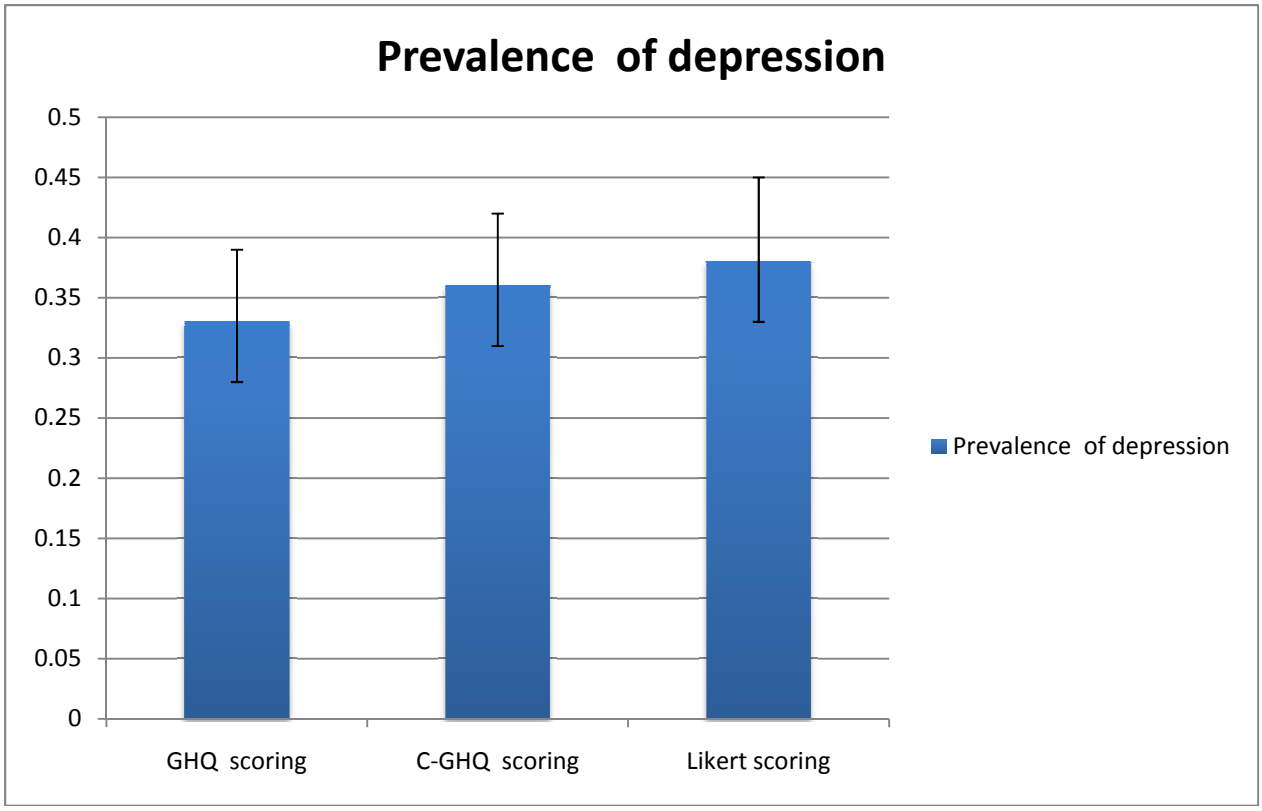
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APPENDICES

Appendix 1: Prevalence of depression among patients on ART by GHQ scoring methods



Appendix 2: Multivariate logistic regression analysis of factors associated with depression in patients on ART

Variable	OR (95% CI)*
Gender	
Male	1
Female	0.99 (0.39 – 2.51)
Age (years)	1.00 (0.96 – 1.05)
Marital Status	
Single	1
Married	1.53 (0.62 – 3.76)
Cohabiting	1.88 (0.43 – 8.23)
Highest Education	
None	1
Primary	1.55(0.48 – 4.99)
Secondary	0.95 (0.29 – 3.16)
Matric/higher	0.75 (0.16 – 3.50)
SES	0.86 (0.72 – 1.03)
Social Support (instrumental)	0.69 (0.54 – 0.87)**
Copping Strategies	
Avoided being with people in general	2.83 (1.37 – 5.88)**
Tried to keep it from bothering you	0.53 (0.24 – 1.16)
CD4 cell count	
<=200	1
>200	0.40 (0.19 – 0.83)*

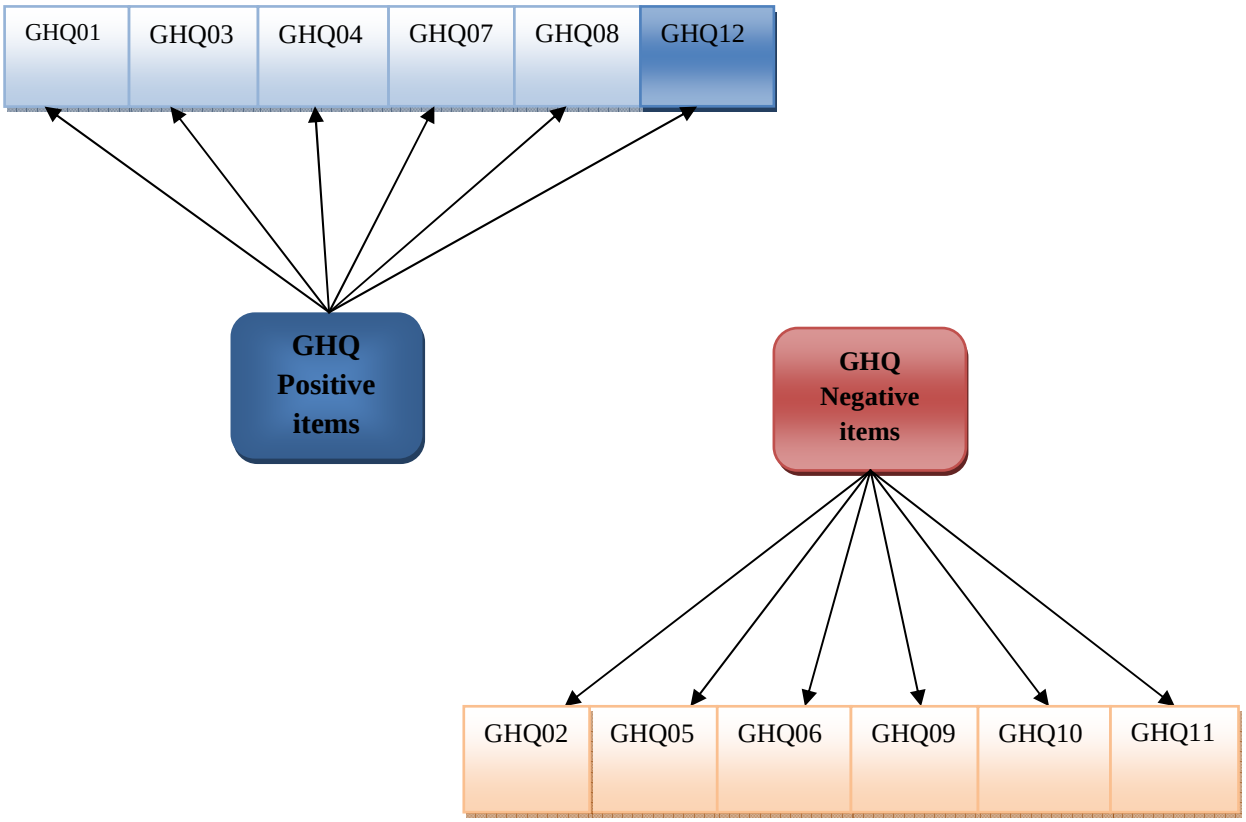
Note: *P< 0.05 **P< 0.01 ***P< 0.001 All factors adjusted for each other

Appendix 3: 12 item version of the General Health Questionnaire (GHQ12)

Name				Date
Please consider the last four weeks and answer the following questions by selecting and circling one of the four answer options.				
Question	**1**	**2**	**3**	**4**
1. Been able to concentrate on what you're doing	Better than usual	Same as usual	Less than usual	Much less than usual
2. Lost much sleep over worry	Not at all	No more than usual	Rather more than usual	Much more than usual
3. Felt you were playing a useful part in things	More so than usual	Same as usual	Less useful than usual	Much less useful
4. Felt capable of making decisions about things	More so than usual	Same as usual	Less useful than usual	Much less useful
5. Felt constantly under strain	Not at all	No more than usual	Rather more than usual	Much more than usual
6. Felt you couldn't overcome your difficulties	Not at all	No more than usual	Rather more than usual	Much more than usual
7. Been able to enjoy your normal day-to-day activities	More so than usual	Same as usual	Less useful than usual	Much less useful
8. Been able to face up to your problems	More so than usual	Same as usual	Less useful than usual	Much less useful
9. Been feeling unhappy and depressed	Not at all	No more than usual	Rather more than usual	Much more than usual
10. Been losing confidence in yourself	Not at all	No more than usual	Rather more than usual	Much more than usual
11. Been thinking of yourself as a worthless person.	Not at all	No more than usual	Rather more than usual	Much more than usual
12. Been feeling reasonably happy, all things considered	More so than usual	About the same as usual	Less so than usual	Much less than usual

Appendix 4: GHQ12 questions and scoring methods

Positive worded questions scored 0 0 1 1 on both GHQ and CGHQ scoring methods but scored 0 1 2 3 on the Likert scoring method



Negative worded questions scored 0 0 1 1 on GHQ method, 0 1 1 1 on CGHQ method and scored 0 1 2 3 on the Likert scoring method

Appendix 5: Adherence Study Questionnaire

Study ID:_____

Interviewer code: _____

Date Interview conducted: _____ _____/_____ _____/ _____ _____

D D M M Y Y

Review by interviewer: _____

Reviewed by second RA: _____

Data entered: _____(date: _____/_____/_____)

QC completed: _____

ADHERENCE STUDY QUESTIONNAIRE: INTERVIEW

I would first like to ask you some questions about your antiretroviral treatment.

1. (Please indicate the sex of the respondent. Circle one.)

Female …… 1

Male ……..…….....2

2. When is your birthday?

DAY: ☐☐ MONTH: ☐☐ YEAR: 19 ☐☐

3. For how many months have you been taking antiretroviral medication?

MONTHS: ☐☐

4. Have you told anyone that you are HIV positive?

(Circle one.)

Yes **(Ask Q. 5)**…… 1

No **(Skip to Q. 6)**……..……..... 2

No reply ……...*99*

5. Could you tell me who you have told that you are HIV positive? **(Read categories to respondent and circle answer for yes or no to each.)**

	Yes	**No**	**No reply**
a. Father ……	1	2	3
b. Mother……	1	2	3
c. Partner……	1	2	3
d. Sister …….....	1	2	3

7. Could you tell me who you have told that you are currently taking antiretroviral medication? **(Read categories to respondent and circle answer for yes or no to each.)**

	Yes	**No**	**No reply**
a. Father ……..	1	2	3
b. Mother…….	1	2	3
c. Partner……..	1	2	3
d. Sister …….....	1	2	3
e. Brother…….	1	2	3
f. Aunt ..…….....	1	2	3
g. Uncle……	1	2	3
h. Grandmother ….....1	2	3	
i. Grandfather……1	2	3	
j. Friend…….....	1	2	3
k. Son ..…….....1	2	3	
l. Daughter..…….....	1	2	3

m. Other (*Specify.*) _____

8. Could you tell me whether you take any of the following? **(Read categories to respondent and circle answer for yes or no to each.)**

	Yes	**No**	**No reply**
a. Herbal medicine ……..	1	2	3
b. Nutrition (vitamins, oils, etc.)…..	1	2	3
c. Anti-AIDS muti….....	1	2	3

d. Other (*Specify.*) _____

In order to treat diseases or conditions other than HIV/AIDS are you

e. Brother……	1	2	3
f. Aunt ..…….....	1	2	3
g. Uncle……..	1	2	3
h. Grandmother ….....	1	2	3
i. Grandfather……	1	2	3
j. Friend……....	1	2	3
k. Son ..…….....1	2	3	
l. Daughter..…….....	1	2	3

m. Other (*Specify.*) _____

6. Have you told anyone that you are taking antiretroviral medication? **(Circle one.)**

Yes **(Ask Q. 7)**…… 1

No **(Skip to Q. 8)**……..……..... 2

No reply ……..*99*

12. Would you tell me why you have put off going to the clinic or the hospital in the last 3 months? **(Read categories to respondent and circle answer for yes or no to each.)**

	Yes	**No**	**No reply**
a. Inyanga…….……	1	2	3
b. Sangoma……..	1	2	3
c. Umthandazi …….....	1	2	3
d. Kwamsane clinic……..	1	2	3
e. Another government clinic……..	1	2	3
f. Hlabisa hospital ……...	1	2	3
g. Another government hospital ….	1	2	3
h. Private clinic or hospital ..……..	1	2	3
i. Pharmacy……..	1	2	3
j. Self-treatment …….....1	2	3	

k. Other (*Specify.*) _____

10. How long does it usually take you to travel from your home to Kwamsane clinic?

MINUTES: ☐☐☐

11. In the last 3 months, have you ever put off going to the clinic or or hospital? **(Circle one.)**

Yes **(Ask Q. 12)**…….. 1

No **(Skip to Q. 13)**……..……... 2

No reply …….*99*

14. Would you say that you have set times for getting up and going to bed? **(Circle one.)**

Yes…… 1

a. I was too sick……1 2 3

b. I didn't have enough money

to pay for transport to get there…1 2 3

c. Transport was unavailable.....1 2 3

e. I had family obligations.....1 2 3

f. I did not have anyone to

accompany me.....1 2 3

g. Taking care of someone else

was more important to me..... 1 2 3

h. I had to work…….....1 2 3

i. Other (*Specify.*) _____

I would now like to ask you two questions about your daily life.

13. Would you say that you have regular routines every day?

(Circle one.)

Yes ……... 1

No ……..……..... 2

No reply …….*99*

No……..…..…….... 2

No reply …….*99*

15. Overall, how would you rate the quality of the care you received in this antiretroviral clinic in the last month? **(Circle one.)**

Poor……... 1

Fair…… 2

Good……. 3

Very good……..4

Excellent……5

No reply ……..*99*

16. These next questions are about your overall health and quality of life. Overall, how would you rate your current health? **(Show to respondent and ask him/her to circle one number)**

|_____|_____|_____|_____|_____|_____|_____|_____|_____|_____|

0 1 2 3 4 5 6 7 8 9 10

Worst possible health — Halfway between worst and best — Best possible health

17. Overall, how would you rate your quality of life? **(Show to the respondent and ask him/her to circle one number)**

|_____|_____|_____|_____|_____|_____|_____|_____|_____|_____|

0 1 2 3 4 5 6 7 8 9 10

Worst possible quality of life — Halfway between worst and best — Best possible quality of life

Like most people, it is likely that you have missed taking your antiretroviral medication at some point in time. In order to improve the adherence support that patients are getting, we would like to ask you three questions about how often you have missed taking your antiretroviral pills. Because you take the antiretroviral pills two times every day, there are two possibilities each day when you could have missed taking your antiretroviral pills. We ask you to answer the questionnaire with only your ANTIRETROVIRAL medication in mind, i.e. the mediation in the seven-day pill boxes that you receive from the antiretroviral treatment services.

18. During the last **7 days**, how many times, **in total**, did you miss taking one or more of your antiretroviral pills?

☐☐ times

19. During the last **7 days**, how many times, **in total**, did you take one or more of your antiretroviral pills more than two hours late?

☐☐ times

20. How would you rate your adherence over the last month? **(Circle one.)**

Very poor…….. 1

Poor……... 2

Fair…… 3

Good……. 4

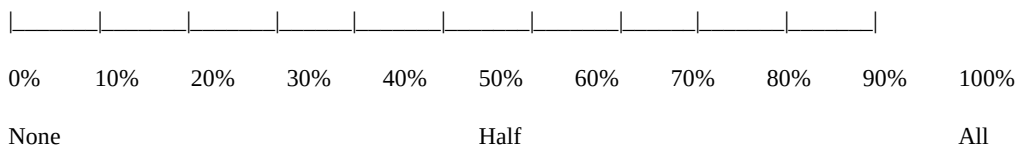
Very good……. 5

Excellent……6

No reply ……*99*

21. Please put a cross on the line below at the point showing your best guess about how many antiretroviral pills you have taken in the **last month**. We would be surprised if this is 100% for most people, e.g. 0% means you have taken none of the pills; 50% means you have taken

half your pills; 100% means you have taken every single pill. **(Hand instrument and pen to respondent.)**



22. When was the last time that you missed taking your antiretroviral pills?

Today …….....……	1
Yesterday…..……. …….	2
Earlier this week ……..……. …….	3
Last week ……. …….	4
Less than a month ago…….. …….	5
More than a month ago …… …….	6
I have never missed ..…….	7
No reply …….	*99*

23. Would you tell me why you missed taking your antiretroviral pills? Please only think about the last time that you missed taking your antiretroviral pills. (Now check all that apply)

You felt too sick……..1	
You did not have the pills with you……	2
You forgot to take them……..	3
You had run out of pills……..	4
You were afraid to lose your government disability grant…….	5
You were too busy to take the pills…….6	
You were afraid that someone would see you take them……7	
You did not want to……	8
You wanted to avoid side effects……	9
A doctor, nurse or treatment counselor has told you to stop……..	10
Someone other than your doctor, nurse or treatment counselor told you to stop……..	11

Other *(Specify)*_____

24. In the past 3 months have you had any side effects which you think may have been a result of taking your antiretroviral pills. These may include nausea, diarrhea, skin rashes or pain in your feet.

Yes ……...1

No ……..…….....2

No reply ……*99*

25. If **yes**, check all that apply **(if no skip to Q.26)**

Diarrhea or nausea…….1

Rash or itching…….. 2

Pain in your hands and feet…….. 3

Feeling tired…….. 4

Change of body shape …….. 5

Other *(Specify)*_____

26. In response to having HIV infection, how often during the past four weeks have you done each of the following? Would you say all of the time, most of the time, some of the time or none of the time? **(Read categories to respondent and circle one number on each line.)**

	All of the time	**Most of the time**	**Some of the time**	**None of the time**
Avoided being with people in general.....	1	2	3	4
Kept yourself from thinking too much about AIDS.....	1	2	3	4
Asked other people for advice and information.....	1	2	3	4
Talked to someone about how you were feeling about having HIV.....	1	2	3	4
Tried to keep it from bothering you.....	1	2	3	4
Involved yourself in volunteer work or an AIDS community organization (e.g. helping others with HIV or AIDS).....	1	2	3	4

27. Now, I would like to ask you some questions about the support you receive from others in your daily life. We are interested in the support you receive in all aspects of your daily life, not only with regards to taking your antiretroviral pills.

	As much as I would like	**Less than I would like**	**Much less than I would like**	**Never**
I get visits from friends and relatives.....	1	2	3	4
I get useful advice about important things in my life.....	1	2	3	4
I get chances to talk to someone about problems at work or with my housework.?.....	1	2	3	4
I have opportunities to talk to someone I trust about my personal life and about family problems.....	1	2	3	4
I get help with child care….....	1	2	3	4
I have people who care what happens to me.....	1	2	3	4
I get love and affection….....	1	2	3	4
I get help around the house….....	1	2	3	4
I get help with money in an emergency….....	1	2	3	4
I get help when I need transport…….…....	1	2	3	4
I get help when I am sick….....	1	2	3	4

28. Please consider the last four weeks and answer the following questions by selecting and circling one of the four answer options. Have you … **(Circle one in each line.)**

	Better than usual	**Same as usual**	**Less than usual**	**Much less than usual**
Been able to concentrate on what you're doing.....	1 2	3	4	

	Not at all	**No more than usual**	**Rather more than usual**	**Much more than usual**
Lost much sleep over worry.....	1 2	3	4	

	More so	**Same as**	**Less than**	**Much less**

	than usual	**usual**	**usual**	**than usual**
Felt you were playing a useful part in things.....	1 2	3	4	
Felt capable of making decisions about things…….	1 2	3	4	
	Not at all	**No more than usual**	**Rather more than usual**	**Much more than usual**
Felt constantly under strain……..	1 2	3	4	
Felt you couldn't overcome your difficulties.....	1 2	3	4	
	More so than usual	**Same as usual**	**Less than usual**	**Much less than usual**
Been able to enjoy your normal day-to-day activities.....	1 2	3	4	
Been able to face up to your difficulties.....	1	2	3	4

(Continued on the next page.)

	Not at all	**No more than usual**	**Rather more than usual**	**Much more than usual**
Been feeling unhappy and depressed…….....	1 2	3	4	
Been losing confidence in yourself…….....	1 2	3	4	
Been thinking of yourself as a worthless person…….....	1 2	3	4	
	More so than usual	**Same as usual**	**Less than usual**	**Much less than usual**
Been feeling reasonably happy all things considered….....	1 2	3	4	

The next questions are about items that your household owns.

29. Does your household own the following items? **(Circle "yes" if respondent's household owns item.)**

	Yes	No	No reply
a. Telephone…….	1	2	3
b. Cell phone……	1	2	3
c. Watch …….....	1	2	3
d. Alarm clock……..	1	2	3
e. Radio/stereo…… ..…….....	1	2	3
f. Primus cooker, sikeni……....	1	2	3
g. Electric hot plate.....	1	2	3
h. Electric stove plate……...	1	2	3
i. Gas cooker …….....	1	2	3
j. Fridge/freezer……...	1	2	3
b. Electric kettle……...	1	2	3
c. Television set …….....	1	2	3
d. Video cassette recorder……	1	2	3
e. Block maker…….	1	2	3
f. Sewing machine……	1	2	3
g. Car or bakkie…….....	1	2	3
h. Motorcycle or scooter……..	1	2	3
i. Bicycle …….....	1	2	3
j. Kombi/lorry/tractor……..	1	2	3
k. Table/chairs…… ..….....	1	2	3
l. Sofa/sofa set…….....	1	2	3
m. Kitchen sink.....	1	2	3
n. Car battery for electricity…….	1	2	3
o. Wheelbarrow …….....	1	2	3
p. Hoe, spade or garden fork……	1	2	3

31. Have you had a meal last night? **(Circle one.)**

Yes …….. 1

No ……..…… 2

No reply ……... *99*

32. Have you had a meal this morning? **(Circle one.)**

Yes …….. 1

No ……..…… 2

No reply ……... *99*

33. Do you currently receive a disability grant for HIV/AIDS? **(Circle one.)**

Yes **(Ask Q. 34)**……1

No **(Skip to Q. 36)**……..……2

No reply **(Skip to Q. 36)**……..*99*

34. Since when have you been receiving the disability grant for HIV/.AIDS?

DAY: ☐☐ MONTH: ☐☐ YEAR: 20 ☐☐

35. From which government welfare office are you receiving the HIV disability grant?

☐ **(PLEASE WRITE NAME)**

q. Bed nets……	1	2	3
r. Cattle …….....	1	2	3
s. Other livestock……..	1	2	3

30. Has there ever been a time when the household was buying something on hire-purchase or lay by and could not make the payment and the good was re-possessed or you lost the money you had paid? **(Circle one.)**

Yes…… 1

No…….…….…..... 2

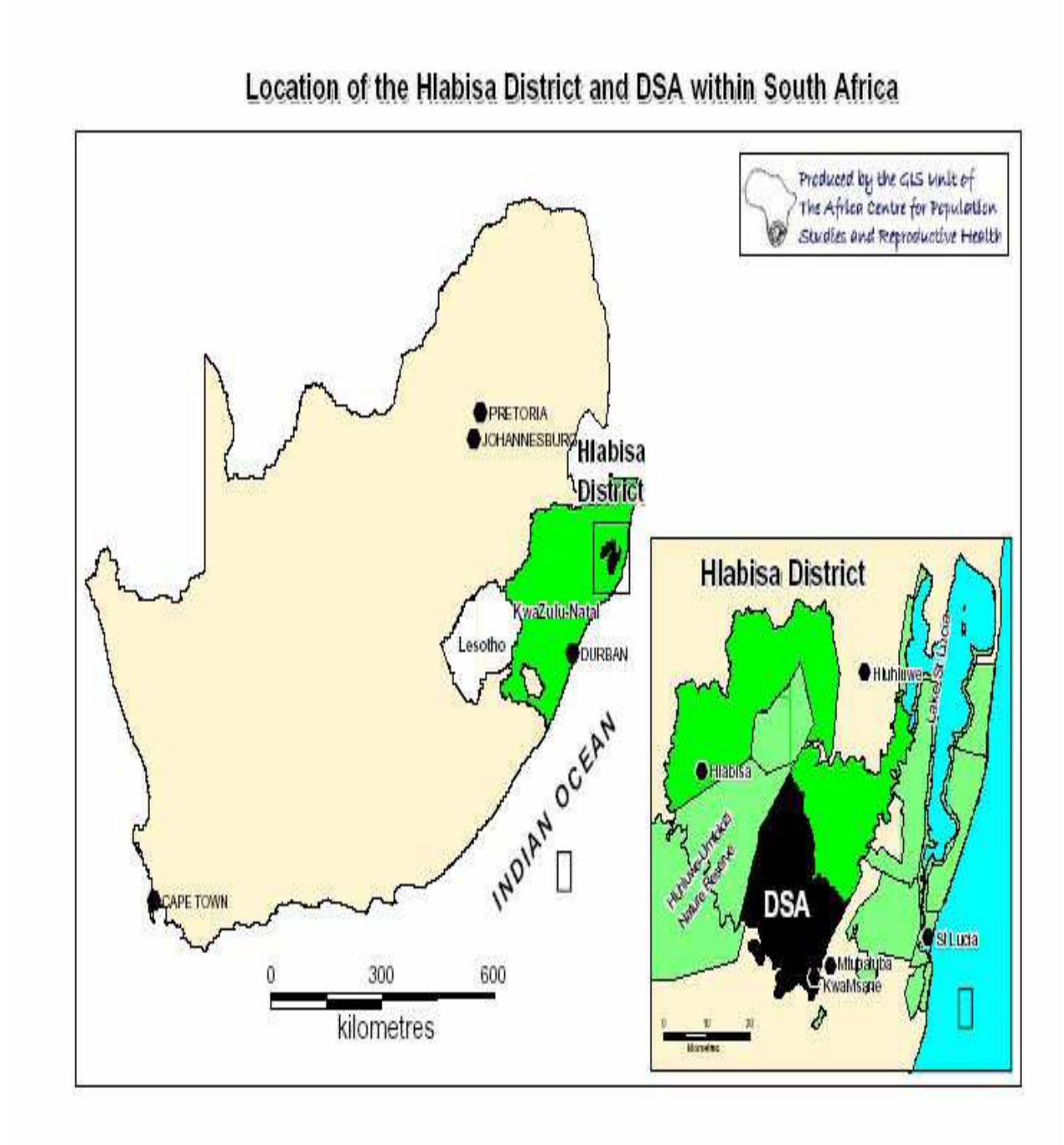
No reply …….. *99*

36. During the past 4 weeks, on how many days did you have a drink containing alcohol (such as a can of beer, a glass of Zulu beer, a glass of whine, a shot of hard liquor)?

NUMBER OF DAYS: ☐☐

Thank you very much for your help!

Appendix 6: Map showing the location of the study area



Appendix 7: University of Witwatersrand Human Research Ethics committee's Approval Letter

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Yeji

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER M080983**
PROJECT	Determinants of Mental Health Status of Patients in a Rural Antiretroviral Treatment Programme in KwaZulu-Natal, South Africa
INVESTIGATORS	Mr F Yeji
DEPARTMENT	School of Public Health
DATE CONSIDERED	08.09.26
DECISION OF THE COMMITTEE*	

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE **CHAIRPERSON** .....
pp (Professor P E Cleaton Jones)

*Guidelines for written 'informed consent' attached where applicable

cc: Supervisor : Prof KK Grobusch

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix 8: University of KwaZulu-Natal Biomedical Research Ethics Approval Letter

UNIVERSITY OF
KWAZULU-NATAL

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Research Office
Room N40 - Govan Mbeki Building
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08 May 2007

Professor M-L Newell
Director - Africa Centre for Health & Population Studies
PO Box 198, Mtubatuba
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Fax: 035-5507565
Email: mnewell@africacentre.ac.za

Dear Professor Newell

PROTOCOL: ANTIRETROVIRAL ADHERENCE ACROSS AGE GROUPS IN RURAL SOUTH AFRICA: A PILOT STUDY TO VALIDATE INSTRUMENTS TO MEASURE ANTIRETROVIRAL ADHERENCE. PROF M-L NEWELL, AFRICA CENTRE FOR HEALTH & POPULATION STUDIES
REF: E133/06

The Biomedical Research Ethics Committee considered the abovementioned application and the protocol was approved at its meeting held on 12 December 2006 pending appropriate responses to queries raised. Your responses received on 04 May 2007 to queries raised on 24 April 2007 has been noted by a sub-committee of the Biomedical Research Ethics Committee. The conditions have now been met and the study is given full ethics approval and may begin as at **08 May 2007.**

We acknowledge receipt of permission from the Chief Medical Superintendent of the Hlabisa Hospital.

This approval is valid for one year from **08 May 2007.** To ensure continuous approval, an application for recertification should be submitted a couple of months before the expiry date. In addition, when consent is a requirement, the consent process will need to be repeated annually.

I take this opportunity to wish you everything of the best with your study. Please send the Biomedical Research Ethics Committee a copy of your report once completed.

Yours sincerely

DR J MOODLEY
Chair: Biomedical Research Ethics Committee

UNIVERSITY OF
KWAZULU-NATAL

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20 June 2008

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PROTOCOL: ANTIRETROVIRAL ADHERENCE ACROSS AGE GROUPS IN RURAL SOUTH AFRICA: A PILOT STUDY TO VALIDATE INSTRUMENTS TO MEASURE ANTIRETROVIRAL ADHERENCE. PROF M-L NEWELL, AFRICA CENTRE FOR HEALTH & POPULATION STUDIES
REF: E133/06

Dear Professor Newell

PROTOCOL RECERTIFICATION RATIFICATION

Further to our letter to you dated 26 May 2008, this letter serves to notify you that at a full sitting of the Biomedical Research Ethics Committee Meeting held on **10 June 2008**, the Committee RATIFIED the sub-committee's decision to approve the Recertification of the above protocol dated 25 April 2008.

Yours sincerely

pp P Ngwenya
Prof. D Wassenaar
Chair: Biomedical Research Ethics Committee

Appendix 9: Letter of permission for use of data from Africa Centre for Health and Population Studies

AFRICA CENTRE
FOR HEALTH AND POPULATION STUDIES

Mr Francis Yeji
University of Wits
Public Health School
Johannesburg

Re: Permission and conditions to use data

Analysis "Determinants of mental health status of patients in a rural antiretroviral treatment programme in KwaZulu-Natal, South Africa in 2007"

Francis Yeji, a student at the Wits University in South Africa (MSc in Field-based epidemiology), is granted access to the data from the study "Antiretroviral adherence across age groups in rural South Africa: a pilot study to validate instruments to measure antiretroviral adherence" (ethics committee reference number: E133/06).

The data to be made available to Francis Yeji is that which contains the variables for the analysis of the abovementioned analysis.

The following conditions have to be adhered to:

- Use of the data is strictly limited to the purpose of the mentioned study and only for the fulfillment of academic requirements.
- The medical ethics committee at the University of Kwazulu-Natal will be informed of the involvement of Francis Yeji in this study.
- The work is done under the supervision of Dr. Till Bärnighausen.
- All resulting publications will be co-authored and the Africa Centre for Health and Population Studies and the funding organisation, the National Institute of Aging (NIH) will be acknowledged in any publications related to the data analyses.

Dr. Till Bärnighausen
Associate Professor of Health and Population Studies
Africa Centre for Health and Population Studies
University of KwaZulu-Natal
South Africa

IN COLLABORATION WITH THE UNIVERSITY OF KWAZULU-NATAL AND THE SOUTH AFRICAN MEDICAL RESEARCH COUNCIL

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