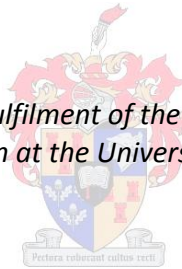


**An Evaluation of Nutrition Care to Adult  
Patients on Highly Active Antiretroviral  
Therapy (HAART) Attending Primary  
Healthcare Facilities in Mbombela North,  
Mpumalanga**

by  
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*Thesis presented in partial fulfilment of the requirements for the degree  
Master of Nutrition at the University of Stellenbosch*



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## **Declaration**

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Jane Frances Schiever

December 2015

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## **ABSTRACT**

### **Background**

South Africa has the most people infected with the human immunodeficiency virus (HIV) in the world; however the rollout of highly active antiretroviral therapy (HAART) is expanding. Treatment of HIV is changing and improving, altering the nutritional status of patients in this era. Mpumalanga has the second highest HIV burden, with most patients accessing care from primary healthcare (PHC) facilities. However, information regarding the current nutrition care received by adult patients on HAART attending these facilities is lacking.

### **Aim**

To evaluate the nutrition care received by adult patients on HAART attending PHC facilities in Mbombela sub-district, in Ehlanzeni district, Mpumalanga.

### **Methods**

A cross-sectional descriptive study design was used. Subjects included 263 adult patients on HAART and 75 nursing professionals. An assessment of 19 PHC facilities was also conducted. An interviewer-administered questionnaire was completed for each patient, along with pre-defined anthropometric measurements. Nursing professionals completed a self-administered questionnaire. An assessment tool was completed for each PHC facility.

### **Results**

A combined total of 41.4% of patients were overweight or obese, and most (51.8%) females had a body mass index (BMI)  $\geq 25$ . Based on waist circumference, 52.7% of females and 8.4% of males were at increased risk of cardiovascular disease. Although nurses were aware of a nutrition supplementation programme (NSP), knowledge of the national nutrition supplementation programme guideline (NNSPG) details was inadequate and the programme was poorly implemented. Only three nurses correctly identified entry criteria into the NSP. Clinical judgement, rather than eligibility criteria, was used to identify patients eligible for supplementation, with 13.3% of patients receiving nutrition supplementation at the time of the

study, when only 4.9% qualified for supplementation according to the guidelines. Nurses were confident about their knowledge of nutrition-related topics, but this did not match actual knowledge. Nutrition counselling was frequently (66.2%) guided by general knowledge and patients expressed a need for more nutrition information. Most patients (70.7%) had a previous weight recorded on file, while only 6.1% had height and 4.6% had BMI records available. PHC facilities generally had sufficient equipment available, storage conditions were fair, but stock shortages of nutrition supplements posed a major problem. Most patients (76.0%) and nurses (69.3%) rated the nutrition care received/provided as 'Good' or 'Excellent'.

## **Conclusion**

Certain aspects of nutrition care to adults on HAART are good. However, care could be improved through training and support to professional nurses, focusing particularly on BMI and nutrition counselling to encourage the consumption of appropriate portions of balanced meals and promote household food security. Counselling should be guided by recognised guidelines and focus on preventing over-nutrition and associated disease. Nurses should be familiarised with the NNSPG through formal training and have a constant nutrition supplement supply, in order to implement them correctly. It may be worthwhile to consider modifying the supplementation programme to better meet the needs of the majority of patients who are not undernourished, but who are food insecure. However, better monitoring and evaluation of nutrition care to adult patients receiving HAART from PHC facilities are needed.

## **OPSOMMING**

### **Agtergrond**

Suid-Afrika het die meeste mense wat geïnfekteerd is met die menslike immuniteitsgebreksvirus (MIV) in die wêreld, met die implementering van hoogs aktiewe antiretrovirale terapie (HAART) wat uitbrei. Die behandeling van MIV is besig om te verander en verbeter, met die gevolg dat die voedingstatus van pasiënte in hierdie era verander. Mpumalanga het die tweede hoogste MIV las, met die meeste pasiënte wat toegang tot sorg verkry van publieke gesondheidsorg-(PGS) fasiliteite. Tog is inligting onvoldoende wat betref die voedingsorg wat volwasse pasiënte op HAART wat hierdie fasiliteite besoek, tans ontvang.

### **Doel**

Om die voedingsorg te evalueer wat volwasse pasiënte op HAART ontvang by PGS-fasiliteite in die Mbombela sub-distrik, in die Ehlanzeni distrik, Mpumalanga.

### **Metodes**

'n Deursnee-beskrywende studie ontwerp is gebruik. Proefpersone het ingesluit 263 volwasse pasiënte op HAART, 75 verpleegsters, en 'n assessering van 19 PGS-fasiliteite. 'n Vraelys wat deur die onderhoudvoerder voltooi is, is vir elke pasiënt ingevul; tesame met vooraf-bepaalde antropometriese metings. Verpleegpersoneel het self 'n vraelys ingevul. 'n Assesseringsinstrument is vir elke PGS-fasiliteit voltooi.

### **Resultate**

'n Gekombineerde totaal van 41.4% pasiënte was oorgewig of vetsugtig, en die meeste (51.8%) vroue het 'n liggaamsmassa-indeks (LMI)  $\geq 25$ . Gebaseer op middellyf-omtrek het 52.7% van vroue en 8.4% van mans 'n verhoogde risiko gehad vir kardio-vaskulêre siektes. Alhoewel verpleegpersoneel bewus was van 'n voedingaanvullingsprogram (VAP), was hulle kennis van die besonderhede van die nasionale VAP-riglyne gebrekkig en die implementering daarvan swak. Slegs drie verpleegsters het toelatingskriteria vir die VAP korrek

geïdentifiseer. Kliniese oordeel, eerder as geskikheidskriteria, is gebruik om pasiënte te identifiseer wat in aanmerking kom vir aanvullings, met 13.3% van pasiënte wat tydens die studie aanvullings ontvang het, terwyl slegs 4.9% volgens die riglyne vir aanvullings gekwalifiseer het. Verpleegsters was selfversekerd oor hulle kennis van voedingsverwante onderwerpe, maar hierdie self-persepsie het nie ooreengestem met hulle werklike kennis nie. Voedingsvoorligting was dikwels (66.2%) gebaseer op algemene kennis en pasiënte het 'n behoefte aan meer voedingsinligting uitgespreek. Die meeste pasiënte (70.7%) het 'n voorheen aangetekende gewig in hulle rekords gehad, terwyl slegs 6.1% se lengte en 4.6% se LMI-rekords beskikbaar was. PGS-fasiliteite het oor die algemeen oor voldoende toerusting beskik, bergingsomstandighede was redelik, maar tekorte aan voorraad van voedingaanvullings was 'n groot probleem. Die meeste pasiënte (76.0%) en verpleegpersoneel (69.3%) het die voedingsorg wat ontvang/gelewer is as 'Goed' of 'Uitstekend' bestempel.

### **Gevolgtrekking**

Sekere aspekte van voedingsorg aan volwassenes op HAART is goed. Tog kan sorg verbeter word deur die opleiding en ondersteuning van professionele verpleegpersoneel, met spesifieke klem op LMI en voedingsvoorligting om die verbruik van geskikte porsies van gebalanseerde maaltye aan te moedig, en huishoudelike voedselsekerheid te bevorder. Voorligting behoort gedryf te word deur aanvaarde riglyne en deur te fokus op die voorkoming van oorvoeding en verwante siektes. Verpleegpersoneel behoort deur formele opleiding vertrouwd gemaak te word met die nasionale VAP en behoort 'n konstante voedingaanvullingsvoorraad te hê sodat dit korrek geïmplementeer kan word. Dit kan waardevol wees om dit te oorweeg om die aanvullingsprogram aan te pas om beter aan die behoeftes te voldoen van die meerderheid pasiënte wat nie ondervoed is nie, maar wat voedsel-onseker is. Beter monitering en evaluering van voedingsorg aan pasiënte wat HAART van PGS-fasiliteite ontvang, word benodig.

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I would also like to thank the clinic staff for their willingness to participate in the study. To the patients, thank you for your eagerness to participate in the study, your friendliness, your trust and your bright smiles.

## **Dedication**

This research is dedicated to the many unsung heroes who have either played a role in fighting for better care for those infected with or affected by HIV, or who themselves are bravely fighting this chronic disease. My hope is that this research can go a little way in making things better for the many South Africans whose lives have been horrifically damaged by such a cruel disease as HIV.



### **Contributions by principal researcher and fellow researchers**

The principal researcher (Jane Schiever) developed the idea and the protocol. The principal researcher planned the study, undertook data collection with a research assistant, captured the data for analyses, analysed the data with the assistance of a statistician (Professor Nel), interpreted the data and drafted the thesis. Supervisors (Mrs Janicke Visser and Mrs Maria van der Merwe) provided input at all stages and revised the protocol and thesis.

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## List of Abbreviations and Acronyms

3TC	Lamivudine
ADA	American Dietetic Association
AIDS	Acquired Immunodeficiency Syndrome
ANOVA	Analysis Of Variance
ART	Antiretroviral Therapy
ARV	Antiretroviral (drugs)
ASSAF	Academy of Science of South Africa
AZT	Zidovudine
bd	twice daily
BMI	Body Mass Index
CCMT	Comprehensive Care and Management
CD4	T-lymphocyte cell bearing CD4 receptor
CDC	Centers for Disease Control and Prevention
CMV	Cytomegalovirus
CSG	Child Support Grant
CVD	Cardiovascular Disease
d4T	Stavudine
ddl	Didanosine
DG	Disability Grant
DM	Diabetes Mellitus
DNA	Deoxyribonucleic Acid
DoH	Department of Health
EFV	Efavirenz
FDC	Fixed Dose Combination
FTC	Emtricitabine
GI	Gastrointestinal

HAART	Highly Active Antiretroviral Therapy
HCT	HIV-Counselling and Testing
HDL	High Density Lipoprotein
HIV	Human Immunodeficiency Virus
HPT	Hypertension
HREC	Health Research Ethics Committee
LDL	Low-Density Lipoprotein
MAM	Moderate Acute Malnutrition
MCT	Medium-Chain Triglyceride
MI	Myocardial Infarction
MS	Microsoft
MUAC	Mid-Upper Arm Circumference
NACS	Nutrition Assessment, Counselling and Support
NCD	Non-Communicable Disease
NCP	Nutrition Care Process
NGO	Non-Governmental Organisation
NIMART	Nurse-Initiated Management of Antiretroviral Therapy
NNRTI	Non-Nucleoside Reverse-Transcriptase Inhibitor
NNSPG	National Nutrition Supplementation Programme Guidelines
NRTI	Nucleoside/Nucleotide Reverse-Transcriptase Inhibitor
NSP	Nutrition Supplementation Programme
NVP	Nevirapine
PCP	Pneumocystis Pneumonia
PEM	Protein–Energy Malnutrition
PHC	Primary Health Care (Facility) (Also referred to as ‘clinic’)
PI	Protease Inhibitor
PLWHA	People Living With HIV/AIDS

PMTCT	Prevention of Mother-to-Child Transmission (of HIV)
RCT	Randomised Controlled Trial
RDA	Recommended Dietary Allowance
REE	Resting Energy Expenditure
RNA	Ribonucleic acid
SA	South Africa
SA DoH	South African Department of Health
SAFBDGs	South African Food-Based Dietary Guidelines
SAM	Severe Acute Malnutrition
SANHANES-1	South African National Health and Nutrition Examination Survey
SD	Standard Deviation
STD	Sexually Transmitted Disease
TB	Tuberculosis
TDF	Tenofovir
TEE	Total Energy Expenditure
TNF	Tumour Necrosis Factor
UNAIDS	The Joint United Nations Programme on HIV/AIDS
VCT	Voluntary Counselling and Testing (for HIV)
WC	Waist Circumference
WCM	Waist Circumference Measurement
WHO	World Health Organization

## Definition of Terms

**Acquired immune deficiency syndrome (AIDS)** - HIV infection along with a CD4 count of 200 or less, dementia, wasting syndrome, cancers such as Kaposi's sarcoma or non-Hodgkin's lymphoma, or one of 20 other opportunistic infections.<sup>1</sup>

**Antiretroviral therapy (ART)** - Antiretroviral therapy refers to the use of a combination of three or more antiretroviral (ARV) drugs to achieve viral suppression and is usually given for life<sup>2</sup>; also called highly active antiretroviral therapy (HAART).<sup>1</sup>

**Anthropometry** - the science of measuring the size, weight and proportions of the human body.<sup>1</sup>

**Body Mass Index (BMI)** - is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in metres (kg/m<sup>2</sup>).<sup>3</sup>

**CD4 cells** - T-helper lymphocyte cells.<sup>1</sup>

**Continuum of care** - concept of an integrated system of care that guides and tracks clients over time, through a comprehensive array of health services spanning from screening for HIV, to diagnosis and management of HIV, to initiation onto ART, retention in care and psychosocial support.<sup>2</sup>

**Epidemic** – the occurrence of cases of disease in a community or region at a level that is clearly in excess of the background incidence of disease for this defined group during a particular season and time period.<sup>4</sup>

**Human immunodeficiency virus (HIV)** - the retrovirus isolated and recognised as the etiologic agent of AIDS.<sup>1</sup>

**Nutrition assessment** - the process by which the nutritional status of an individual is determined; usually includes diet history and intake data, laboratory data, physical examination and health history, anthropometric data, psychosocial data, and intake of nutrient and herbal supplements.<sup>1</sup>

**Nutrition care** - an organised group of activities allowing identification of nutritional needs and provision of care to meet these needs.<sup>1</sup>

**Nutrition care process** - a systematic problem-solving method used to critically think and make decisions to address nutrition-related problems and provide safe and effective quality nutrition care.<sup>1</sup>

**Primary healthcare facility (clinic)** - A facility at and from which a range of primary healthcare services is provided.<sup>5</sup>

**Sero-discordance** - sexual partners where one partner is living with HIV and the other is HIV-negative.<sup>2</sup>

**Viral suppression** - Refers to the aim of ART to maintain viral load below detectable levels of available assays (<50 copies/ml).<sup>2</sup>



## **Chapter 1. LITERATURE REVIEW**

### **1.1 INTRODUCTION**

Since the start of the acquired immunodeficiency syndrome (AIDS) epidemic in the early 1980s, approximately 78 million people have become infected with the human immunodeficiency virus (HIV) and an estimated 39 million lives have been lost owing to AIDS-related illnesses.<sup>6</sup> While South Africa (SA) is still home to the most HIV-infected people of any country in the world, the roll-out of antiretroviral therapy (ART) is expanding greatly.<sup>7</sup> Treatment of HIV is improving and transforming the disease from a terminal illness to a manageable chronic condition.<sup>8</sup> Life-saving ART has helped increase an estimated 40.2 million life-years since the start of the epidemic.<sup>9</sup>

Mpumalanga is the province with the second highest HIV burden in the country,<sup>10</sup> with most patients accessing care from primary healthcare (PHC) facilities and receiving nutrition care from nursing professionals.<sup>11</sup> Nutrition is recognised as an important part of the 'package of care' of the South African Department of Health's (SA DoH) continuum of care rendered to HIV-positive individuals.<sup>2</sup> Yet, information regarding the nutrition care currently received by adult patients on highly active antiretroviral therapy (HAART) attending these facilities is lacking. Nutrition care is multifactorial and therefore a comprehensive evaluation of these interrelated factors is required.

This research project therefore set out to evaluate the nutrition care received by adult patients on HAART attending PHC facilities in Mbombela sub-district, in the Ehlanzeni district of Mpumalanga province.

The study findings provide evidence-based information on current areas of excellence, as well as shortfalls, and assist in creating recommendations on how the nutrition care to adult patients on HAART can be improved.

### **1.2 HIV/AIDS: A BACKGROUND**

HIV infection is caused by one of two viruses, namely HIV-1 or HIV-2.<sup>12-13</sup> Both viruses are transmitted via body secretions, especially blood, semen and vaginal secretions, and commonly enter the body during sexual intercourse.<sup>1,12-13</sup> Since HIV-1 is most common, when referring to HIV, unless specified, HIV-1 is the type discussed.<sup>1</sup> HIV-1 and HIV-2 infections

tend to occur in different areas. HIV-1 is most common in Europe, Asia and Central, South and East Africa. HIV-2 is found in West Africa, although many people living in West Africa are infected with HIV-1.<sup>1,12</sup> HIV is a retrovirus and stores its genetic information as ribonucleic acid (RNA) instead of deoxyribonucleic acid (DNA).<sup>12</sup> The 'infectious specificity' of HIV demonstrates that CD4 proteins provide the avenue of attack.<sup>13</sup> Once HIV has joined to the receptor on the CD4 lymphocyte cell, and moved inside the target cell, the virus releases and uses an enzyme *reverse transcriptase* to turn its viral RNA into DNA.<sup>12-13</sup> The viral DNA is then integrated with the host cell DNA. This reverses the pattern of human cells which copy RNA from a pattern of human DNA. This is the reason for the virus being referred to as a *retrovirus*; 'retro' meaning 'backward'.<sup>12</sup>

The lymphocytes replicate the virus inside the cell, ultimately destroying the cell. Other RNA viruses, for example polio and measles, copy their own RNA but do not make DNA copies. Every time a host cell divides it makes a new copy of the integrated viral DNA together with its own genes.<sup>12</sup> This DNA copy, now a provirus, inserts itself into the target cell's DNA and directs the cell to manufacture new copies of viral RNA and proteins so that the virus can multiply and infect other cells.<sup>13</sup> The thousands of new viruses made by each infected cell can infect other lymphocytes and destroy them too. Enough HIV may be produced to substantially reduce lymphocyte numbers.<sup>12</sup>

In summary, HIV is unique in that it attacks a key part of the immune system, the T-cells or CD4 cells. The virus invades these CD4 cells, uses them to make copies of itself and then destroys them. When the T cells are destroyed, cell-mediated immunity is lowered. Although B cells and T cells mount a vigorous response from the outset to this viral exposure, a deficiency of B cells and cytotoxic T cell function quickly develops. The entire immune system is turned 'on its head'. As more and more CD4 cells are destroyed, the body's ability to fight infections and diseases is lowered.<sup>1,12-13</sup>

### **1.2.1 The progression from HIV infection to AIDS**

AIDS was first observed in 1981, in the United States of America, among homosexual men and intravenous drug users. These cases were described by the Centers for Disease Control and Prevention (CDC) during the same year, reporting on previously healthy young men who presented with unusual opportunistic infections associated with severe lowering of cellular immunity: *Pneumocystis pneumonia* (PCP), cytomegalovirus (CMV), candidiasis and Kaposi's sarcoma. In 1983 researchers isolated the causative retrovirus and named it 'human immunodeficiency virus' (HIV).<sup>13</sup> AIDS is a disease caused by HIV<sup>1,12</sup>, which cripples the normal functioning of the immune system by destruction of the helper T cells.<sup>1,13</sup> Characterised by a CD4 count of less than 200<sup>1</sup>, AIDS is usually accompanied by severe weight loss, night sweats, swollen lymph nodes, and frequent (otherwise rare) opportunistic infections such as PCP and Kaposi's sarcoma, a cancer of the blood vessels that leaves visible purple lesions on the skin. HIV-associated dementia may also present.<sup>13</sup> As an individual's CD4 count drops below 200 (in comparison with that of a healthy person whose CD4 lymphocyte count usually ranges between 800–1300 cells per microlitre of blood) the immune system becomes less and less able to fend off opportunistic infections.<sup>12</sup>

### **1.3 SOUTH AFRICA'S PAST OF NUTRITION MISTRUTHS AND AIDS 'DENIALISM'**

The history of HIV and AIDS in SA is possibly one of the most notorious of any country in the world, characterised by government inaction and harmful interference, pseudoscience, as well as clashes between politicians, HIV and AIDS organisations and scientists.<sup>7,14</sup> The quarrels and policies against providing ART [zidovudine (AZT) and nevirapine (NVP)], when evidence was available to support their use, soon evolved into a much wider questioning of the HIV and AIDS epidemic known as 'denialism'. This school of thought disputed that HIV caused AIDS, but rather resulted from socio-economic factors or 'lifestyle' choices.<sup>7</sup>

The health minister at the time became known for advocating the effectiveness of good nutrition in repressing the virus, saying, "I don't know how many (South Africans) with HIV would want to take antiretrovirals (ARVs)". Controversially, at the 16th Global AIDS Conference held in Toronto in 2006, the South African Department of Health (SA DoH)

presented a display of garlic, lemons and beetroot, with bottles of ARVs added after a series of complaints.<sup>7</sup> Nutrition quackery was advocated, in place of ART, resulting in the unnecessary loss of thousands of lives.<sup>15-17</sup>

Fortunately SA has moved from that tragic era, where despite the call for ARVs to be made freely available in the government sector, the president and health minister adamantly denied that HIV caused AIDS and that ART was of benefit<sup>15-17</sup>, to now having the largest ART roll-out programme in the world.<sup>14-15</sup>

## **1.4. CURRENT KNOWLEDGE**

### **1.4.1 Global HIV/AIDS statistics**

Globally, there were approximately 35.3 million people living with HIV/AIDS (PLWHA) in 2012<sup>18</sup>, of which an estimated 28.3 million were eligible for ART, under the World Health Organization's (WHO) 2013 consolidated guidelines.<sup>19</sup> Available data indicate that the number of PLWHA increased to around 36.9 million worldwide for 2014/2015, with an estimated 25.8 million people living with HIV in sub-Saharan Africa.<sup>20</sup>

During 2014/2015, an estimated two million people become newly infected with HIV globally, while around 1.2 million people died from AIDS-related illnesses.<sup>20</sup> These figures, although still high, show a positive decreasing trend from having had three million new HIV infections and two million AIDS-related deaths worldwide in 2001. Goals have been set by the Joint United Nations Programme on HIV/AIDS (UNAIDS) to minimise new infections and AIDS-related deaths to 0.2 million by 2030. With improved access to ART, life expectancy for PLWHA globally has increased from 36 years to 55 years, aiming for the same life expectancy for PLWHA as for HIV uninfected individuals by 2030.<sup>20</sup>

### **1.4.2 Global statistics on antiretroviral therapy**

In 2012, approximately 9.7 million people in low- and middle-income countries received ART.<sup>19</sup> Thus, roughly a third of patients who were eligible for ART received treatment. According to the UNAIDS World AIDS Day Report<sup>6</sup>, as of June 2014, 13.6 million people were accessing ART globally. Three-quarters of people receiving ART lived in sub-Saharan Africa.<sup>6</sup>

The target set by the 2011 Political Declaration on HIV and AIDS – to have 15 million people receiving ART by 2015 – was described as potentially achievable.<sup>19</sup> UNAIDS recently announced that as of March 2015, the number of people receiving ART worldwide had increased to 15 million, meaning the target has been achieved nine months earlier than planned, and bodes well for efforts to end the AIDS epidemic by 2030.<sup>20</sup> The success of having 15 million people on ART globally has been described as one of the greatest achievements in the history of global health.<sup>20</sup> While more people than ever before are accessing ART, there is still a significant need to scale up HIV treatment as more patients are eligible for ART, with an increasing acceptance that every person infected with HIV will ultimately need ART.<sup>20</sup> A projected 30.7 million people will be in need of ART by 2015 if all low- and middle-income countries adopt the WHO 2013 guidelines.<sup>18</sup> The increase in the number of people living with HIV accessing ART has risen from 1 million in 2001 to 15 million in 2015 and the goal set for 2030 is that every person living with HIV receives ART.<sup>20</sup> Substantial progress has also been made in the number of pills taken by PLWHA, which decreased from an average of eight pills per day in 2001, to one per month in 2015, to aiming for one pill every three months by 2030.<sup>20</sup>

#### **1.4.3 South African HIV statistics**

South Africa has the most HIV-infected people of any country in the world<sup>14</sup>, conservatively estimated at 5.26 million in 2013 by Statistics SA (Stats SA).<sup>21</sup> However, the 2014 World AIDS Day Report<sup>6</sup> stated that there were 6.1 million HIV-positive South Africans. The 2015 UNAIDS report<sup>20</sup> estimated that in 2014, 6.8 million people were living with HIV in SA, 6.5 million of whom were adults (>15 years). The prevalence of HIV in those aged 15–49 years in 2013 was estimated to be 19.1%<sup>22</sup>, while Stats SA reported a lower prevalence of 15.9% for the same year.<sup>21</sup> In 2014, UNAIDS<sup>20</sup> reported that the prevalence of HIV in this age group to be 18.9%. In Mpumalanga, an estimated 21.8% of the population aged 15–49 years are HIV positive.<sup>10</sup> Mpumalanga has the second highest HIV prevalence, after KwaZulu-Natal.<sup>10</sup> Both provinces have prevalences higher than the national average.

Substantial progress has been made in the treatment of HIV. The scaling up of ART and improving access to treatment in SA has been mostly attributed to decreasing the number of AIDS-related deaths, which in the last five years has decreased by 58%. AIDS-related deaths (all ages) in SA for 2014 were estimated to be approximately 140 000.<sup>20</sup> Life expectancy has also increased from 51 years in 2005 to 61 years by the end of 2014, as a result of the massive increase in access to ART<sup>20</sup>. SA has the largest and continually growing ART programme in the world<sup>14,19-20</sup>, in line with the National Strategic Plan 2012–2016 goal to ensure that 80% of patients in need of ART actually receive it and ensure that 70% of these people recover and remain alive and on treatment five years after starting ART.<sup>23</sup>

In 2013, the number of South Africans estimated to be in need of ART, according to 2013 WHO ARV criteria guidelines, was 5.3 (5.1–5.6) million.<sup>19</sup> In 2012, SA had a reported 2 010 340 adults on ART<sup>24</sup>, an increase from approximately 1.46 million in March 2011<sup>14</sup> and 1.8 million in mid-2011<sup>24</sup>. In 2014 it was estimated that between 2.2–2.7 million people were accessing ART in SA, and according to the SA DoH, by the end of 2014, approximately 1.5 million patients were receiving ART in the form of FDC.<sup>24</sup> It was further estimated that by 2015 approximately 3.1 million South Africans would be accessing ART.<sup>14</sup> The most recent figures from UNAIDS show that 2 911 594 adults (>15 years) were receiving ART in SA in 2014, representing around 45% of those in need of ART.<sup>20</sup> The SA DoH aims to have 4.6 million people on ART by the end of 2016.<sup>24</sup> Considering that SA has adopted earlier initiation of ART, in line with the WHO 2013 consolidated guidelines<sup>2</sup>, the country will eventually need to provide approximately 5–6 million people with life-long ART for many years to come.<sup>14</sup>

#### **1.4.4 HIV/AIDS and tuberculosis (TB) in South Africa**

The HIV epidemic in SA fuels the tuberculosis (TB) epidemic. People who are HIV positive are at a greater risk of developing active TB as a weakened immune system facilitates the development of the disease. Similarly, TB can hasten the course of HIV to AIDS.<sup>25</sup> TB was found to be the leading cause of death in SA, between 2008–2010, accounting for approximately 12% of all deaths, taking the lives of between 60 000–75 000 people in each of

these years.<sup>26</sup> This is in comparison with HIV's being reported as the cause of death for a smaller 2.5 % to 3.4 % between 2008 and 2010.<sup>26</sup>

South Africa has one of highest estimated TB rates in the world. With roughly 461 000 new TB cases reported each year, the country is ranked fourth among 22 of the WHO-determined high-burden countries. The TB/HIV co-infection rate is also high. An estimated 55% of TB patients are HIV positive. The problem of drug-resistant strains of TB exacerbates the situation, often caused by poor adherence to prescribed drug regimens.<sup>27</sup>

The National Strategic Plan 2012–2016, outlining how SA plans to respond to the prevention and treatment of HIV and AIDS, TB and STI infections during this period, has set goals in accordance with UNAIDS' vision to reduce the number of new TB infections and deaths caused by TB by 50%.<sup>23</sup>

## **1.5 THE MEDICAL MANAGEMENT OF HIV AND THE USE OF ART**

The main goals in the medical management of HIV are to reduce HIV-related disability and death, enhance quality of life, restore and maintain proper immune function and maximise the suppression of viral replication. This is largely achieved through the use of ART. The aim of ART is to decrease and maintain the patient's viral load to an undetectable level, while enabling CD4 counts to increase and continue staying above baseline.<sup>2</sup> The use of evidence-based medicine principles to optimise the usefulness of presently available antiretroviral (ARV) medications and lessen drug toxicity is also an important aspect. The prevention and management of HIV-related co-morbidities such as TB contribute to achieving the main goals of therapy. Medical management of HIV also includes the regular monitoring of relevant biochemical variables and appropriate action based on the findings. The awareness, prevention and management of adverse side effects of ART are important considerations to both medical and nutritional management of HIV.<sup>13</sup>

The medical management of HIV in SA was forced to be adapted, based on the large number of people requiring HIV care. With the intention to reach 80 percent of those in need of ART by 2011, the South African government made use of task shifting. Task shifting refers to the

reallocation of tasks among available employees.<sup>28</sup> ART services in SA had at first been hospital-based and doctor-led. However, the rapid roll-out of ART overburdened HIV and AIDS wellness clinics, requiring that nursing professionals (rather than doctors) initiated ART. The nurse-initiated management of ART is abbreviated as, and commonly referred to, as 'NIMART'. In NIMART, lay counsellors (rather than nurses) carry out HIV testing, and pharmacy assistants (rather than pharmacists) prescribe ARVs. This resulted in a greater number of access points to treatment and care, and a reduction in the 'bottlenecks' in the healthcare system, which were created by a shortage of staff that were able to provide vital HIV services.

Antiretroviral medication alone has increased life expectancy in SA by a decade, in just a few years, making it one of the most powerful public health interventions ever.<sup>15</sup> The 'picture' of HIV has changed dramatically since 1 April 2004, when free provision of ARVs in the government sector began. The choice of drugs also improved, and in a short time good first- and second-line therapy options were available, which were refined in 2010. Today, a world-class fixed-dose combination (FDC) and third-line drugs, not even available in many developed countries, are available to South Africans as a result of the decrease in cost.<sup>2,15</sup>

With the improved knowledge and management of HIV, many HIV-positive individuals are living longer, healthier lives and HIV is largely managed as a chronic health condition.<sup>2</sup> However, starting ART early is vital for the treatment to be successful.<sup>19,29</sup> In three provinces in South Africa, the life expectancy of people receiving ART is now about 80 percent of normal life expectancy, so long as treatment is started early.<sup>19</sup> The massive scale-up of treatment in SA is remarkable, especially considering the years of disputing the effectiveness of ART at the highest levels of government, and the initial delays and sluggish pace in attempting to deliver an effective public ARV programme.<sup>15</sup>

### **1.5.1 Current South African antiretroviral treatment guidelines**

As of 1 January 2015, SA adopted the 2013 WHO consolidated guidelines<sup>30</sup> on the use of ART for treating and preventing HIV infection. These guidelines recommend earlier initiation of life-long ART at CD4 counts of 500 or less for adults, adolescents and children older than



five years. The guidelines also recommend starting ART, regardless of CD4 count, if the patient is co-infected with active TB, has hepatitis B with severe liver disease, is pregnant or breastfeeding, is younger than five years and for those in relationships with HIV-negative people (sero-discordance).<sup>2,30-31</sup> Table 1.1 below shows the ART eligibility of adults from the National Consolidated Guidelines for the prevention of mother-to-child transmission of HIV (PMTCT) and the management of HIV in children, adolescents and adults, updated in April 2015.<sup>2</sup>

**Table 1.1 ART<sup>1</sup> eligibility in adults (>15 years) living with HIV<sup>2</sup> in South Africa**

CD4 count $\leq$ 500 cells/ $\mu$ l irrespective of clinical stage (prioritise those with CD4 $\leq$ 350 cells/ $\mu$ l) OR
Severe or advanced HIV disease (WHO <sup>3</sup> clinical stage 3 or 4) regardless of CD4 count OR
Irrespective of CD4 count or clinical stage: <ul style="list-style-type: none"> <li>● Active TB disease (including drug-resistant and extrapulmonary TB)</li> <li>● Pregnant and breastfeeding women who are HIV positive</li> <li>● Known hepatitis B viral (HBV) co-infection</li> <li>● Prioritise those with CD4 <math>\leq</math> 350 cells/<math>\mu</math>l or advanced HIV disease</li> </ul>

<sup>1</sup>ART: antiretroviral therapy; <sup>2</sup>HIV: human immunodeficiency virus; <sup>3</sup>WHO: World Health Organization

First-line treatment is in agreement with the WHO guidelines and is preferably a fixed-dose combination (FDC) of tenofovir (TDF), lamivudine (3TC) or emtricitabine (FTC) and efavirenz (EFV).<sup>2,30,32</sup> Instead of taking three separate ARV pills, the FDC pill is a single 3-in-1 pill.<sup>33</sup> The FDC tablet (Atrioza) was made available in the government health sector in South Africa in April 2013<sup>32-33</sup>, and contains 300 mg tenofovir (TDF), 200 mg emtricitabine (FTC) and 600 mg efavirenz (EFV).<sup>34</sup> Atrioza (manufactured by the American company, Mylan), Odimune (manufactured by the Indian company, Cipla) and Tribuss (manufactured by the South African company, Aspen) are all generic equivalents of ATRIPLA<sup>®</sup>. Other generic equivalents of ATRIPLA<sup>®</sup> include Viraday and Trivenz.<sup>33</sup> The 3-in-1 combination drug is aimed at mainly simplifying treatment and improving adherence. Advantages include the convenience of taking only one pill a day, reduced risk of incorrect dosing, and decreased risk of defaulting single drugs or receiving only part of the triple therapy due to drug shortages.<sup>2</sup>

As SA's ARV programme continues to expand, PHC facilities are experiencing ever-increasing populations of stable patients who are clinically well and virologically suppressed.<sup>35</sup> Although ART in the form of an FDC has advantages, there are also disadvantages associated with the use of FDC ART.<sup>36</sup> (Table 1.2.)

**Table 1.2 The advantages and disadvantages of FDC<sup>1</sup> ART<sup>2</sup>**

Advantages of FDC ART	Disadvantages of FDC ART
Greater ease of regimen and stock management foreseen	Discontinuation of the FDC drug will be needed if toxicity develops to an individual component
Adherence should be improved	Dose adjustment of individual components is not possible for those with weight loss, renal or liver dysfunction
Greater efficacy is anticipated if the pill is taken more reliably	TDF in the regimen means that individuals on drugs with renal toxicity and patients with renal impairment will not be able to use this FDC as close adjustments cannot be made
Dosing and dispensing mistakes less likely considering 'fixed' nature of medication	EFV in the regimen may make the regimen more prone to drug failure and viral resistance, as NNRTI regimens are less robust
Cost saving to the SA DoH. The selected FDC is available for R89.37 per person per month	

<sup>1</sup>FDC: fixed dose combination; <sup>2</sup>ART: antiretroviral therapy

The first-line FDC ART regimen (TDF+3TC (or FTC) + EFV) is suited to most adult patients. However, patients weighing less than 40kg can rather be aligned with paediatric regimens and EFV should be replaced with NVP in cases of significant psychiatric co-morbidity, intolerance to EFV, or where neuropsychiatric toxicity of EFV may impair daily functioning such as for night shift workers.<sup>2</sup>

Stavudine (d4T), a relatively inexpensive drug which played a key role in the early expansion of ART in most sub-Saharan African countries, is being discontinued owing to its distressing side effects.<sup>8</sup> The drug commonly resulted in peripheral nerve damage and loss of facial fat<sup>12</sup>, as well as being implicated in causing lipodystrophy, lactic acidosis and pancreatitis.<sup>34</sup> Stavudine is currently being phased out, and all patients should be changed to regimens not comprising d4T.<sup>2</sup>

Furthermore, in an attempt to curb TB infection among HIV-positive individuals, all HIV-positive adults without signs or symptoms suggestive of active TB are eligible for TB prophylaxis therapy.<sup>2</sup>

The timing of ART initiation is important and according to the South African ART guidelines<sup>2</sup>:

- ART should be initiated as soon as the patient is ready, and within at least two weeks of CD4 count being done
- If diagnosed with TB, start with TB treatment first, followed by ART as soon as possible and within eight weeks
- Immediate initiation of ART for all HIV-positive pregnant or breastfeeding women (as long as no active TB or contra-indication to FDC (TDF/FTC/EFV), in which case AZT 300mg bd immediately and changed to FDC/alternative triple regimen at appropriate time)
- Fast tracking (within seven days) for patients with CD4  $\leq$  200 or HIV Stage 4 (Addendum 1)

Second- and third-line regimens are available for patients who fail on first-line therapy.<sup>2</sup>

### **1.5.2 Classification of ARV drugs**

Antiretroviral drugs are classified by their action and include non-nucleoside reverse-transcriptase inhibitors (NNRTIs), nucleoside and nucleotide reverse-transcriptase inhibitors (NRTIs and NtRTIs) and protease inhibitors (PIs).<sup>12</sup> Other drug classes comprise integrase inhibitors, fusion inhibitors and CCR5 inhibitors. There are various other candidate drugs in clinical trials, including one in a class known as 'maturation inhibitors', in addition to innovations in immune-based strategies.<sup>34</sup>

Efavirenz (EFV) and nevirapine (NVP) belong to the group of drugs known as non-nucleoside reverse-transcriptase inhibitors (NNRTIs). Drugs in the NNRTI class halt the replication of HIV within cells by binding near reverse transcriptase's active site and inhibiting polymerase activity.<sup>34</sup>

Tenofovir is categorised as a nucleotide reverse-transcriptase inhibitor (NtRTI). Like the nucleoside analogue reverse-transcriptase inhibitors (NRTIs), NtRTIs work by inhibiting the *reverse-transcriptase* enzyme. This enzyme is crucial in the process of viral replication of the HIV.<sup>34</sup>

Emtricitabine fits into a class of drugs known as nucleoside reverse-transcriptase inhibitors (NRTIs). When HIV infects a cell, the enzyme *reverse transcriptase* copies the viral single-stranded RNA genetic material into double-stranded viral DNA. This viral DNA is then incorporated into the CD4 chromosomal DNA and can continue to reproduce in the body. Four natural nucleosides complete the making of DNA: adenosine, cytidine, guanosine, and thymidine. An NRTI drug substitutes a faulty version of one of the nucleosides, causing early termination of the proviral DNA chain.<sup>34</sup>

Second-line therapy often includes didanosine (ddi), lopinavir, ritonavir and zidovudine. Didanosine and zidovudine are classified as NRTI's, and lopinavir and ritonavir are PIs.<sup>12</sup>

### **1.5.3 Common side effects of ARV drugs**

Antiretroviral drugs commonly have side effects, many of which directly or indirectly impact on a patient's nutritional status.<sup>1,37</sup> The main side effects reported by patients receiving ATRIPLA<sup>®</sup> are dizziness, nausea, diarrhoea, fatigue, headache, and rash.<sup>34</sup> Side effects of efavirenz mostly include central nervous system problems such as insomnia, sleepiness, nightmares, depression, confusion, mood changes, dizziness, anxiety, agitation, forgetfulness, euphoria, paranoia, and in some cases, a skin rash.<sup>12</sup> (Table 1.3 overleaf.)

**Table 1.3: Antiretroviral drugs and common side effects**

Generic name	Trade name	Formulation	Major and rare* side effects	Food considerations
Single-tablet regimen (Fixed-Dose Combination) FDC				
Odiume / Atrioza / Tribuss / Viraday / Trivenz	<b>ATRIPLA®</b>	600mg Efavirenz 200mg Emtricitabine 300mg Tenofovir	See each specific drug	Take on empty stomach, preferably at night
Nucleoside reverse-transcriptase inhibitors (NRTIs)				
Emtricitabine (FTC)	<i>Emtriva</i>	200mg capsule	Common: nausea, diarrhoea, headache, raised creatinine kinase levels, skin darkening. Lactic acidosis*, liver damage*	Take with or without food
Lamivudine (3TC)	<i>Epivir</i>	300mg tablet	Common: nausea, vomiting, diarrhoea, headache, abdominal pain, hair loss, fever, difficulty sleeping, rash, tiredness, joint pain, loss of appetite, fatigue. Lactic acidosis*, liver damage*	Take with or without food
Zidovudine (AZT)	<i>Retrovir</i>	250mg tablet twice a day	Common: nausea, vomiting, fatigue, headache, dizziness, weakness, muscle pain, loss of appetite, fever. Lactic acidosis*, lipodystrophy*, blood disorders*	Take with or without food
Stavudine (d4T)			Nausea, vomiting, diarrhoea, peripheral neuropathy, chills, fever, anorexia, anemia, headache, rash, stomatitis, pancreatitis, bone marrow suppression, lipodystrophy.	Take with or without food
Nucleotide reverse-transcriptase inhibitor (NtRTI)				
Tenofovir (TDF)	<i>Viread</i>	245mg tablet	Common: nausea, diarrhoea, vomiting, bloating, flatulence, dizziness, low blood phosphate levels, weakness, rash, headache, abdominal pains, fatigue, kidney problems*, bone thinning*	Take with or without food
Non-nucleoside reverse-transcriptase inhibitors (NNRTIs)				
Efavirenz (EFV)	<i>Stocrin Sustiva</i>	600mg tablet	Common: abnormal dreams, sleep disturbances, anxiety, depression, suicidal thoughts, poor concentration, nausea, diarrhoea, vomiting, dizziness, tiredness, rash, headache, psychosis*, severe rash*, liver problems*	Take on an empty stomach, preferably at bedtime
Nevirapine (NVP)	<i>Viramune</i>	200mg tablet	Common: liver toxicity, allergic reaction, nausea, diarrhoea, abdominal pain, fatigue, rash, headache, Stevens–Johnson syndrome*	Take with or without food

## 1.6 THE RELATIONSHIP BETWEEN HIV AND NUTRITION

The relationship between HIV and nutrition is complex. HIV infection may result in under-nutrition, especially without successful ART. The inability to maintain a healthy weight may be as a result of problems with ingestion, absorption, digestion, metabolism and the use of nutrients, caused either by the HIV itself or unwanted side effects of ARV medication.<sup>1</sup>

### 1.6.1 Nutrition care in HIV

Infection with HIV can result in involuntary weight loss.<sup>1</sup> Weight loss and wasting associated with HIV are multifactorial<sup>1,37</sup> relating to decreased intake, malabsorption, metabolic problems, uncontrolled opportunistic infections or lack of physical exercise.<sup>1</sup> Before a potent combination of HAART became the standard treatment for HIV infection, HIV wasting syndrome was common. Although HIV wasting syndrome does still occur, it is less common.<sup>1</sup> In HIV-positive individuals the loss of weight and lean body cell mass are strong predictors of a poor prognosis.<sup>37</sup> In addition to this, ART commonly has side effects and drug–nutrient interactions that can negatively impact nutritional status,<sup>2</sup> thus all patients with HIV need early and continuous nutrition care.<sup>1</sup> Individuals should be counselled on the importance of eating a well-balanced diet to provide sufficient food and nutrients to maintain or improve nutritional status, as well as to prevent protein–energy malnutrition and micronutrient deficiencies.<sup>1</sup> Nutrition counselling to HIV-positive individuals is ideally an interactive process between patient and a trained counsellor, and is individualised using information from nutrition assessments to prioritise actions to improve nutritional status.<sup>1,38</sup> Nutrition counselling can assist in identifying patients' individual preferences, as well as barriers to behaviour change and possible solutions to overcome these barriers.<sup>1,38</sup> The patient and healthcare worker together can then plan a feasible course of action to support healthy eating practices. The care provider may use counselling cards or other visual aids to select appropriate messages and guide counselling sessions. Group education on key nutrition topics can also be provided in health facility waiting rooms or for community groups using various print and audio-visual media.<sup>38</sup>

Nutrition should not take the place of ART, but together with HIV medications, good nutrition can help to improve the health and quality of life of individuals receiving HAART. <sup>38</sup>

The goals of medical nutrition therapy to those living with HIV are to<sup>1</sup>:

- enhance nutrition knowledge and foster a sense of empowerment
- re-establish or maintain a healthy weight and body shape
- restore and preserve optimum body and visceral protein stores
- avert nutrient deficiencies or excesses that compromise the immune system
- prevent or treat HIV or medication-related complications that negatively affect nutritional status
- rectify metabolic irregularities
- support adherence to ARV and other HIV-related medications to help achieve therapeutic drug levels
- improve quality of life

Nutrition care is defined as “an organized group of activities allowing identification of nutritional needs and provision of care to meet these needs”.<sup>1</sup> The American Dietetic Association (ADA) established a Nutrition Care Process (NCP) to standardise the process of providing nutrition care. The NCP includes four steps: assessment of nutritional status, identification of the nutrition problem (diagnosis), implementation of relevant interventions, and monitoring and evaluation of the nutrition care outcomes.<sup>1</sup> The final step in the NCP, upon which this research is based, is to monitor and then evaluate the care provided. This monitoring and evaluation step helps to ensure the nutrition care plan is flexible and responsive to the patient’s needs.<sup>1</sup>

The goal of nutrition care is to meet the nutritional needs of the patient; thus the interventions must be monitored and the meeting of objectives evaluated regularly. This ensures that in cases where objectives are not met, the problem can be addressed and that care is continually evaluated and modified as needed.<sup>1</sup>

## 1.6.2 Nutrition and immune function

Despite earlier controversies with regard to the role nutrition played in HIV, good nutrition has been shown to contribute to improved immunity and metabolic function.<sup>37</sup> The link between nutrition and immunity is well known and individuals with poor nutritional status are recognised to be more vulnerable to infections. The immune system is a complex system designed to protect the body against foreign or harmful substances that invade it, and HIV infection resulting in AIDS is the most common severe acquired immunodeficiency disorder.<sup>12</sup> The immune system requires adequate macronutrient intakes, particularly for protein and energy needs to be met, to function properly. Under nutrition alone can impair the immune system.<sup>12,37</sup>

Micronutrients also play important roles in immune function, especially copper, zinc, selenium, iron, essential fatty acids, pyridoxine, folate and vitamins A, C and E.<sup>1</sup> Immune changes associated with advanced HIV infection and AIDS are similar to those seen in protein–energy malnutrition (PEM). In both conditions patients are vulnerable to – and often present with – multiple opportunistic infections including those of viral, bacterial, parasitic and fungal origin.<sup>1</sup>

Malnutrition may increase the frequency and severity of opportunistic infections seen in AIDS by further compromising the immune system. Organ damage can also result from severe weight loss which may increase the risk of mortality from infections.<sup>1</sup> With a decrease in weight below 80% of ideal weight, the immune system is usually impaired, while a decrease to below 70% of ideal weight results in severe impairment of the immune function.<sup>12</sup>

In summary, the relationship between nutrition and immunity is especially relevant in HIV-infected people since a poor nutrient status can aggravate an already compromised immune system, increasing the likelihood of opportunistic infections, in turn leading to deterioration in nutrient status and overall health. In the context of HIV, malnutrition can be both a cause and a result of HIV disease progression.<sup>37</sup>



A scientific inquiry into the nutritional influences on human immunity with special reference to HIV and TB in South Africa (SA) titled 'HIV/AIDS, TB and Nutrition' was published by the Academy of Science of South Africa (ASSAF) in 2007.<sup>37</sup> It reported that SA has three concurrent inter-dependent epidemics: HIV/AIDS, caused by the human immunodeficiency virus (HIV), active TB, caused by *Mycobacterium tuberculosis*, and malnutrition, resulting from various socio-economic factors. Although caused by single factors, evidence suggests that each epidemic acts synergistically to exacerbate the other two. SA has a large number of people infected with HIV, active TB and presenting with under-nutrition. Since these three conditions often occur together and exacerbate one another, the immune system is compromised and requires additional nutritional support.<sup>37</sup>

Studies investigating the pathogenesis of HIV infection have provided new insights that the "gastrointestinal tract is a major anatomical front line of the disease", and that lymphocyte activation is a crucial step in the CD4 T-cell decline that defines AIDS. These insights have major implications for the understanding of the connection between nutrition and HIV/AIDS. Gut integrity may be damaged directly by the HIV and cause malabsorption of food and/or loss of micronutrients. Immunomodulation in HIV-infected individuals is currently a research area of interest and may provide new evidence for specific immunonutrition recommendations to those with HIV infection.<sup>37</sup>

### **1.6.3 HIV and weight loss**

Prolonged HIV infection, associated with a greater energy expenditure than energy intake (negative energy balance), results in the loss of body protein stores and fat cells. The negative energy balance may result from HIV-positive persons' inability to increase their food intake sufficiently to match their increased needs, and/or diminished ability to obtain nutrients from ingested food owing to gastrointestinal (GI) disease or virus-related disturbance of the intestinal mucosa.<sup>37</sup> A decreased oral intake is relatively common and can be caused by anorexia.<sup>1,37</sup> A lack of appetite, most likely as a result of the anorectic effect pro-inflammatory cytokines exert, is a common complaint in the later stages of HIV infection.<sup>37</sup> Other reasons for a poor oral intake include depression, infection, nausea, vomiting, diarrhoea, fatigue,

neurologic disease, illegal drug use and alcohol abuse, and food insecurity. Food security and availability is an important part of HIV-associated weight loss, particularly in a developing country like South Africa. The ramifications of HIV infection are extensive, as individuals who are ill become less able to work to earn an income to support themselves and their families.<sup>37</sup> Lack of a caregiver or social support may also increase the risk of a poor dietary intake.<sup>1</sup>

Malabsorption of food is another cause of less energy being available for the body to use than needed. Disruption of the structure and physiology of the intestines and resultant malabsorption and diarrhoea are commonly experienced with HIV infection. HIV-infected individuals may also lessen their food intake in an attempt to reduce the frequency and severity of diarrhoeal episodes.<sup>37</sup>

Resting energy expenditure (REE) indicates the basal metabolic activity of the body. In HIV infection, REE is expected to be higher owing to the increase in cytokines related to the viral replication continuously underway, in addition to greater protein turnover and *de novo* lipogenesis in the liver. Although increased REE is usually as a result of increased levels of thyroid hormones, catecholamines and cortisol, in HIV-infected individuals these hormone levels appear to be within normal ranges.<sup>37</sup> REE was found to be approximately 11% higher in HIV-infected individuals versus healthy HIV-negative controls. Further analyses of subgroups found that symptomatic HIV-infected individuals tended to have non-significantly higher REE than asymptomatic, weight-stable HIV-infected individuals. Evidence also suggests that the specific type of secondary infection complicating HIV infection may have an effect on changes in REE.<sup>37</sup> Several studies have found that HIV-infected individuals are not hypermetabolic. Although an increase in total energy expenditure (TEE) would not be surprising considering the increased REE, an increase in TEE was not observed. On the contrary, TEE was significantly reduced in HIV-infected men who were losing weight rapidly. This was seemingly because they significantly reduced their activity-related energy expenditure. As total energy input (after digestion and absorption of food) and total energy expenditure are the main determining factors of energy balance, net weight loss in HIV infection is associated with greater losses of energy inputs than outputs.<sup>37</sup>

Weight loss may occur either gradually or rapidly in HIV-infected individuals. Slow, steady weight loss often results from anorexia, GI disturbances, psychosocial and financial factors, or side effects from ARV medication. Recurrent episodes of acute weight loss may result in wasting, which is usually associated with opportunistic infections. Wasting, particularly the loss of lean body mass, has been associated with increased risk of mortality, hastened disease progression from HIV to AIDS, and deterioration of physical strength and functional status.<sup>1</sup> In the absence of ART, HIV-infected patients with advanced disease often present with wasting.

HIV wasting syndrome (defined as weight loss of more than 10% from baseline, with either diarrhoea or fever for more than 30 days) was included as one of the Centers for Disease Control and Prevention (CDC) AIDS-defining illnesses in the 1980s. Malnutrition associated with HIV infection and AIDS has many characteristics similar to those of starvation, but some are dissimilar. For example, AIDS results in a greater loss of body cell mass with less loss of fat, and this is more so in men than in women, differing from uncomplicated starvation in which fat stores are depleted.<sup>1</sup> Weight loss and wasting-infected individuals. However, wasting is an avoidable consequence of HIV infection, as there appears to be a large variability in the amount of weight loss and wasting in HIV-positive individuals, and in the majority of cases, acute weight-loss episodes are associated with secondary infections. After recovery from secondary infections, HIV-positive individuals are inclined to gain weight and remain reasonably weight stable.<sup>37</sup>

In summary, continuous weight loss in HIV infection is usually associated with inflammation or infection of the GI tract, and associated malabsorption. In HIV-positive individuals the loss of weight and lean body cell mass are strong predictors of a poor prognosis.<sup>37</sup> Therefore, appropriate nutrition support to HIV-positive patients may decrease the incidence of HIV-associated complications, slow disease progression, improve quality of life and decrease mortality.<sup>39</sup> A poor nutritional status and severe weight loss have been found to be highly predictive of death, even after starting ART. HIV and AIDS can aggravate existing under-nutrition due to decreased food intake, absorption, and metabolism, together with high levels

of food insecurity, commonly present in HIV-affected communities.<sup>40</sup> Appropriate nutrition assessment and care is therefore essential to improve the nutritional status of patients on ART and improve quality of life and survival.<sup>40-41</sup>

#### **1.6.4 Nutrition-related side effects of ART and nutrient–drug interactions**

##### **1.6.4.1 Common nutrition-related side effects of ART**

ARV drugs may have side effects and interactions with foods that impact on nutritional status. This makes the role of nutrition especially important in the care of HIV-positive patients on ART. Nutrition-related side effects commonly associated ART include loss of appetite, nausea, vomiting and diarrhoea. Other common side effects include dizziness, general malaise, headaches and peripheral neuropathy.<sup>2,34</sup> (Table 1.3). These conditions need to be managed as effectively as possible to minimise the potentially negative impact they can have on a patient's overall health and nutrition status.

##### **1.6.4.2 Lipodystrophy**

The use of some older HIV medications, particularly the NRTIs, stavudine (d4T), and to a lesser extent, zidovudine (AZT), may result in lipodystrophy or 'fat redistribution'.<sup>2,34</sup> Lipodystrophy is a condition in which the body does not produce, use and distribute fat normally. This disturbance in fat metabolism often results in body shape changes, dysglycaemia and dyslipidaemia. Changes in body shape may include the loss of adipose tissue below the skin (lipoatrophy), presenting as thinning of the limbs, buttocks and face. The loss of fat on the face is often evident in the maxillary, nasolabial and temporal areas.<sup>1</sup> Other body shape changes include the build-up of adipose tissue in the visceral, mammary and axillary areas. Lipomas or a 'buffalo hump', as a result of the dorsocervical fat pad enlarging, may also occur.<sup>1</sup>

##### **1.6.4.3 Metabolic abnormalities in HIV infection**

Metabolic abnormalities have changed over the course of the HIV/AIDS epidemic. During the early years, before the disease was well understood and ART was not readily available, wasting syndrome with severe loss of weight, muscle and fat was common. This skeletal

wasting was considered the 'hallmark' of AIDS. Wasting syndrome was more prevalent with opportunistic infections, poverty, low CD4 and without ART. Once HAART was introduced, lipodystrophy, dyslipidaemia and insulin resistance surpassed wasting syndrome as common metabolic abnormalities.<sup>42</sup>

The use of ART often induces metabolic changes, including decreased serum testosterone levels (in both males and females) and increased serum triglycerides, insulin, glucose and blood pressure. ARVs may have a direct impact on insulin resistance, as well as raising cholesterol, low-density lipoprotein (LDL) and triglyceride levels, while lowering high-density lipoprotein (HDL) levels. Consequently, ART may increase the risk of cardiovascular disease (CVD) and diabetes mellitus (DM),<sup>1</sup> with stavudine (d4T) and protease inhibitors (PIs), particularly ritonavir, mostly being associated with a greater risk of hyperlipidaemia and lipodystrophy in comparison with other ARVs.<sup>2,42</sup> A healthy eating plan, exercise and weight reduction (if needed) are central to managing abnormal lipid and glucose levels.<sup>1</sup>

#### **1.6.4.4 Over-nutrition in HIV infection**

Although weight loss may be detrimental in HIV infection, so may excess weight gain after initiating ART.<sup>43-44</sup> Many people with HIV gain weight after starting ART, and this may have a negative effect on health.<sup>43-44</sup> Reasons suggested for this increase in weight appear to be largely based on the desire to gain weight, and avoid the stigma of thinness associated with HIV/AIDS or TB infection.<sup>43</sup> A recent study<sup>43</sup> found a strong association between PLWHA's perception of body weight, desire to gain weight and their actual weight on ART. Those who wanted to gain weight gained 2.8 times more weight (mean 7.8kg) than those who were happy with their weight ( $p < 0.001$ ) after one year on ART. There were statistically significant increases in anthropometric measurements ( $p < 0.001$ ), with 43 of the 110 women having waist circumferences that increased their risk of cardiovascular disease (CVD); the incidence of lipodystrophy was 35% (62/177), 36% were overweight, and 22% were obese, compared with 21% (49/230) and 12% respectively at baseline ( $p = 0.002$ ). This desire to gain weight applies in particular to females of African ethnicity who tend to perceive overweight as culturally

desirable and healthy, are generally unaware of the potential health risks of excess weight gain, and tend to perceive their weight as less than their actual weight.<sup>43</sup>

Another study investigated the relationship between short-term changes in body mass index (BMI) after ART initiation and subsequent risk of CVD and diabetes mellitus (DM), by analysing results from the Data Collection on Adverse Events of Anti-HIV Drugs (D:A:D) study.<sup>45-46</sup> The D:A:D study was a large international study that included approximately 9 000 patients starting ART for the first time. Findings from the study, presented at the 20<sup>th</sup> International AIDS Conference in Melbourne in 2014, demonstrated that HIV-infected individuals in the normal weight range (BMI 18.5–24.9) who gain a substantial amount of weight soon after starting ART may have an increased risk of CVD and DM. Patients were excluded from the study if they had known CVD or DM prior to starting ART. Participants were included if a recent (less than one year) weight was available before starting ART. The change in weight and BMI was calculated by the difference between the initial pre-ART weight and weight 12 months post ART. The majority of patients were male (75%), of European ethnicity and half were self-reported homosexual. Before starting ART, 6% of participants were underweight (BMI<18.5), 64% were normal weight (BMI 18.5–24.9), 23% were overweight (BMI≥25) and 6% were obese (BMI≥30). The median CD4 T-cell count was approximately 270 cells/mm<sup>3</sup> in the latter three groups, compared with 170 cells/mm<sup>3</sup> in the underweight group, reflecting more advanced disease. A third of participants were smokers at the time of the study. Not surprisingly, overweight and obese participants had higher blood pressure and were more likely to have pre-existing diabetes, rising from 1.6% among underweight people to 6.8% in the obese group. The percentage of overweight/obese participants grew from 29% before initiating ART to 35.5% post ART. The researchers concluded that short-term gain in BMI after initiating ART for the first time could be associated with the increased risk of CVD, largely in those with normal levels of pre-ART BMI. It was also reported that an increase in BMI was associated with an increased risk of DM in all groups. The researchers however found no “appreciable change in cardiovascular disease risk” with gain in BMI in those who had a high BMI prior to starting ART. A limitation noted in the study was that BMI may not reflect abdominal obesity, which is most closely related to metabolic

abnormalities and CVD. The study also did not provide information regarding nutrition and physical activity, which could affect risk independent of weight. In addition, the relative influences that the HIV infection itself, the resulting inflammatory and metabolic changes, ARV toxicities, and other factors may have, are not well understood as yet.<sup>45</sup>

HIV patients appear to be at a higher risk of adverse cardiovascular events, owing to complex interactions between traditional, modifiable risk factors and the HIV infection itself. HIV infection can cause ongoing endothelial dysfunctional immune activation or inflammation and greater risk of thrombosis. The long-term safety of certain ARV drugs given for life is not yet fully understood at a time in which life expectancy for people living with HIV is increasing, while treatment of non-HIV-related serious events as a result of non-communicable diseases (NCDs) is of growing concern.<sup>47</sup>

The mechanisms underlying the increased risk of CVD are unclear, but may relate to dyslipidaemia, insulin resistance, DM, inflammation, impaired fibrinolysis, factors specific to ARV medications, or combinations of these factors. It appears that both HIV and ART might be associated with many of these risk factors<sup>48</sup>, making it difficult to separately assess the role of HIV and ART in CVD risk in HIV-positive patients on lifelong HAART.<sup>47</sup>

It has been proposed in recent studies that certain ARV drugs are associated with increased risks of CVD. Bavinger et al.<sup>48</sup> therefore conducted a systematic review and meta-analysis to summarise available evidence, and clarify whether specific ARVs are associated with a greater risk of myocardial infarction (MI). The evidence linking ARVs and CVD has pointed specifically to PIs as a class, and specific agents such as abacavir and didanosine.<sup>48</sup> In the review<sup>48</sup>, evidence was pooled across studies investigating the association between cumulative and recent exposure to particular ART drugs as well as to classes of ART drugs and the risk of MI. Their findings pin-pointed recent exposure to abacavir, recent exposure to PIs in general, and cumulative exposure to PIs, indinavir and lopinavir. However the researchers warned that the findings need to be interpreted cautiously. The study found evidence based on observational studies to suggest harmful associations between abacavir and risk of MI, as well as the use of PIs and increased MI risk. However, evidence from

observational and randomised controlled trials (RCTs) are incongruent. While RCTs would offer the least biased method to assess CVD risk, the clinical trials included in the review were not designed to investigate CVD risk and were therefore short term and underpowered for assessing CVD risk sufficiently. In comparison with the meta-analyses of RCTs, the observational studies have longer follow-ups and more representative samples, but are vulnerable to confounding by indication, where risk of CVD may influence both the choice of ART, as well as the risk of MI, possibly leading to false associations. Other challenges with combining evidence across different studies were varying study designs and analytic plans.<sup>48</sup> From the overall evidence, the researchers concluded that there is still uncertainty whether ART leads to increased CVD risk, and if so, the extent of that risk. However, the current evidence provided from observational studies is adequate to warrant further investigation in prospective studies designed to assess CVD from ART.<sup>48</sup>

Obesity itself is a complex health issue and in addition to the increased risk of health problems (such as CVD and DM) in obese individuals, such individuals may also consume diets that lack specific micronutrients. In some instances this may have significant functional consequences. Macrophages in the abundant adipose tissue of obese people are known to release pro-inflammatory cytokines comprising primarily, but not only, of tumour necrosis factor (TNF), which may form part of the pathophysiology of the 'metabolic syndrome' seen in obese individuals. There may be 'immunological deficits' under these conditions that intersect with HIV- associated changes, but little evidence is currently available. A potentially serious problem for HIV-infected obese individuals may be activated transcription of HIV in infected cells, especially if there are simultaneous deficiencies in anti-oxidant vitamins and minerals.<sup>37</sup>

## **1.7 NUTRITION REQUIREMENTS FOR HIV-POSITIVE ADULTS**

### **1.7.1 Energy requirements**

Nutrition requirements for PLWHA were recently reviewed by the World Health Organization (WHO) and the 2005 recommendations currently remain.<sup>40</sup> For HIV-positive asymptomatic patients, energy intake should be 10% higher than the standard dietary recommendations for HIV-uninfected individuals.<sup>40</sup> However, in the case of fever, energy requirements may need to



be increased by 13% for every degree Celsius temperature is raised above normal.<sup>1</sup> For those recovering from opportunistic infections, energy intake should be increased by 20–50 %.<sup>40</sup>

### **1.7.2 Protein requirements**

According to the WHO<sup>40</sup>, there is no evidence to support a protein intake higher than 12–15% of total energy. Protein requirements may be calculated at an estimated 1 to 1.4g/kg for maintenance and 1.5 to 2g/kg for protein repletion. Protein restriction is not indicated unless in the case of severe hepatic or renal disease.<sup>1</sup> In the case of fever, it is argued that protein requirements may increase by 10% for every degree Celsius temperature is above normal.<sup>1</sup>

### **1.7.3 Fat requirements**

Individual fat tolerances differ. A low-fat diet may benefit individuals experiencing malabsorption or diarrhoea. Medium-chain triglyceride (MCT) oil, which is more readily absorbed, is considered to be superior to long-chain triglyceride-based supplements for lessening stool fat and nitrogen content, decreasing the number of bowel movements, and assisting to alleviate abdominal symptoms. Fish oil (containing omega-3 fatty acids) when given with MCT oil may improve immune function as this combination is less inflammatory than omega-6 fatty acids.<sup>1</sup>

### **1.7.4 Fluid requirements**

Fluid requirements are 30–35ml/kg; however extra fluid is needed in certain circumstances to replenish fluid lost as a result of diarrhoea, vomiting, night sweats, prolonged fever, hot weather or prolonged physical activity. The replacement of lost electrolytes, including sodium, potassium and chloride, is also advisable.<sup>1</sup>

### **1.7.5 Micronutrient requirements**

Micronutrients are vitamins and minerals that the body needs to maintain good health. Research has shown that HIV-positive individuals are more likely to present with signs of micronutrient deficiencies, compared with uninfected people. Specifically, low serum levels of

vitamin A, vitamin B12, vitamin C, vitamin D, carotenoids, selenium, zinc and iron have been reported in HIV-positive patients. However, evidence is not conclusive with regard to micronutrient status in HIV-infected individuals and it is possible that the HIV may affect the markers commonly used to measure micronutrient levels more than it affects the actual amounts of micronutrients present in the body.<sup>49</sup> In other words, serum micronutrient levels may not accurately reflect micronutrient status in HIV infection. It is recommended that patients meet the standard recommended dietary allowance (RDA) for vitamins and minerals.<sup>1</sup>

Some studies have proposed that ARV treatment may improve micronutrient status. A study investigating micronutrient status in HIV-positive individuals receiving HAART by reviewing observational and trial evidence found that several observational studies have suggested that some (but not all) micronutrients become replete after starting HAART. Meanwhile, some intervention studies have found that certain micronutrients may still be beneficial in conjunction with HAART.

However, many of the studies examined had major limitations regarding sample size, short length of follow-up, lack of adjustment for inflammatory markers and poor assessment of HIV-related outcomes. The authors found insufficient evidence to determine conclusively whether HAART improves or corrects micronutrient deficiencies and to support or refute the benefit of micronutrient supplement provision to HIV-positive, HAART-receiving individuals. The available evidence was insufficient to provide recommendations on micronutrient supplementation to HAART-receiving patients, and since micronutrient supplements may cause harm, randomised placebo-controlled trials are needed. Further research is needed to investigate whether micronutrient supplements affect HIV-related outcomes in HIV-positive individuals on HAART.<sup>50</sup> A Cochrane Review<sup>51</sup> investigating micronutrient supplementation in HIV-positive adults and children, published in 2010, explained that with evidence from one large RCT in Africa, multiple micronutrient supplements had been shown to reduce death and disability in HIV-positive pregnant women and their children (and support early child growth); however the feasibility to generalise these findings to other HIV-positive patients is not clear.

Authors of the review concluded that further research is needed to investigate the long-term benefits and potential harm multiple micronutrient supplements may have for HIV-positive individuals with varied disease statuses, as well as what the ideal composition of this multiple micronutrient supplement would be.<sup>51</sup>

Everything possible should be done to promote and support the intake of micronutrients at recommended levels.<sup>37</sup> However, it should be acknowledged that this may not be enough to correct nutritional deficiencies in all HIV-positive individuals. In areas where micronutrient deficiencies are endemic, micronutrients may need to be provided from food fortification or as micronutrient supplements.<sup>37</sup>

Key findings regarding micronutrients and HIV-infection from ASSAF<sup>37</sup> were:

- Dietary intake studies have shown micronutrient intakes to be less than optimal in many South Africans. Evidence is not conclusive, but there is a possibility that micronutrient deficiencies that lead to functional impairment may hasten disease progression, increase mortality and increase the risk of mother-to-child transmission of HIV.
- Observational studies have shown a direct correlation between micronutrient intake (particularly vitamins A and B, multivitamins, zinc and selenium) and favourable clinical outcomes in patients infected with HIV. However, observational studies generally lack valid markers of micronutrient status, and the effects of micronutrient deficiencies are susceptible to confounding by other factors.

#### **1.7.6 Summary of nutrition requirements for HIV-positive adults**

In clinically stable HIV-infected patients on ART without advanced disease and various opportunistic infections, except for the 10% greater energy need, nutrition requirements are similar to those of the general population, with an adequate nutrition intake best achieved by consuming a healthy, balanced diet from a variety of locally available and culturally acceptable foods to meet protein, fat, carbohydrate and micronutrient requirements. In

situations where food insecurity is prevalent and/or food quality is poor, nutritional requirements may not be met without additional macronutrient supplementation.<sup>40</sup>

## **1.8 EVIDENCE ON THE EFFECTIVENESS OF NUTRITION SUPPLEMENTATION INTERVENTIONS**

A recent Cochrane Review<sup>39</sup> evaluated the effectiveness of nutritional interventions (given orally) for reducing morbidity and mortality in HIV-positive patients. Fourteen RCTs were included in the review, including 1 725 and 271 HIV-positive adults and children respectively. The RCTs evaluated the effectiveness of different macronutrient interventions (given for four weeks or longer) versus no nutrition supplements or placebo. Seven of the 14 studies were conducted in high-income countries. Four studies were conducted in Africa, one in South Africa and the others in Brazil, India and Spain respectively. The trials were mostly out-patient based. In three of the four African studies, none of the participants received ART. In seven studies, more than half of all participants were classified as WHO Stage 3 or 4. Study participants with a normal weight, those with stable weight loss, and with malnutrition, were included. The quality of the trials was generally poor, with a high degree of performance and reporting bias, small sample sizes and ambiguous reporting of randomisation methods. In adult patients losing weight, balanced macronutrient supplements (increasing energy intake by 600–690kcal/day) increased energy and protein intake versus nutrition counselling alone or no supplementation. This increased intake resulted in some weight gain, but only in one study was weight gain significantly greater than nutrition counselling alone. The increased intake had no influence on other anthropometric or immunologic measurements.

Since all the supplements in the above studies contained both macro- and micro-nutrients, the effect of an increased energy and protein intake alone could not be ascertained. Unlike adults with weight loss, there was no effect on food intake, nutritional status or anthropometry in adults within a normal weight range, who received nutrition supplementation. A Kenyan study, included in the review, found that malnourished pre-ART, HIV-infected patients gained less weight versus those on ART, despite receiving nutrition supplementation or not. Of the patients initiating ART, those who received nutrition supplementation had a significantly

greater weight and BMI gain in the first three months, but this effect did not last after three months. Nutrition supplementation had no effect on CD4 count or serum albumin, but had a significant beneficial effect on haemoglobin levels in both pre-ART and ART-receiving patients. Nutrition supplementation had a positive impact on patients' perceived quality of life, particularly in pre-ART patients. Nutrition supplementation to HIV/TB co-infected adults, not yet on ART, neither significantly reduced mortality or TB treatment failure nor increased the TB cure rate at six months. Authors of the review concluded that everything possible should be done to assist patients consume a suitable, balanced diet and to promote food security. There is low quality evidence to support the provision of a balanced macronutrient supplement, with added micronutrients, to increase energy and protein intake versus nutrition counselling alone. If nutrition supplementation is provided, the type of nutrition supplementation selected will likely depend on cost and availability. The effects of nutrition supplementation on mortality, morbidity, body weight and immunological parameters in HIV-infected patients remain unclear. Evidence is scant as to the ideal type and amount of supplements to be used in nutrition supplementation programmes for HIV-positive patients.<sup>39</sup>

Studies by Lategan et al.<sup>52</sup> and Esposito et al.<sup>44</sup> investigated the nutritional status of South African HIV-infected adults on ART in 2007. Lategan et al.<sup>52</sup> included 98 patients (both genders, 66% female) from the Northern Cape. At baseline, 27% of patients were underweight (BMI<18.5), 63% were within a normal weight range (BMI 18.5–24.9) and 8% were overweight (BMI 25–29.9). Nutrition supplementation was an enriched maize product providing 100% of the recommended daily allowance for vitamins and minerals, as well as 1800 kJ energy, 14g protein, 15g fat, and 61g carbohydrates per 100g of product given for four months. It was found that 49.4% of patients gained weight, while 40.2% lost weight. Nutrition supplementation was initiated at the same time as ART, therefore conclusions could not be drawn as to the impact nutrition supplementation alone had on weight gain or loss, without taking ART into consideration.

The study by Esposito et al.<sup>44</sup> included 30 female patients from KwaZulu-Natal and reported at baseline (when initiating ART) that 6.7% of patients were underweight (BMI<18.5), 43.3%

were a normal weight (BMI 18.5–24.9), 30% were overweight (BMI 25–29.9) and 20% were obese (BMI>30). After initiating ART, and followed up 24 weeks later, 70% of patients had gained weight, 18.5 % had no significant change in weight, and 11.1 % had lost weight without any nutrition supplementation.

Assessing the cost effectiveness of various forms of ‘nutrition support’ is especially important in the South African context. With South Africa’s tender to provide ART for 2015–2017 being worth approximately 10 billion rand<sup>24</sup>, it is crucial that the limited remaining financial resources are allocated appropriately. HAART has proved to be highly effective in the management of HIV, regardless of whether patients receive nutrition supplementation or not. A recently published study<sup>53</sup> investigated the cost effectiveness of nutrition supplementation for malnourished, HIV-infected adults starting ART in resource-constrained Zambia. Although the study acknowledges that it ‘estimated’ the expense of nutrition supplementation, in theory the expense of providing nutrition supplementation would require only modest improvements in survival and programme retention to be cost effective for the most severely malnourished individuals (BMI<16) starting ART. However, this study concluded that nutrition supplementation interventions to those in higher BMI strata (BMI>16) were unlikely to be cost effective versus ART alone. The Zambian study was conducted between 2004 and 2010 and assessed patients starting ART, in comparison with the current study conducted in 2014 to patients already on lifelong ART. Although nutrition supplementation may improve health outcomes of severely malnourished patients, and the expected benefit of the intervention be in proportion to the associated cost, resources in South Africa are also limited, the number of people accessing ART is increasing dramatically, and the percentage of clinically stable outpatients who are severely malnourished appears to be low.

Following ASSAF’s scientific inquiry into the nutritional influences on human immunity with special reference to HIV infection and active TB in South Africa,<sup>37</sup> the following conclusions regarding macronutrient supplementation were reached:

- Supplementation of macronutrients may benefit HIV-positive individuals. Targeted interventions with balanced nutritional supplements appear to increase energy and protein intake.
- Balanced supplementation increases body weight.
- Evidence-based advice on the macronutrient supplementation use in HIV-positive patients in developing countries was limited, since the few randomised trials done were conducted in high-income countries where patients were generally well nourished and had access to ART.

While the evidence supporting the use of macronutrient supplementation to adult HIV-positive patients on HAART is limited, current evidence is also inconclusive on the role micronutrient supplementation may have on HAART-receiving adults and is an area for future research. Since many studies have investigated the use of ready-to-use nutritional supplements that supplemented both macronutrients and micronutrients at the same time as ART was initiated, it is difficult to draw conclusions on the role additional macro- or micro-nutrient supplementation alone may have played. Studies also vary greatly with regard to the type of study population investigated, type and duration of nutrition supplementation provided, and health outcomes investigated. In some studies patients initiated ART at the same time as starting nutrition supplementation; whether improvements in health outcomes were as a result of nutrition supplementation alone (either macronutrients, micronutrients or both), or due to a combination of factors, was difficult to determine. In many of the studies patients had relatively low CD4 counts, more advanced disease, and a large prevalence of under nutrition.

Although nutrition supplementation may benefit certain HIV-positive individuals, the extent of this benefit is not clear and the applicability of the studies to the current South African HIV-positive population on HAART is unclear.

### **1.9 ADDITIONAL STUDIES CONTRIBUTING TO HIV AND NUTRITION KNOWLEDGE**

The South African National Health and Nutrition Examination Survey (SANHANES-1)<sup>54</sup> released in 2013 revealed a worryingly high prevalence of obesity against the backdrop of a high HIV prevalence, and provided further evidence that although energy dense, South

Africans' diets tend to have a low nutrient density. Also of interest was a study by Matoti-Mvalo & Puoane<sup>55</sup> that investigated perceptions of body size and the association of body size with HIV. It was found that figures depicting a greater BMI were perceived as less likely to be HIV positive.<sup>55</sup> In SA, in this new ART era it would appear that both under- and over- nutrition in HIV-positive individuals pose significant problems. A review<sup>42</sup> that investigated HIV infection and obesity in developed countries, published in 2009, reported an increasing prevalence of overweight and obesity in the HIV-positive population following the introduction of lifelong ART. The prevalence of overweight and obesity among ART-receiving patients in the United States now almost matches the general population, with almost two out of three of these adults being overweight and one in four being obese.<sup>42</sup> Obesity was found to be more prevalent than wasting in these HIV-positive individuals on lifelong ART. Subjects who were female and non-white, were found to be at greater risk of being obese.<sup>42</sup>

The World Health Organization (WHO), the Southern African HIV Clinicians Society and the SA NDoH agreed on the following principles, in 2007, to be considered in forming recommendations for nutrition policy relating to HIV/AIDS and tuberculosis.<sup>37</sup>

- The best possible nutrition at a public health level is needed as part of a group of general measures for minimising the spread of HIV/AIDS and TB. At an individual level optimum nutrition is needed to improve health, quality of life and response to drug therapy, but it cannot directly prevent transmission of these infections nor cure them.
- Nutrition advice should not do harm and nutrition interventions to address HIV/AIDS and TB should be part of a holistic, comprehensive, integrated approach, including both public health and therapeutic nutrition strategies and actions.
- Nutritional care of people living with HIV and/or active TB should focus on consuming a variety of available, affordable, traditional and culturally accepted foods. The fact that sub-optimal intakes are endemic in South Africa, the characteristic wasting of HIV-infected persons and the effects of infections on food intake and nutrient absorption,



metabolism and losses, however, dictate the use of fortified foods, as well as macro- and micro-nutrient supplements at safe levels.

- Comprehensive and easy-to-understand steps and protocols should be established to be followed in public health nutrition interventions and in the therapeutic nutritional care of individual patients.

Recommendations made in 2007 by ASSAF<sup>37</sup> included that the implementation of the existing integrated nutrition programme of the SA DoH be evaluated and that resources should be directed to ensure food security based on locally available, affordable and traditional foods to vulnerable groups. It was further recommended that “the nutritional care of people infected with HIV should focus on diversified diets including locally available, affordable and traditional foods, and should be complemented by appropriate, locally acceptable macronutrient supplements”. Other recommendations were that “more nutritionists and dieticians should be trained, employed and utilized in all programmes addressing HIV/AIDS and TB, and the nutritional knowledge of all healthcare workers in community, clinic and hospital settings should be improved and extended”.<sup>37</sup>

Finally, recommendations for implementation were to:

- implement and properly resource the integrated national nutrition programme
- train and mobilise more nutritionists and dietitians<sup>37</sup>

### **1.10 THE HISTORY OF NUTRITION SUPPLEMENTATION PROGRAMMES IN SA**

Nutrition supplementation programmes have evolved with time. The Protein-Energy Malnutrition (PEM) scheme was initiated by the SA DoH in 1971, targeting malnourished or at risk of becoming malnourished children aged six months to six years. In 2004, supplementary feeding programmes were revived and the importance of nutritional interventions for people living with HIV and AIDS acknowledged. Nutrition supplementation formed the core part of

nutritional interventions in the Comprehensive Care and Management (CCMT) plan aimed at people living with HIV/AIDS.<sup>41</sup> The National Guidelines on Nutrition for People Living with HIV/AIDS (PLWHA) and TB,<sup>56</sup> although published in 2007, are the most recent guidelines developed by the SA DoH and recognise that nutrition education, in addition to supplementation, tends to be more effective at preventing and treating moderate malnutrition than supplementation alone.<sup>41,56</sup>

### **1.11 THE CURRENT NATIONAL NUTRITION SUPPLEMENTATION GUIDELINES**

At the time of the study, a national nutrition supplementation guideline ('The South African Supplementary Feeding Guidelines for At-Risk and Malnourished Children and Adults') was implemented.<sup>41</sup> The purpose of these guidelines, as quoted directly from the document are to:

- provide guidance to healthcare personnel on supplementary feeding to individuals who are undernourished and those at risk of being undernourished;
- rehabilitate at-risk and undernourished clients and prevent them from becoming severely malnourished;
- reduce the risk of mortality and morbidity associated with malnutrition;
- provide guidance to healthcare providers on replacement feeding; and
- strengthen systems for continuous monitoring and evaluation of supplementary feeding.

The SA DoH states that, "supplementary feeding becomes necessary whenever individuals cannot meet or are deficient in terms of micronutrients and energy requirements". The current national guideline has clearly defined entry and exit criteria and includes nutrition counselling in combination with nutrition supplementation (if required) to prevent severe malnutrition. The 'South African Supplementary Feeding Guidelines for At-Risk and Malnourished Children and Adults'<sup>41</sup> acknowledges that consuming a variety of healthy, balanced, nutrient-dense meals is the best way to meet both macro- and micro-nutrient needs.

## 1.12 MOTIVATION FOR THE PROPOSED STUDY

The SA DoH published a Framework for Implementing Nutrition Interventions for People Living with TB, HIV and AIDS<sup>11</sup> in which it describes nutrition care as an important part of the ‘package of care’ to HIV-positive adults. The core package of nutrition interventions for PLWHA was described in the framework as “nutrition screening and assessment, nutrition education, targeted nutritional supplements, supplementary/replacement and therapeutic feeding and home/community nutrition support through mechanisms such as home/community care, non-governmental organisations (NGOs) etc.” Nutrition assessment, counselling and interventions are mostly the responsibility of nursing professionals at PHC facility level, since very few facilities have posts available for dietitians. The roles and responsibilities of nursing professionals in the nutrition care of patients are described in the document. (Table 1.4.)

**Table 1.4 Nurses’ key responsibilities in the nutrition care of HIV-positive patients**

Anthropometrics	Weight, height, body mass index (BMI), mid-upper arm circumference (MUAC)
Clinical	Physical examination, oral disturbances e.g. thrush and ulcers, gastro-intestinal (GI) disturbances e.g. nausea, vomiting, diarrhoea (malabsorption vs drug side effects), fevers and sweats
Diet history	24-hour recall and quick nutrition screening
Medical profile	Current medical status & medication, side effects of drugs & stage of illness
Psychosocial & economic factors	Environmental history and access to food (household food security)
Nutrition education, advocacy & promotion	Importance of adequate nutrients and fluid intake Strategies to improve intake of nutrient-dense foods Nutritional care for symptoms and illnesses associated with HIV, AIDS and TB Food-drug interaction & food hygiene, water safety and sanitation Use of complementary or alternative therapies, physical activities Nutritional supplements
Nutrition support	Identify beneficiaries for nutritional support
Monitoring and evaluation (M&E)	Implementation of core nutrition package & monitor availability of nutrition supplements Collecting and reporting on nutrition indicators as per M&E framework

The researcher is concerned that although some nursing professionals receive training in nutrition assessment, not all nursing professionals may feel competent and confident to

render good nutrition care to patients on ART. Although the national guidelines for nutrition supplementation included clear entry and exit criteria to ensure identical nutrition supplementation to patients, regardless of the healthcare facility attended, the guideline has not yet been formally adopted or introduced and implementation may be problematic. It appears that many healthcare workers may not be aware of the guidelines and how to issue nutrition supplementation to adults appropriately. Potential problems with implementation as stipulated in the guidelines, may include lack of awareness of the guideline, interruptions in the supply of nutrition supplements, lack of interest in nutrition, lack of anthropometric equipment, lack of knowledge or understanding of nutrition care to patients on ART, and poor understanding of the national supplementation guidelines. Furthermore, a high patient to nursing professional ratio may result in minimal time for nutrition assessment and intervention. Patients may be receiving nutritional supplements in a haphazard manner. There is concern that these scarce resources may be inappropriately issued (or withheld), and nursing professionals may be unsure of the purpose of nutrition supplementation.

There is a further concern that nutrition counselling may be neglected or insufficient. It is crucial to investigate the knowledge professional nurses have of nutrition care, including supplementation, as well as assessing the current nutritional status of ART-receiving patients attending the targeted primary healthcare facilities. Studies investigating implementation of nutrition care to patients on ART, nursing professionals' knowledge, and the current nutritional status of ART-receiving adults at clinics in this area, to the best of the researcher's knowledge, have not yet been done. It is therefore essential that the current nutrition status of adult patients on ART, and the current implementation of nutrition care, including supplementation to these patients, be investigated.

The need for baseline information on nutrition assessment and support given to HIV-infected individuals is also lacking. The need for this information is recognised as the Roadmap for Nutrition in South Africa 2013–2017<sup>57</sup> and includes an indicator “proportion of people living with HIV nutritionally assessed using anthropometric measurement that were found to be undernourished and provided with nutritional support”. Currently there are no baseline data

available, while the goal set is to target 90% by 2016. Information obtained from this study may also assist in this regard.

### **1.13 IMPACT OF FINDINGS**

The nutrition knowledge of nursing professionals is important to evaluate to improve the quality of nutrition care as it is a crucial determinant of nutrition care outcomes. By investigating the understanding nursing professionals have regarding nutrition care, nutrition supplementation, current awareness and implementation of nutrition supplementation guidelines, a better understanding of how nutrition care and the supplementation programme are understood and implemented currently, can be obtained.

By investigating the current nutrition status of HAART-receiving patients, a better understanding of the prevalence of under-nutrition, over-nutrition and food insecurity may be obtained. This can help to provide current information on the nutrition-related problems experienced by the majority of HIV-positive patients on HAART attending PHC facilities within the Mbombela sub-district in the Ehlanzeni district of Mpumalanga province. Recommendations to address identified problems regarding nutrition care received at PHC facilities can be suggested. The obtained information will lead to the development of recommendations for nutrition care programmes in this area, such as:

- What is working well and needs to be continued or expanded, and positive feedback given.
- What is not working well and needs to be changed or discontinued.
- What can be done, introduced, and adapted and how to improve current nutrition care.
- What the implementation barriers of the national nutrition supplementation programme are, and suggestions to overcome these.

This information can be used by the Mpumalanga DoH to improve current knowledge and implementation of nutrition care to HAART-receiving adults attending PHC facilities. Informed decisions with regard to creating awareness of the national supplementation guidelines, training of healthcare professionals and provision of sufficient resources can then be made to

distribute nutrition supplements in accord with the national guidelines at all health facilities. This will assist in making the most effective, efficient and sustainable use of nutritional supplements to malnourished and at risk of becoming malnourished patients (the target group).

#### **1.14 CONCLUDING REMARKS**

HIV infection is a multifaceted condition which requires specialised medical and nutritional management. The management of HIV is continually changing as new research comes to light and has changed drastically in the last decade, since the free provision of ART in the government sector began. The links between HIV-infected individuals receiving HAART and nutritional status are complex. There are many aspects that are still poorly understood, requiring further research.

High-quality, scientifically sound nutrition education has been found to be helpful in preventing and treating under-nutrition in HIV-positive patients, but in certain cases, such as where high levels of food insecurity exist, nutrition supplementation has been proposed in addition to nutrition education. Nutrition supplementation has been suggested as a way to prevent and treat malnutrition in HIV-positive patients. Currently the national nutrition supplementation programme guidelines (NNSPG), developed by the SA DoH, aim to prevent malnutrition in those who are classified as being 'at risk' of malnutrition and aid in the treatment of those already found to be malnourished. It is essential to evaluate the quality of nutrition care received by adult patients on HAART and the extent to which the nutrition triplets (over-nutrition, under-nutrition and food security) exist in this population. An understanding of the knowledge professional nurses (working at PHC facilities, where most patients access treatment), have of nutrition assessment and supplementation is also important. An investigation into the current implementation of nutrition care and the nutritional supplementation programme is crucial as this data will provide useful information to improve the nutritional status, health and wellbeing of South African HIV-infected adults on lifelong HAART in the future.

## **CHAPTER 2. METHODOLOGY**

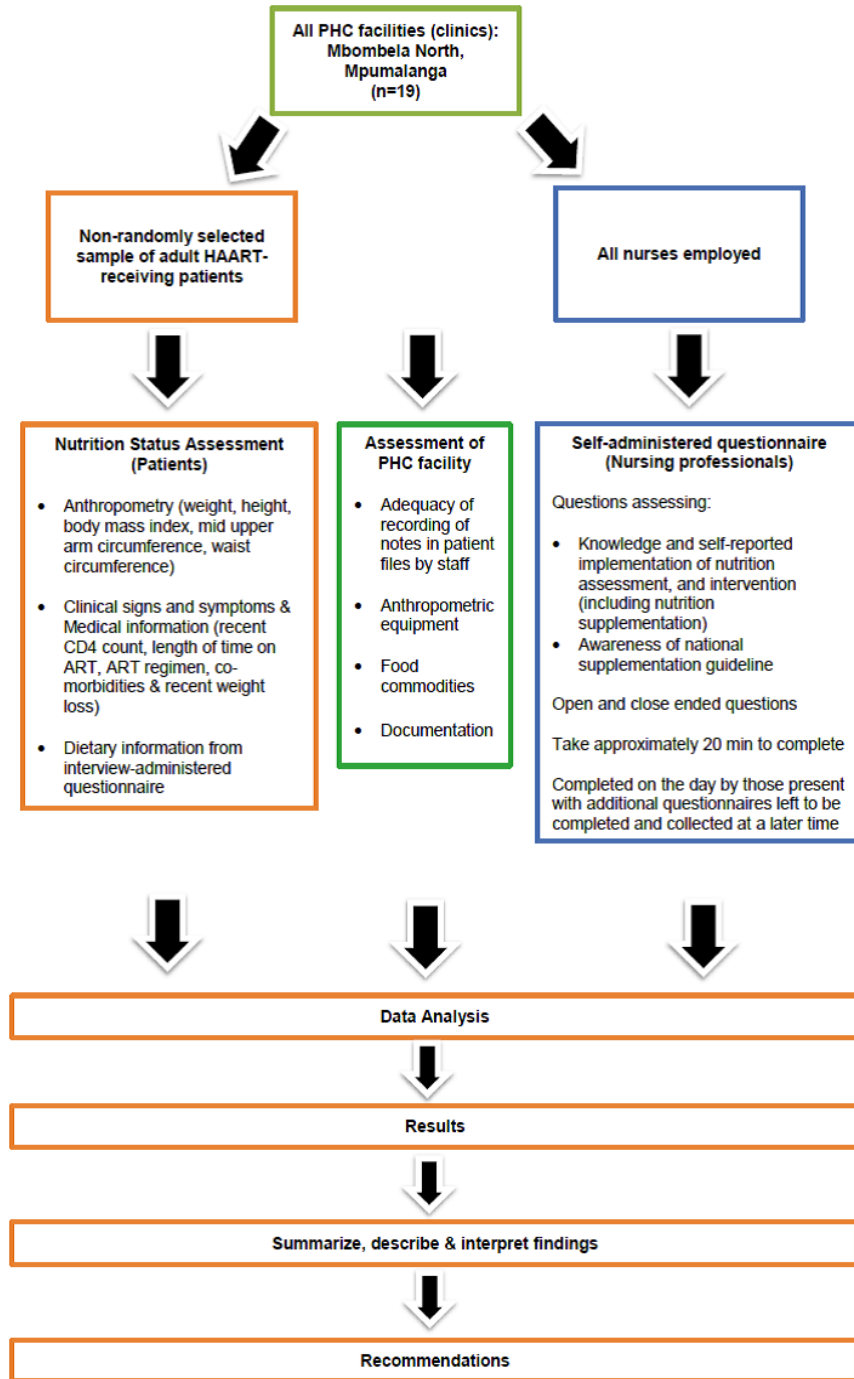
### **2.1 RESEARCH AIM**

To evaluate the nutrition care received by adult patients on HAART attending PHC facilities in Mbombela North, Mpumalanga.

### **2.2 SPECIFIC STUDY OBJECTIVES**

- 2.2.1 To describe the current nutritional status of adult HAART-receiving patients.
- 2.2.2 To describe the nurses' knowledge regarding nutrition care, including nutrition supplementation, to patients receiving HAART attending PHC facilities in Mbombela North sub-district, in Ehlanzeni district, Mpumalanga.
- 2.2.3 To describe the implementation of nutrition care to patients receiving HAART, attending PHC facilities in Mbombela sub-district, in Ehlanzeni district, Mpumalanga and compare nutrition supplementation practices with the national nutrition supplementation guidelines.

## 2.3 CONCEPTUAL FRAMEWORK



**Figure 2.1 Conceptualisation diagram for the current research project**



## **2.4 STUDY PLAN**

### **2.4.1 Study design**

The study was a cross-sectional descriptive study.

### **2.4.2 Study population**

The study populations comprised all adult patients on HAART, present at the selected PHC facility at the time of data collection, all nurses employed at the selected PHC facility, and all 19 PHC facilities in the Mbombela North sub-district, in Ehlanzeni district, Mpumalanga. The latter were identified from the Ehlanzeni Clinic Directory<sup>58</sup>, as sites for data collection.

#### **2.4.2.1 Sample selection**

##### Patients

Proportional sampling was used to select the sample of adult HAART-receiving patients. The number of patients selected was proportional to the number of patients on HAART at that PHC facility, based on SA DoH records from April–August 2013. A random sampling strategy was originally planned, but to protect the confidentiality of the study population, it was necessary to deviate from this original plan. Rather than participants disclosing their HIV status in public and HIV-positive patients being issued cards from which to randomly draw those for participation in the study, adult patients attending the targeted PHC facility during the data-collection period were approached privately by the principal investigator and research assistant and invited to participate. If the participant was eligible and willing to participate in the study, he/she was invited into the designated venue for detailed information on what participating in the study entailed. Participants were enrolled repeatedly in this manner during the data-collection period, until the sample size target had been met.

##### Nursing professionals

All nursing professionals employed at the selected PHC facility, and present during the data-collection period, were invited to participate in the study. If they were willing to participate, and gave written consent, they were included in the study. At the time of the study there were no

dietitians employed at any of the 19 PHC facilities in the Mbombela North area of Ehlanzeni district. Two nutritionists were employed at two of the PHC facilities but were excluded from this study. As the vast majority of patients receiving ART from a PHC facility receive nutrition assessment/counselling/supplementation from a nursing professional, nursing professionals were targeted in this study.

#### Primary healthcare facilities

All 19 facilities in the Mbombela North area of Ehlanzeni district (Mpumalanga), as identified from the Ehlanzeni Clinic Directory,<sup>58</sup> were included in the study.

#### **2.4.2.2 Sample size**

Based on provincial DoH statistics of the number of adults receiving ART at each clinic, a representative sample size for each of the 19 clinics was calculated. The error percentage (Cp) selected was 6, giving a total sample size of 263 patients (Table 2.1).

All nursing professionals eligible and willing to participate were included in the study. It was estimated that 80 nursing professionals would be included, based on the limited available PHC facility information.

**Table 2.1 Representative sample size of patients from each PHC<sup>1</sup> facility**

	Code	PHC facility	April 2013	May 2013	Jun 2013	Jul 2013	Aug 2013	Average	Clinic size	Sample size from each PHC facility
1	A	Bhuga	2 402	2 445		2 499	2 526	2 468	13.74%	36
2	B	Clau Clau	1 065		1 247	1 461	1 359	1 283	7.14%	19
3	C	Dwaleni	358	311	334	343	371	343	1.91%	5
4	D	Gutshwa	780	790	807	841	859	815	4.54%	12
5	E	Hazyview	1 531	1 628	1 351	1 379	1 395	1 457	8.11%	21
6	F	Jerusalem	571	585	595	605	622	596	3.32%	9
7	G	Kabokweni	2 592	2 640	2 662	2 696		2 648	14.74%	39
8	H	Khumbula	17	16	11		962	252	1.40%	4
9	I	Legogote	655	683	695	692	704	686	3.82%	10
10	J	Makoko	348	353	358	365	387	362	2.01%	5
11	K	Manzini	291		14	1 054	1 081	610	3.40%	9
12	L	Mbonisweni	636	685	652	697	705	675	3.76%	10
13	M	Mjejane	258	267	210	223	227	237	1.32%	3
14	N	Mthimba	790		847	852	833	831	4.63%	12
15	O	Phola-Nzikasi	2 357	2 464	2 468	2 493	2 513	2 459	13.69%	36
16	P	Sandrivier	774	794	479	838	866	750	4.17%	11
17	Q	Shabalala	651	677	499	518	723	614	3.42%	9
18	R	Skukuza	137	144	0	144		106	0.59%	2
19	S	White River	837	854	718	722	741	774	4.31%	11
		<b>TOTAL</b>								<b>263</b>

<sup>1</sup>PHC: primary healthcare

### **2.4.2.3 Inclusion criteria**

#### Patients

Patients were included if:

- equal or older than 18 years
- HIV positive and currently receiving HAART, regardless of length of time on ART
- considered competent to give informed consent (based on reasonable judgement by researcher that person is coherent)
- understood English or siSwati
- present at the health facility at the time of data collection

#### Nursing professionals

All nursing professionals employed at the PHC facility were eligible to be included in the study, after giving written consent. Nursing professionals in all categories and of all ages were included. Nursing professionals were included regardless of their home language. Since English is the medium of instruction for tertiary training, and used in daily professional communication, English was considered to be sufficiently good to fully understand and complete the questionnaire successfully.

### **2.4.2.4 Exclusion criteria**

#### Patients

Patients who were known to be pregnant were excluded from this study.

## **2.5 DATA-COLLECTION METHODS**

### **2.5.1 Logistics**

A qualified nutritionist with previous research experience and training specific to this research assisted with data collection at the selected PHC facilities. A two-hour training session was conducted by the researcher (a qualified dietitian) covering:

- Reasoning behind the research, aims and objectives
- Roles and responsibilities required for this research

- Importance of confidentiality of patient information
- Interview skills
- The interview-administered nutrition assessment questionnaire (Part A & B in detail)
- The PHC assessment tool
- Professional conduct

The clinics were known to the researcher and research assistant. Data collection was done over a period of 11 weeks (30 May 2014 – 14 August 2014).

After arriving at the PHC facility in the morning, the patient's nutritional assessments were done first when the facility was busier. Thereafter, the assessment tool for PHC facilities was completed and the nursing professionals invited to complete the self-administered questionnaires when the clinic was quieter later in the day.

At the smaller facilities professional nurses were approached individually and invited to participate, while at the larger facilities the study was discussed with the matron-in-charge, enabling several professional nurses to be available in a group to complete the questionnaire. In cases where more than one professional nurse was completing the questionnaire simultaneously, and the researcher/research assistant was present, there was no discussion and/or sharing of responses. In some cases, when professional nurses were busy and unable to complete the questionnaire immediately, the signed consent form was completed but the questionnaire was left at the facility for completion and collection at a later time.

### **2.5.2 Nutrition assessment of patients (Addendum 2)**

Patients underwent a nutrition assessment, consisting of four sections. The research assistant was trained in all aspects of the nutrition assessment of patients. When both the researcher and research assistant were available, the assistant focused on sections A and B and the researcher on sections C, D and E.

All data collection was conducted in a 'private' room, as available at the clinic. The assessment took approximately 20 minutes per patient.

Section A and B solicited information by an interview-administered questionnaire. Section A had nine questions to obtain socio-demographic information. Section B had five questions to gather information on clinical signs and symptoms, dietary information and nutrition care received at the PHC facility. Section C consisted of seven questions and sought to obtain medical information (recent CD4 count, length of time on ART, current HAART regimen, co-morbidities and recent weight changes) by reviewing information available in the patient's file. Section D consisted of four questions to obtain information on the adequacy of recording of notes in patient files by nursing staff. Section E involved physically taking anthropometric measurements (height, weight, mid-upper arm circumference (MUAC) and waist circumference (WC). Further assessments (e.g. skin folds) were not done as they are not anthropometric measurements included in the NNSPG (to assess risk of malnutrition and eligibility for nutrition supplementation) with which this information was compared.

#### **2.5.2.1 Reliability of interviewer-administered questionnaire**

The trained research assistant conducted all the interview-administered questionnaires in a standardised manner. The questionnaires were checked for content validity by two external experts. The research assistant conducting the interviews was fluent in siSwati and English. Participants were asked whether they would like the interview to be conducted in siSwati or English. The majority of patients preferred for the interview to be conducted in the local language, siSwati.

#### **2.5.2.2 Reliability of patients' anthropometric assessments**

Weight was measured using an electronic scale (lighter and easier to move about, also quicker and simpler to operate than balance beam scale while not compromising accuracy) and recorded to the nearest 0.1 kg.<sup>59-60</sup> Participants were weighed after being asked to remove their shoes, heavy items of clothing such as jackets, and any items from their pockets, such as cellular phones, keys, wallet, food, etc.<sup>59</sup> The research assistant clearly explained the procedure so the participant was put at ease, if needed. Participants were asked to gently step onto the middle part of the scale and stand still and relaxed with their

feet slightly apart,<sup>59-60</sup> and weight spread equally on both feet.<sup>60</sup> The participants were not to lean against/hold onto anything, nor have any part of their feet off the scale.<sup>59</sup>

Height was taken using a stadiometer and measured to the nearest 0.1cm. Participants (after removing hairpieces/wigs or flattening their hair, if applicable) stepped onto the platform with both feet flat and legs straight, shoulders relaxed and with both arms at their sides. The back of the head, shoulder, buttocks, and heels were all against the backboard, if possible. The participants stood in an upright position (head in line with the spine), looking straight ahead, and were assisted in having their heads positioned into the Frankfort horizontal plane. This creates an imaginary straight line from the top of the ear canal to the lowest part of the bony socket of the eye (orbit) which is parallel to the floor and 90 degrees to the backboard. The stadiometer head stick was then gently lowered onto the participants' heads, pressing against their hair. The measurement was read at eye level to avoid the error of parallax.<sup>59-60</sup> If the participant had an elaborate hairstyle that interfered with correct height measurement and could not be removed/flattened, the researcher measured the height of the hairpiece and then subtracted it from the reading to obtain the true height.<sup>59</sup>

BMI was calculated as weight divided by height squared ( $\text{kg}/\text{m}^2$ ).<sup>61</sup> Participants were classified according to the WHO classification of BMI<sup>3</sup> (Table 2.2).

**Table 2.2 BMI<sup>1</sup> classification**

Classification of adult underweight, overweight and obesity according to BMI and associated chronic disease risk		
BMI ( $\text{kg}/\text{m}^2$ ) finding	World Health Organization <sup>3</sup> classification	Chronic disease risk
BMI <16.0	Underweight (severe thinness)	Low (but increased mortality & morbidity from other causes)
BMI 16.0–16.9	Underweight (moderate thinness)	
BMI 17.0–18.49	Underweight (mild thinness)	
BMI 18.5–24.9	Normal range	Average
BMI 25–29.9	Overweight	Increased
BMI 30–34.9	Obesity (Class I)	Moderate
BMI 35–39.9	Obesity (Class II)	Severe
BMI $\geq$ 40	Obesity (Class III)	Very severe

Source: World Health Organization (WHO)<sup>3</sup>; <sup>1</sup>BMI: body mass index

Mid-upper arm circumference (MUAC) was measured using an adult MUAC tape.<sup>41</sup> Although the mid-upper arm is accurately measured midway between the acromion process at the shoulder and the olecranon process at the elbow<sup>60</sup>, for the purpose of this study the MUAC was taken in the same way it would be routinely done at the PHC facility by nursing staff, visually assessing 'midway' between the elbow and the shoulder. Although the more accurate way of measuring MUAC as described above could have been used, it would not have served the purpose of this study which was to compare MUAC measurements to nutrition supplementation programme entry criteria and the receiving of nutrition supplementation as per the guidelines. In order to compare this, one would need to mimic the measurement as it would correctly be done by a nursing professional following the national supplementation guidelines, using the adult MUAC tape. MUAC was measured to the nearest 0.5cm. Patients with an MUAC less than 16cm without oedema or less than 18.5 with oedema were classified as having severe acute malnutrition (SAM). Patients with an MUAC between 18 and 22cm were classified as having moderate acute malnutrition (MAM). Patients with an MUAC above 22cm were classified as not malnourished. These classifications are in accordance with the NNSPG to identify at-risk and malnourished adults.<sup>41</sup>

Waist circumference (WC) was measured using a non-stretch measuring tape. The participants lifted their shirts, exposing their waists, so the tape touched the skin. Outer clothing like jackets and jerseys that would potentially interfere with getting the measuring tape against the waist had already been removed before weight and height were taken.<sup>60</sup> The measuring tape was pulled straight (parallel to the floor) around the narrowest part of the waist (below the ribcage above the umbilicus).<sup>60</sup> The zero of the tape was aligned below the measurement and the researcher bent down to be at eye-level with the reading to avoid the error of parallax.<sup>59</sup> The measuring tape was pulled firmly around waist to sit snugly against the skin, but not press into the skin when the measurement was taken. The measurement was taken at the end of a normal breath out (expiration).<sup>60</sup> Markings were not made on patients in order to protect confidentiality.



Waist circumference is a good indicator of abdominal visceral fat and associated with an increased risk of metabolic complications and CVD. An increased WC is an independent predictor of chronic disease risk, despite BMI. There is a greater risk of metabolic complications for men with a WC  $\geq 94$  cm, and women with a WC  $\geq 80$  cm<sup>62</sup> (Table 2.3).

**Table 2.3 Waist circumference and associated risk of metabolic complications**

Waist circumference measurement (cm)		Associated risk of metabolic complications & chronic disease including CVD <sup>1</sup>
Male	Female	
< 94	< 80	Not at an increased risk
$\geq 94$	$\geq 80$	Increased risk
$\geq 102$	$\geq 88$	Substantially increased risk

<sup>1</sup>CVD: cardiovascular disease

Measurements were taken using standardised procedures and techniques, using the same equipment and units of measurement for each participant.<sup>59-60</sup> The measurements were done by the researcher and research assistant. Training was done to minimise errors between measurements done by the researcher and research assistant.

Before starting to weigh participants each day, the scale was placed on a firm, flat surface<sup>60</sup>, calibrated and checked to be accurate with a known (5kg) weight.<sup>59-60</sup>

### 2.5.3 Self-administered questionnaire to nursing professionals (Addendum 3)

A self-administered questionnaire was used to assess the knowledge of nursing professionals. The questionnaire was developed in English. Participants' English proficiency was considered sufficient to understand and complete the consent form and questionnaire, since their nursing training was conducted in English, their professional knowledge tested in English, and daily note taking done in English.

The questionnaire was compiled by the researcher with input from two external experts (to ensure content validity). Questions were based in part on 'The South African Supplementary Feeding Guidelines for At-Risk and Malnourished Children and Adults'<sup>41</sup> and included both

open and closed-ended questions, although most were closed-ended. The questionnaire had a total of 34 questions divided into four sections.

Section A had five questions assessing biographical information. Section B had nine questions soliciting information on additional nutrition training, background clinic information and perceptions of a healthy weight for patients. Pictures depicting different BMI ranges, used in the study by Matoti-Mvalo and Puoane<sup>55</sup>, developed by Stunkard<sup>63</sup> and validated for use among South Africans by Mciza<sup>64</sup>, were used when asking questions regarding perception of a 'healthy weight' and a 'healthy weight for patients on ART' (See Question 13 of Addendum 3 for Stunkard figures). Permission to use the Stunkard figures was granted on 13 January 2014 (Addendum 4). Section C had five questions assessing knowledge of and confidence in using MUAC and BMI. Section D had 23 questions assessing knowledge of nutrition supplementation, including the aim, entry and exit criteria of the nutrition supplementation programme, healthy eating counselling, and nursing professionals' rating of the quality of nutrition care patients receive and ways to improve care. The questionnaire took approximately 20 minutes to complete.

#### **2.5.4 Assessment tool for primary healthcare facilities (Addendum 5)**

An assessment tool was designed by the researcher, with input from two external experts (for content validity), to investigate the adequacy of the following:

- anthropometric equipment and material (Section A)
- food commodities (Section B)
- relevant documentation/policies/materials and tools (Section C)

Section A consisted of 14 questions, Section B had approximately 11 questions (dependent on variety of stock available) for participants to tick 'yes' or 'no' and Section C consisted of five questions to tick 'yes' or 'no'. The assessment took between 15 and 30 minutes. Data were collected by the researcher and research assistant.

## **2.6 PILOT STUDY**

A pilot study was carried out at Zwelisha, a similar PHC facility in close proximity to those included in the main study, on 29 May 2014. The questionnaire for nursing professionals was piloted to four participants by the researcher. The patients' nutritional assessment was piloted to four participants by the researcher and research assistant. The PHC tool was also piloted by the researcher and research assistant.

The pilot study was conducted before the main study to check methods, sufficiency of research assistant training, time taken to collect data, and to identify potential problems. Changes to improve the smooth running of the main study included correcting numbering and wording errors on the questionnaires and patient's nutritional assessment tool, improved seating arrangements of researcher, research assistant and participant to be as efficient as possible for collecting data, the decision not to draw on patients for waist circumference measurements and change to non-random sampling methods to protect participant confidentiality and to be more assertive when inviting professional nurses to participate in the study. Data obtained from the pilot study were not included in the main study.

## **2.7 DATA ANALYSIS**

### **2.7.1 Analysis of data**

Microsoft (MS) Excel version 2013 was used to capture the data. The raw data obtained from the patients' nutrition assessments, nursing professionals' questionnaires and PHC assessment tools were coded and entered into MS Excel by the principal investigator. Data were analysed as far as possible by the principal investigator (descriptive statistics); thereafter a statistician appointed by Stellenbosch University (Prof. DG Nel) assisted with further data analysis. STATISTICA version 12 [(StatSoft Inc. (2014) STATISTICA (data analysis software system), [www.statsoft.com](http://www.statsoft.com).)] was used to analyse the data.

Summary statistics was used to describe the variables. Medians or means were used as the measures of central location for ordinal and continuous responses and standard deviations as indicators of spread. The relationships between continuous response variables and nominal

input variables were analysed using appropriate analysis of variance (ANOVA). When ordinal response variables were compared to a nominal input variable, non-parametric ANOVA methods were used. A  $p$ -value of  $p < 0.05$  represented statistical significance and 95% confidence intervals were used to describe the estimation of unknown parameters.

### **2.7.2 Statistical methods**

Descriptive statistics were used to describe the knowledge and implementation of nutrition care (assessment and intervention, including supplementation) as well as the nutrition status of HAART-receiving patients. Comparisons to investigate associations between specific variables were done under the guidance of a statistician. The relationships between gender and weight, gender and BMI, as well as gender and WCM and CVD risk were assessed using ANOVA.

## **2.8 ETHICAL AND LEGAL ASPECTS**

### **2.8.1 Ethics Review Committee**

The study was submitted for ethics approval to the Health Research Ethics Committee at Stellenbosch University (Faculty of Medicine and Health Sciences), the Ehlanzeni district manager and the Mpumalanga Department of Health Research and Ethics Committee (HREC). Approval was granted from Stellenbosch University (Addendum 6) on 14 May 2014 and obtained by the principal researcher on 20 May 2014 (Ethics Reference #: S14/04/076). Approval was granted verbally from the Mpumalanga HREC on 28 May 2014 to begin the research and a letter confirming approval was received on 3 June 2014 (Addendum 7).

### **2.8.2 Informed consent**

The informed consent form for patients was developed in English (Addendum 8) and translated into siSwati (Addendum 9), since this is the predominant language of the study population from which the sample was drawn. Translation was done by a registered dietitian fluent in English and siSwati and knowledgeable in the subject/technical language. Back translation was done by a qualified nutritionist also fluent in English and siSwati and familiar with the subject/technical language. Potential participants were informed of the study and

what participating in the study entailed before signing the consent form. Participants were asked if they had any questions they would like to ask before data collection began. Participation was voluntary and there was no pressure or obligation to participate in the study. Participants were also free to withdraw from the study at any stage. Only once the participant fully understood what the study entailed, had agreed to participate, and had signed the consent form, did data collection begin. Participants were adults and consented only for themselves. Participants who were unable to sign, made an X on the form. If they were considered incompetent or unable to give consent themselves, they were not included in the study. Patients also received a copy of the consent form to take home. This copy summarised the most important information pertaining to the study and had the principal researcher's contact number in case any study participants sought more information or had any queries relating to the study.

The informed consent form for nursing professionals (Addendum 10) was developed in English. Nurses receive tertiary training in English and their clinical knowledge and knowledge of English terminology are expected to be sufficient to write formal referral letters and notes in patient files and therefore considered sufficient to read and fully understand the consent form. Potential participants were informed of the study and what participating in the study entailed before signing the consent form. Participants were asked if they had any questions they would like to ask before data collection began. Participation was voluntary and there was no pressure or obligation to participate in the study. Participants were also free to withdraw from the study at any stage. Only once participants fully understood what the self-administered questionnaire entailed, had agreed to participate and had signed the consent form, was the questionnaire handed to the participant for completion. All participants received an extra copy of the consent form to take home.

### **2.8.3 Patient confidentiality**

Confidentiality of the study population was ensured by using a private area for data collection. Patients had anthropometric measurements taken, one patient at a time, in a private room, as free from interruptions as reasonably possible. This privacy was maintained during the course

of the interview and while information was obtained from the patient's medical file. Recording of patient information was anonymous, in a coded form, using assigned participant numbers, not names. Confidential information obtained from anthropometric measurements, interviews and from the medical file reviews was handled by the principal investigator and/or research assistant only and not shared with any other person not directly involved in the study. Information obtained from data collection was kept safe in a dark folder, and not left visible or unattended. Patients did not have any markings or stickers visible on them that could have potentially broken confidentiality by designating that they had participated in the study.

## **Chapter 3. RESULTS**

### **3.1 INTRODUCTION**

Results are divided into three sections. Firstly, the results obtained from the nutrition assessment of adult HAART-receiving patients are given, followed by those of the self-administered questionnaire completed by nursing professionals employed at the targeted facilities. Finally, the findings from the PHC facility assessment tool are reported. Where data were not complete for all participants, it is specified for how many participants data were available; when not specified, data were available for all participants. The response rate was greater than 80% for patients; reasons for declining to participate in the study included mostly work or other commitments, while others wished not to participate without giving an explanation. The response rate was also greater than 80% for nursing professionals, since the most common reason furnished for their declining to participate in the study was being too busy at the time, which was circumvented by leaving questionnaires for completion at a later time.

Representation from each of the selected health facilities is summarised in Table 3.1 overleaf. All 19 facilities in the Mbombela North sub-district, in Ehlanzeni district (Mpumalanga), were included in the study.

**Table 3.1 Representation per selected PHC<sup>1</sup> facility**

No.	Code	PHC Facility (Clinic)	No. of participants PATIENTS	No. of participants PROFESSIONAL NURSES	PHC Facility ASSESSMENT TOOL
1	A	Bhuga	36	4	1
2	B	Clau Clau	19	4	1
3	C	Dwaleni	5	4	1
4	D	Gutshwa	12	3	1
5	E	Hazyview	21	4	1
6	F	Jerusalem	9	4	1
7	G	Kabokweni	39	6	1
8	H	Khumbula	4	1	1
9	I	Legogote	10	4	1
10	J	Makoko	5	4	1
11	K	Manzini	9	4	1
12	L	Mbonisweni	10	4	1
13	M	Mjejane	3	4	1
14	N	Mthimba	12	5	1
15	O	Phola-Nzikasi	36	4	1
16	P	Sandriver	11	4	1
17	Q	Shabalala	9	4	1
18	R	Skukuza	2	4	1
19	S	White River	11	4	1
		<b>TOTAL</b>	<b>263</b>	<b>75</b>	<b>19</b>

<sup>1</sup>PHC: primary healthcare

A total of 263 adult patients on HAART participated in the study. Numbers were obtained in accordance with pre-determined sample size and numbers per PHC facility. Data were collected between 30 May 2014 and 14 August 2014.

### 3.2 NUTRITION ASSESSMENTS (Patients)

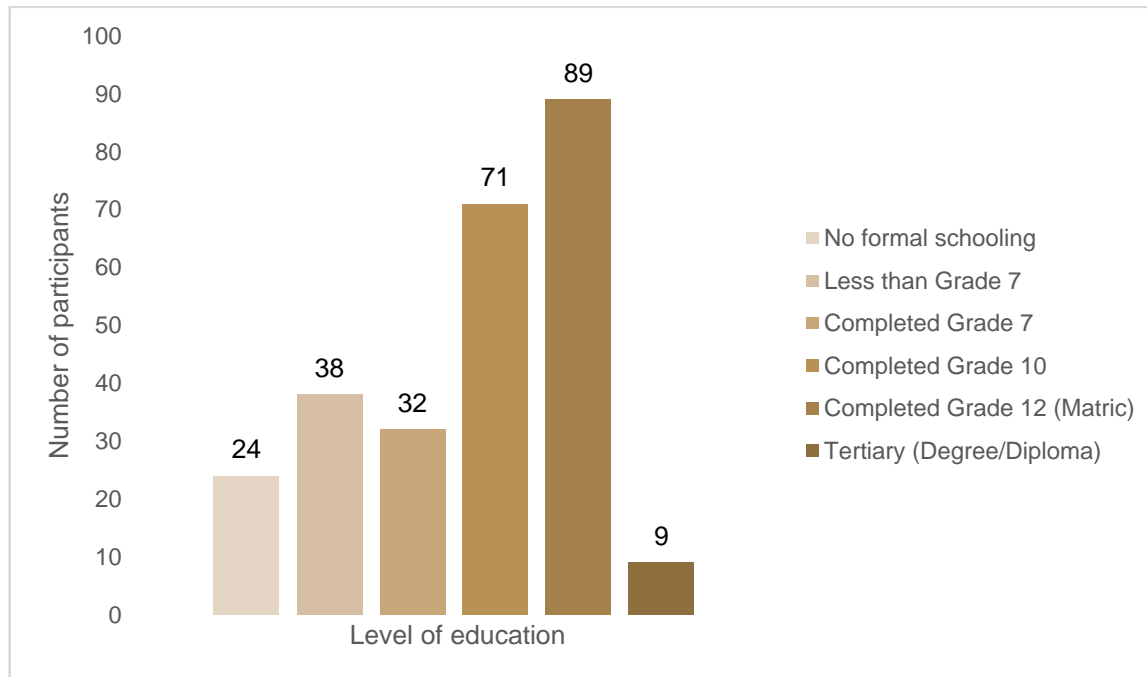
#### 3.2.1 Gender, age and ethnicity

There were 168 female participants (63.9%) and 95 male participants (36.1%). The mean age of the participants was 40.2 years (SD 11.62) (range: 18–89 years). The median age was 38 years. All participants were of African ethnicity.



### 3.2.2 Education

Although many study participants (n=89; 33.8%) had completed Grade 12 (matric), the majority of participants (n=165; 62.7%) had an education level of Grade 10 and lower, and only 3% (n=9) had a tertiary education (a diploma/degree). A summary of the highest level of education (completed grade) obtained by participants is displayed in Figure 3.1 below.



**Figure 3.1 Highest level of education obtained by participants**

### 3.2.3 Employment status

The majority of participants were unemployed and seeking work (n=112; 43%). Participants' employment statuses are summarised in Table 3.2.

**Table 3.2 Current work/employment status of participants**

Current work/employment status	Number of participants (n)	Percentage (%)
Unemployed and looking for work	112	42.6
Unemployed and not looking for work	19	7.2
Temporary employment/'piece jobs'	50	19.0
Permanent employment	54	20.5
Self-employed	28	10.7

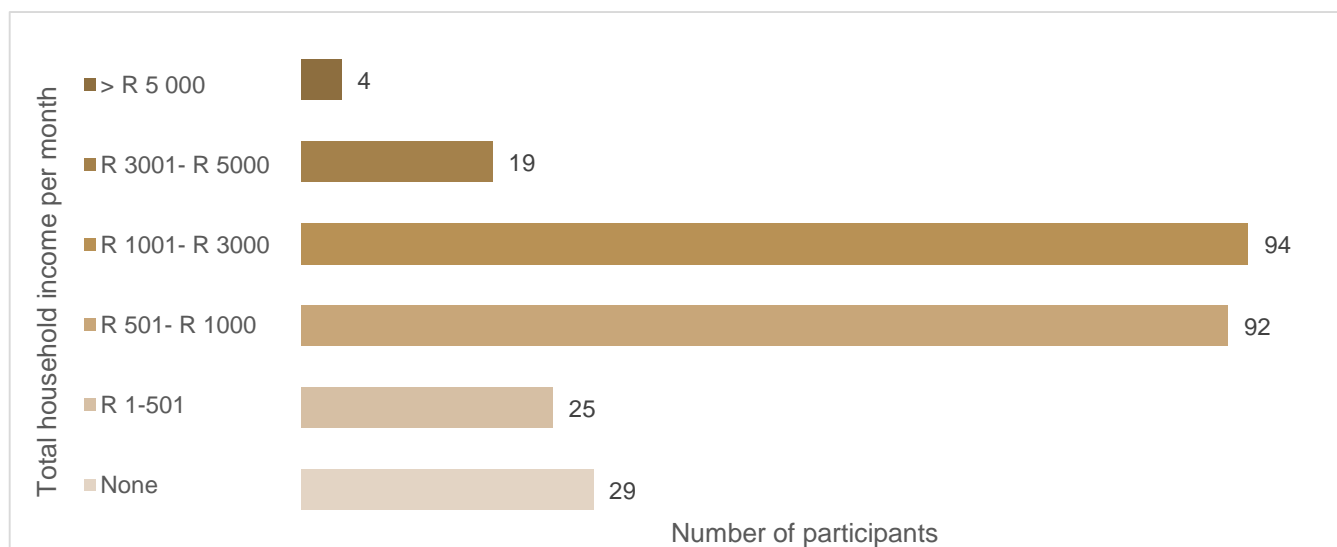
### 3.2.4 Social grant support

Just over a half of participants, 51.3 % (n=135), were receiving a social grant. Most were receiving a child support grant (CSG) (n=100), while the remainder were accessing an old age grant (n=18), a disability grant (DG) (n=16) and a grant that was not specified (n=1). Excluding CSG, 19 males and 16 females were accessing social grants.

### 3.2.5 Monthly household income

The majority of participants earned a monthly household income of between R501–R3000. There was a fairly even split between those who earned between R501–R1000 (n=92; 35%) and those who earned between R1001–R3000 (n=94; 35.7%)

Twenty-nine participants (11%) reported monthly household income to be none, while the minority (n=4; 1.5%) earned more than R5000 (Figure 3.2).



**Figure 3.2 Total monthly household income**

### 3.2.6 Monthly household food expenditure

Monthly household food expenditure was reported by 262 participants. The majority of participants spent less than R 1000 a month on food (n=235; 89.7%). Twenty-six participants

(9.9%) spent between R1001–R3000, while one participant reported spending more than R3000 a month.

### 3.2.7 Household food security

Household food security was assessed simply by asking participants, ‘Does everyone in your household always have enough safe and healthy food to eat?’ Affirmative responses comprised 144 (54.8%) of participants. Based on this response, it appeared that just over half of the participants were food secure.

### 3.2.8 Water source

Most participants accessed drinking water from a tap. For 35.4% (n=93) the tap was in the home, whereas for 43.0% (n=113) the tap was nearby, but not in the home. Fifty-seven participants (21.7%) reported accessing water from another source. Other non-tap water sources included mainly water tankers (n=35) or boreholes (n=18). Four participants, representing 7.0% of those collecting water from another (non-tap) water source, collected water from a nearby stream or fountain.

## 3.3 HEALTH INFORMATION

### 3.3.1 Current ART regimen

Of the 262 participants who reported their current ART regimen, the majority (n=176; 67.2%) were on a fixed-dose combination (FDC) pill. The second most common regimen was TDF + 3TC + EFV (n=40; 15.3%), followed by TDF+FTC+EFV as separate pills (n=23; 8.8%) (Table 3.3).

**Table 3.3 Current ART regimen of participants**

Current ART Regimen	Number of participants (n)	Percentage (%)
Fixed dose combination (FDC) :		
Tenofovir + Emtracitabine + Efavirenz (TDF + FTC + EFV)	176	67.2
Tenofovir + Lamivudine + Efavirenz (TDF + 3TC + EFV)	40	15.3
Tenofovir + Emtracitabine + Efavirenz (TDF + FTC + EFV)	23	8.8
Other [often including Nevirapine (NVP)]	23	8.8

### 3.3.2 Length of time on HAART

Length of time on HAART (n=258) ranged from 5 months to 9 years and 5 months (113 months), with an average of 2 years and 4 months (28 months) (SD 20.20). Length of time having received HAART from their current PHC facility (n=260) ranged from 1 month to 8 years and 2 months (98 months), with an average of 1 year and 9 months (21 months) (SD 16.85).

### 3.3.3 Most recent CD4 count

Of the 251 participants whose laboratory CD4 count results were available, it was found that participants' CD4 counts ranged greatly from 8 to 958, with an average of 385.9 (SD 191.76). When comparing genders, female participants (n=162) had significantly higher mean CD4 counts than their male counterparts (n=89) (411 vs. 340 respectively) ( $p=0.00484$ ).

Of the 250 participants whose laboratory CD4 results were dated, almost half (46%) had been taken less than six months ago (Table 3.4).

**Table 3.4 Most recent CD4 count**

Most recent CD4 count taken	Number of participants (n)	Percentage (%)
≤ 6 months ago	115	46.0
≤ 6–12 months ago	93	37.2
> 1 year ago	42	16.8

### 3.3.4 Co-morbidities

The majority of participants (n=118; 71.5%) did not have any diagnosed co-morbidities. Thirty-five participants (13.3%) had active tuberculosis (TB) (this did not include those receiving TB prophylaxis), 20 participants (7.6%) had hypertension (HPT) and 1 participant (0.4%) had diabetes mellitus (DM). Additionally participants had co-morbidities in combination, such as DM and HPT (n=13; 4.9%). One participant reported asthma as a co-morbidity, while another was receiving chronic treatment for an unspecified condition (Table 3.5).

**Table 3.5 Co-morbidities**

Co-morbidity	Number of participants (n)	Percentage (%)
None	188	71.5
TB <sup>1</sup>	35	13.3
HPT <sup>2</sup>	20	7.6
DM <sup>3</sup> +HPT <sup>2</sup>	13	4.9
HPT <sup>2</sup> +TB <sup>1</sup>	2	0.8
DM <sup>3</sup>	1	0.4
TB <sup>1</sup> ,HPT <sup>2</sup> + DM <sup>3</sup>	1	0.4
DM <sup>3</sup> +TB <sup>1</sup>	1	0.4
Asthma	1	0.4
Other-not specified	1	0.4

<sup>1</sup>TB: tuberculosis; <sup>2</sup>HPT: hypertension; <sup>3</sup>DM: diabetes mellitus

### 3.3.5 Recent weight changes

Recent weight changes were determined from actual values available in the patient's file, rather than self-reporting, to improve accuracy. The majority of participants (n= 92; 35%) had a stable weight within the previous three months, while a fifth had gained weight. However, for many participants (n=76; 28.9%) recent weight changes could not be determined as information was incomplete in the file (Table 3.6).

**Table 3.6 Participants' weight change within previous three months**

Recent weight change within last 3 months	Number of participants (n)	Percentage (%)
Unchanged	92	35.0
Unknown – not available from file	76	28.9
Gained weight	53	20.1
Lost weight	42	16.0

In addition, 23 participants (8.7%) had lost more than 5% of their body weight in the previous month. However, for 72 participants (27.4%), the previous month's weight was not recorded in their file and therefore an objective assessment of weight loss over the previous month was unavailable.

### 3.3.6 Frequency of ART collection from PHC facility

Of the 260 participants who reported frequency of collecting treatment from the PHC facility, the majority of participants (n=197; 75.8%) reported collecting HAART monthly (Table 3.7).

**Table 3.7 Frequency of HAART collection**

Frequency of HAART collection from PHC facility	Number of participants (n)	Percentage (%)
Monthly	197	75.8
Every second month	55	21.1
Every third month	7	2.7
Twice every three months	1	0.4

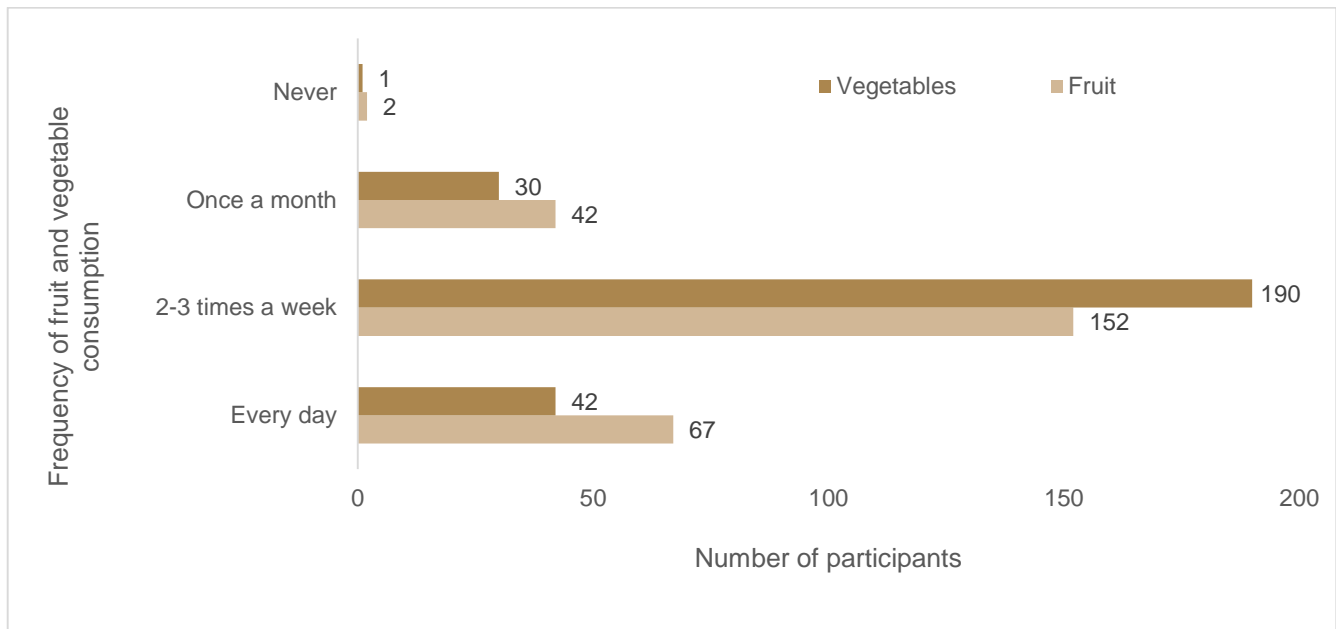
### 3.3.7 Symptoms

Participants' self-reported nutrition-related symptoms included nausea (n=38; 14.4%), loss of appetite (n=31; 11.8%), vomiting (n=29; 11%), taste changes (n=14; 5.3%), diarrhoea (n=13; 4.9%), mouth sores/oral or oesophageal candidiasis (n=5; 1.9%), and constipation (n=3; 1.1%), with 22 participants (8.4%) reporting other non-nutrition related symptoms.

## 3.4 DIETARY INFORMATION

### 3.4.1 Habitual fruit and vegetable intakes

Fruit and vegetable intakes were similar. The majority of participants (n=152 and n=190 respectively) reported eating these foods 2–3 times a week (Figure 3.3).



**Figure 3.3 Frequency of fruit and vegetable consumption**

### 3.5 NUTRITION CARE RECEIVED AT PHC FACILITY

#### 3.5.1 Weight and height measurements

When participants were asked whether they were weighed at each clinic visit, most answered 'yes' (n=244; 92.8%). Of the 262 participants who reported on whether their height had ever been taken at the clinic, most answered 'no' (n=223; 85.1%).

#### 3.5.2 Nutrition counselling

The majority of the 260 participants reported having received nutrition counselling from the clinic (n=161; 61.9%) and of those who had received nutrition counselling, most had received counselling within the last two years (n=62; 38.5%), while 51 participants (31.7%) reported having received nutrition counselling within the previous three months. (Table 3.8). Most of the 262 participants reported that they had never been counselled at the clinic in respect of their weight (n=163 participants; 62.2%).

**Table 3.8 Most recent nutrition counselling received by patients**

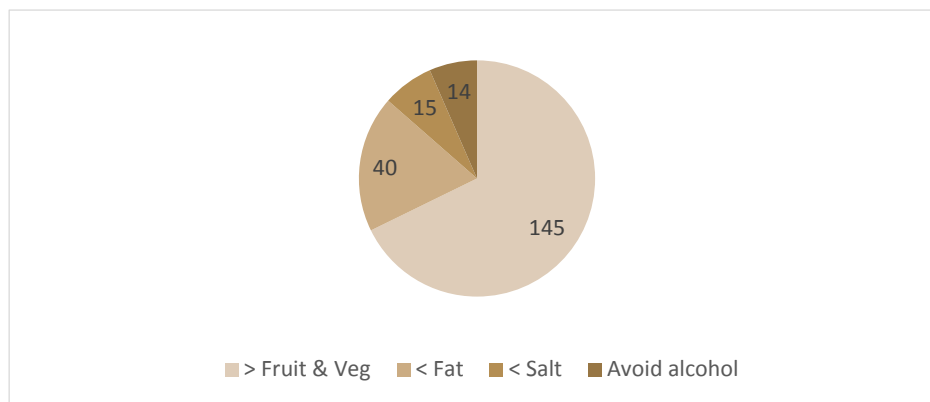
Most recently received nutrition counselling	Number of participants (n)	Percentage (%)
Within previous 3 months	51	31.7
Within previous 6 months	26	16.1
Within last year	19	11.8
Within last 2 years	62	38.5
Cannot remember how long ago	3	1.9

The length of time taken for nutrition counselling was reported to be more than 10 minutes by the majority (n=123; 76.4%) of participants (Table 3.9).

**Table 3.9 Length of time spent on nutrition counselling session**

Time taken for nutrition counselling	Number of participants (n)	Percentage (%)
< 2 minutes	1	0.6
Between 2–5 minutes	5	3.1
Between 5–10 minutes	32	19.9
> 10 minutes	123	76.4

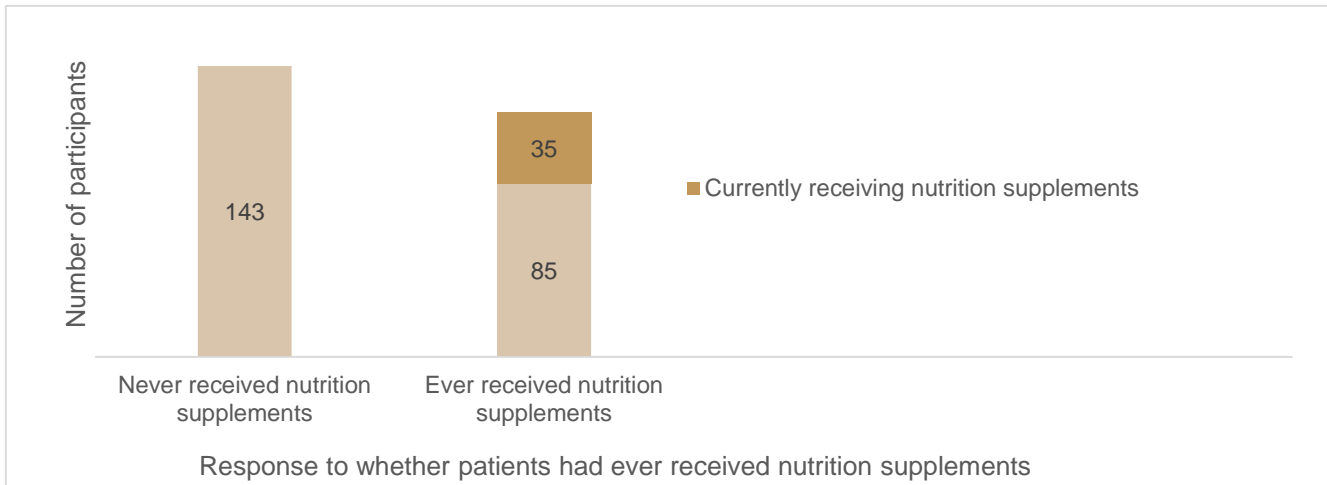
The 161 participants who received nutrition counselling were asked what information they received from their nutrition counselling. This was an open-ended question and participants were free to mention any information they remembered receiving. Several participants gave more than one answer. All the responses were assessed and grouped into themes. The most common themes were increasing fruit and vegetable intake (n=145), decreasing fat intake (n=40), decreasing salt, and avoiding alcohol (Figure 3.4). The values indicated in Figure 3.4 reflect the number of participants. Other responses included more vague answers such as ‘to eat healthily’.

**Figure 3.4 Most commonly received information from nutrition counselling**



### 3.5.3 Nutrition supplementation

A little more than half of the participants (n=143; 54.4%) reported never having received nutrition supplements from a PHC facility, while 120 participants (45.6%) reported receiving nutrition supplements. Thirty-five participants (13.3%) were receiving nutrition supplementation from the PHC facility at the time of study (Figure 3.5).



**Figure 3.5 Receiving of nutrition supplements from PHC facility**

The 35 participants currently receiving nutrition supplementation were asked why they thought they were receiving supplements. The most common responses were: 'because I need to gain weight' (n=8), 'I do not know' (n=7), 'to get enough/the right balance of nutrients' (n=5), 'because I am sick' or 'to help me be strong' (n=5), 'to be able to drink my medicine' (n=2), 'to have enough food to take my medication with' (n=2), 'to gain energy' (n=2) or 'I do not have any food to drink medication with' (n=1). Other responses were 'because I drink ART treatment' (n=1), 'they want me to be healthy' (n=1) and 'I enjoy it' (n=1).

The participants currently receiving nutrition supplements, had received them for an average length of time of 11.7 months (SD 0.6) (range 2–24 months). Twenty-three participants (65.7%) reported that they did not know how long they would receive nutrition supplementation for, while other responses were 'until I gain my weight back' (n=4), 'until I am better' (n=2), 'I will always receive them when they are available' (n=2), or 'until I feel fine'

(n=1), 'until I get my pension' (n=1), 'for as long as I am weak' (n=1), or 'until my condition gets better' (n=1). Of the participants that received nutrition supplements, most had been given instructions on how to mix the supplements (n=28; 80.0%) and how often to take them (n=26; 74.3%). When asked whether it is important to eat healthily when receiving nutrition supplements, 31 participants responded as 'agreed strongly' (n=19; 61.3%) or 'agreed' (n=12; 38.7%). No participants 'disagreed' or 'disagreed strongly' with this statement. One-hundred and thirteen participants (43.0%) believed nutrition supplements to be 'better' than food. Reasons selected by patients from a closed-ended question as to why nutrition supplements are perceived as better than food are summarised in Table 3.10 below. Participants' could select more than one response.

**Table 3.10 Reasons given why nutrition supplements are better than food**

Response	Number of participants (n)
Nutrition supplements have more vitamins and minerals	49
Nutrition supplements have more energy and protein	24
I gain weight better with nutrition supplements	18
Nutrition supplements are 'super-foods' with more goodness	12
Nutrition supplements are easier and safer to make	9
I like nutrition supplements better than food	5
Other (not specified)	1

### 3.5.4 Rating of nutrition care received

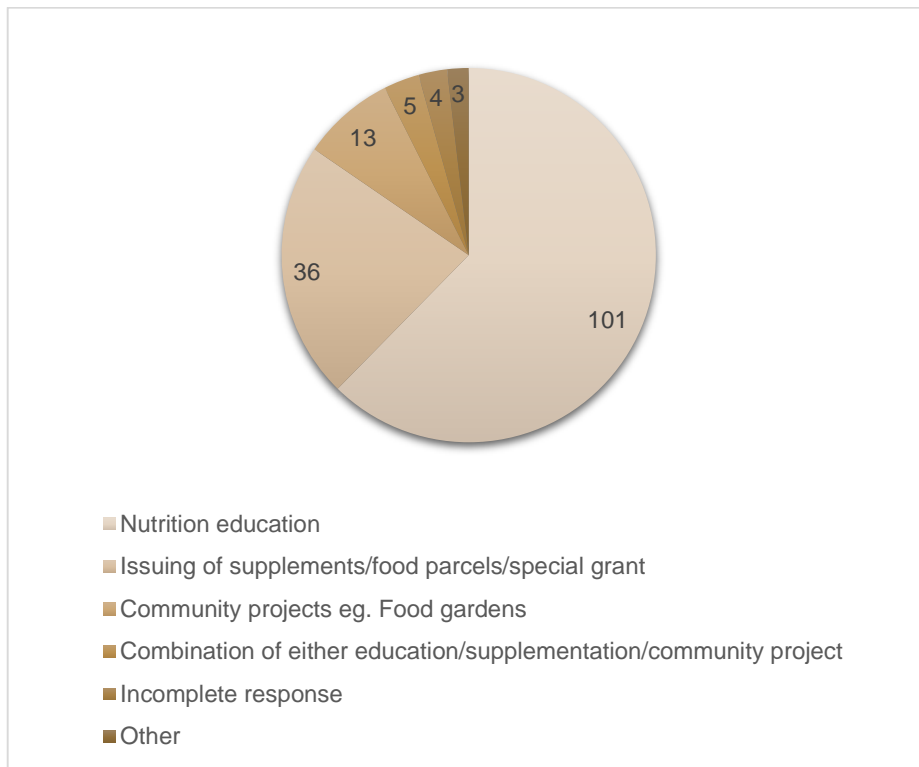
The majority (n=180; 68.4%) rated the nutrition care received at the clinic as 'Good'. There was an even split of 20 participants each (7.6%) who believed the care to be either 'Excellent' or 'Poor' (Figure 3.6).



**Figure 3.6 Rating of the quality of nutrition care received at PHC facility**

### **3.5.5 Suggestions given by patients to improve nutrition care**

An open-ended question was asked on what could be done to improve the nutrition care and service rendered at the PHC facility, with 162 participants giving suggestions (the remaining 101 participants either reported that 'they did not know' or 'everything was fine'). The ideas given to improve nutrition care and service at the PHC were then divided into major themes. The major themes were 'giving more nutrition education/information/nutrition classes' (n=101; 62.3%), 'issuing of more nutrition supplements/food parcels/healthy food or a 'special grant' (n=36; 22.2%) and 'improving on community nutrition projects such as food gardens' (n=13; 8.0%). Five participants (3.1%) gave responses that included a combination of the above-mentioned themes. Four responses (2.5%) were incomplete and the remaining three participants (1.9%) gave responses that did not fit into the major themes; these included 'bringing back nutrition advocates', 'more training being given to nurses' and 'more nutrition experts at the facility' (Figure 3.7).

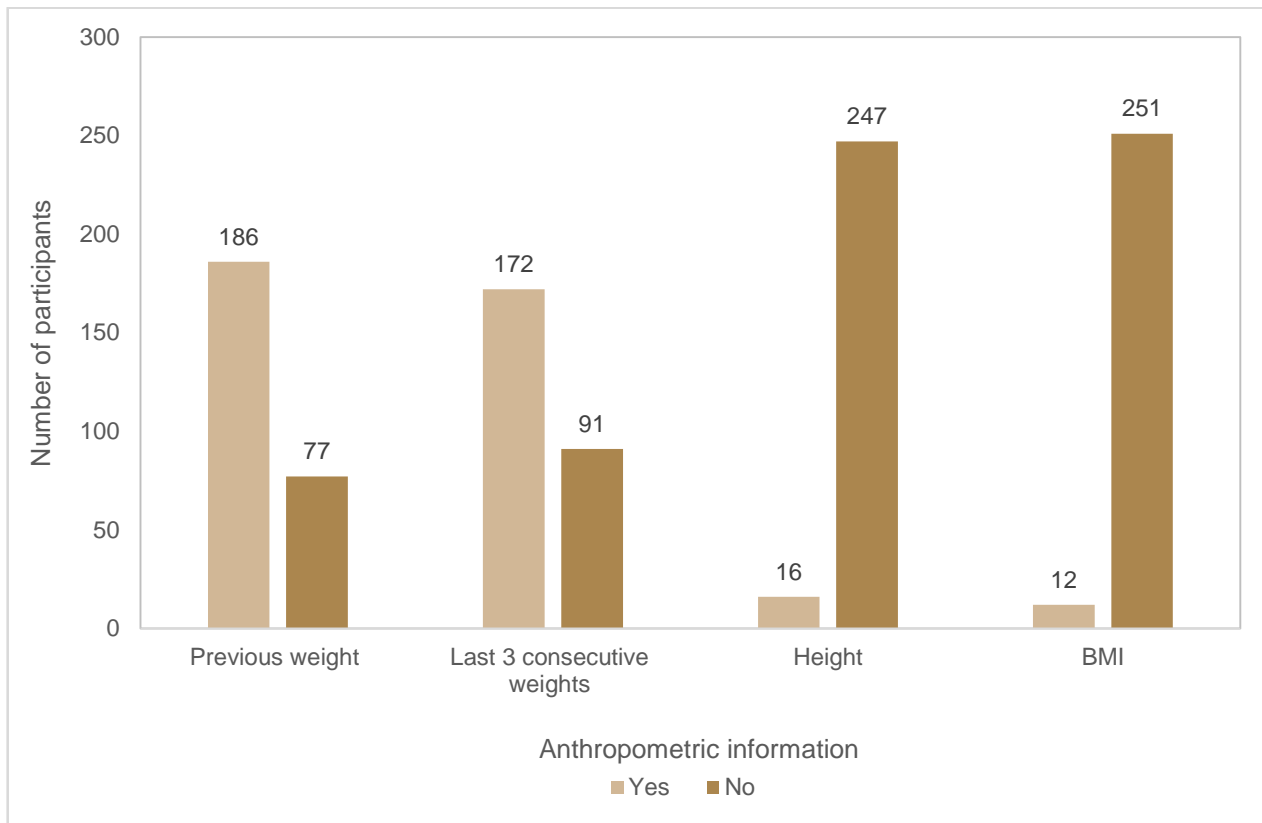


**Figure 3.7 Suggestions to improve nutrition care at PHC facility**

### **3.6 RECORDING OF ANTHROPOMETRIC INFORMATION BY NURSING STAFF IN PATIENTS' FILES**

The weight from each participant's last visit was documented in the file for the majority of participants (n=186; 70.7%). For most participants the last three consecutive weights had been recorded in their files (n=172; 65.4%), although for 91 participants (34.6%) this information was incomplete.

Height had only ever been recorded in 16 participants' (6.1%) files. BMI had been calculated and recorded in only 12 participants (4.6%) files (Figure 4.8). It was also noted that when BMI had been recorded, it was often calculated inaccurately (n=5; 41.7%).



**Figure 3.8 Recording of anthropometric information by nursing staff**

### 3.7 PHYSICAL ASSESSMENT

#### 3.7.1 Weight

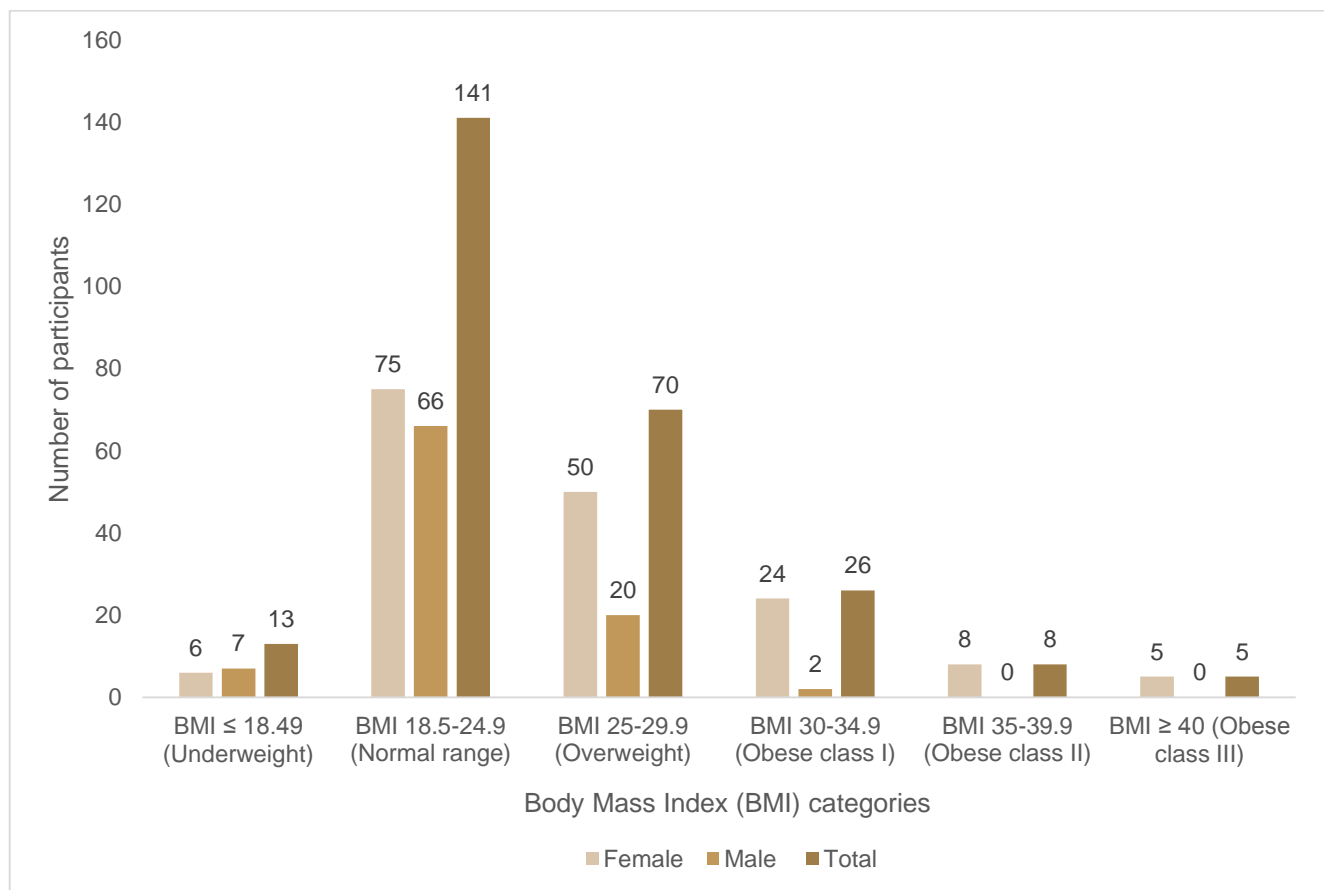
Female participants (n=168) generally weighed more than male participants and had a mean weight of 66.96kg (SD 15.52) (range: 37.8–139.1kg), while male participants (n=95) had a mean weight of 63.7kg (SD 9.92) (range: 46.0–101.8kg).

#### 3.7.2 Height

Female participants (n=168) were shorter than male participants (n=95), with a mean height of 1.597m (SD 0.0569) and 1.672m (SD 0.062) respectively.

### 3.7.3 BMI classification

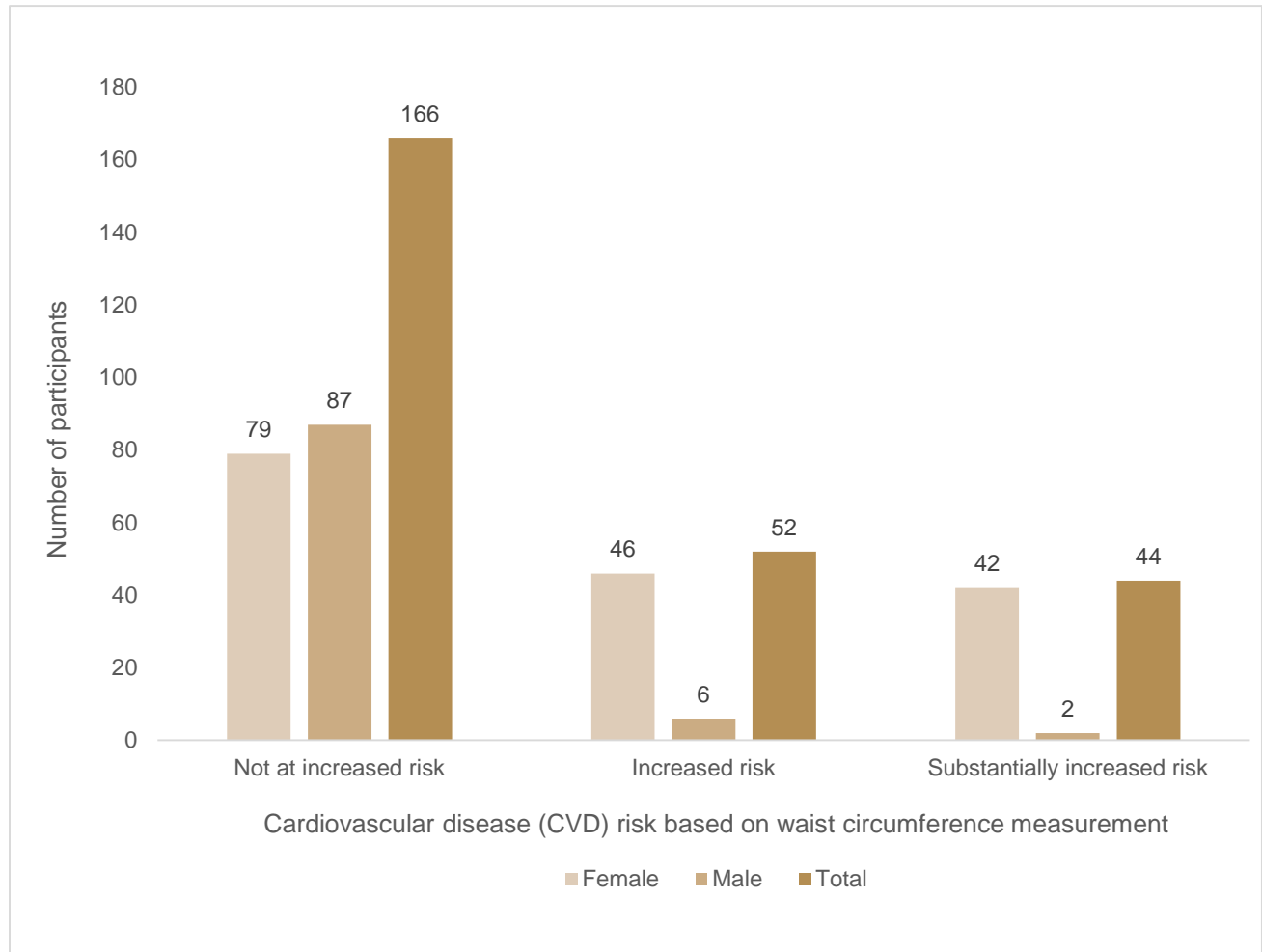
Body mass indices ranged greatly from 15.4 to 53.0, with an average of 24.99 (SD 5.24). The majority of participants (n=141; 53.6%) were classified as being within a normal weight range (BMI 18.5–24.9), while a combined total of (n=109; 41.4%) participants were categorised as either overweight or obese (BMI≥25). A minority of participants (n=13; 4.9%) were underweight (BMI<18.5). Female participants (n=168) had a significantly higher mean BMI of 26.2 kg.m<sup>2</sup> (SD 5.71) than male participants (n=95) who had a mean BMI of 22.8 kg.m<sup>2</sup> (SD 3.32) (p<0.05). More females (n=87; 51.8%) were overweight or obese than had a normal weight (n=75; 44.6%) or were underweight (n=6; 3.6%) (Figure 3.9).



**Figure 3.9 BMI classification of participants**

### 3.7.4 Waist circumference measurements and associated CVD risk

Waist circumference measurements (WCM) were taken for 262 study participants, 167 were female and 95 were male. Females had a mean WCM of 81.9cm (SD 10.54) (range: 63.0–124.0cm), while males had a mean WCM of 80.1cm (SD 7.86) (range: 65.0–113.0cm). Eighty-eight females and eight males were found to have an increased risk of CVD based on WCM. Gender differences were significant for both increased as well as substantially increased risks of CVD ( $p < 0.05$ ) (Figure 3.10).



**Figure 3.10 CVD risk based on waist circumference measurements**

### **3.7.5 Mid-upper arm circumference and malnutrition classification**

Mid-upper arm circumference (MUAC) measurements were taken for all 263 participants. These measurements ranged from 17.0cm to 46.8cm, with an average of 27.38cm (SD 4.35). Based on the MUAC measurements taken, it was determined that most participants (n=241; 91.6%) were not malnourished (MUAC>22cm). Twenty-two participants (8.4%) were moderately malnourished (MUAC 18–22cm), and no participant in this study was found to be severely malnourished (MUAC less than 16cm without oedema or 16–18.5cm with oedema).

## **3.8 INTRODUCTION TO RESULTS OF NURSES' QUESTIONNAIRES**

Seventy-five participants completed the nurse's questionnaire; 74 of the participants were in the nursing profession while one of the participants was an HIV-counselling and testing (HCT) lay counsellor. Since all but one participant were professional nurses, the group will be referred to as nursing professionals. There was participant representation from all 19 PHC facilities within Mbombela North. A summary of the contribution from each PHC facility is provided in Table 3.1. Data were collected from 30 May 2014 to 14 August 2014.

## **3.9 NURSING PROFESSIONALS' SOCIO-DEMOGRAPHIC INFORMATION**

### **3.9.1 Professional category**

Of the total 75 participants who completed the questionnaire, most were professional nurses (n=56; 74.7%), enrolled nurses (n=9; 12%) and chief professional nurses (n=6; 8%). Other professional categories included enrolled nursing assistants (n=2; 2.7%), an operations manager (n=1; 1.3%) and an HCT lay counsellor (n=1; 1.3%).

### **3.9.2 Gender and age**

The majority of participants were female (n=57; 76%), with an average age of 39.6 years (SD 8.9).



### 3.9.3 Education

Of the 73 participants who reported their highest level of education, most had a college diploma/degree (n=51; 69.9%) or a university degree (n=9; 12.3%). Thirteen participants (17.8%) had completed Grade 12 (matric).

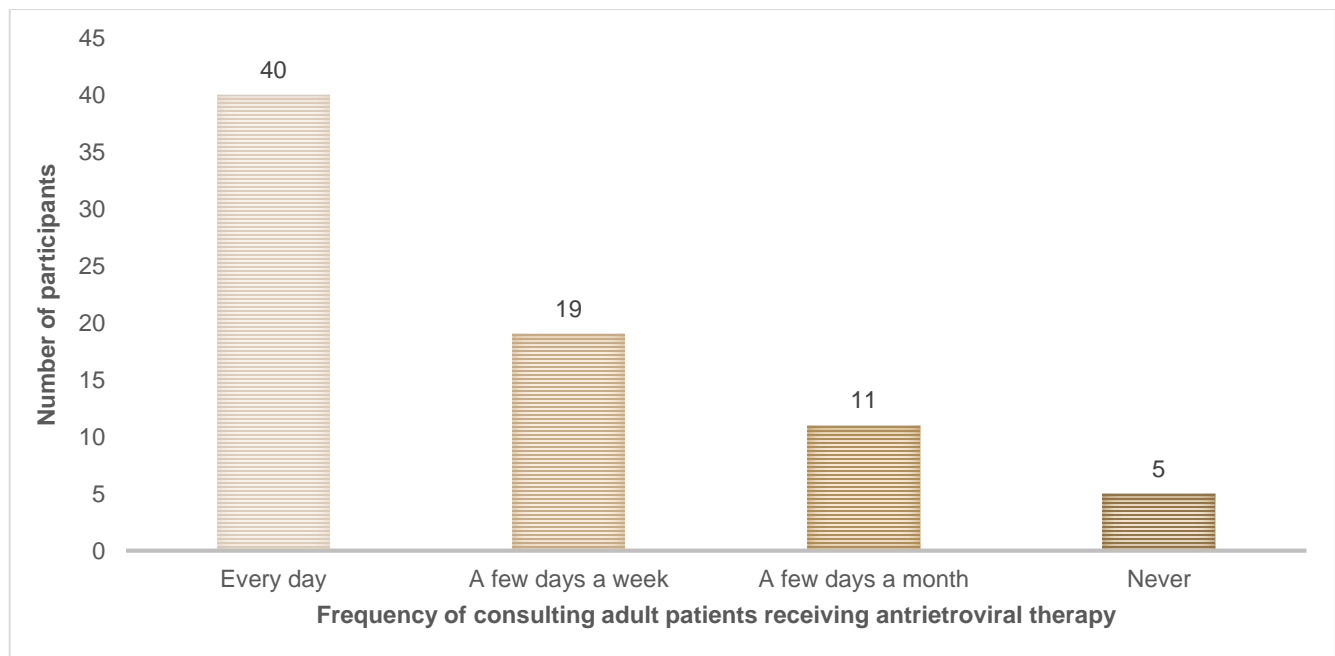
### 3.10 WORK-RELATED INFORMATION

#### 3.10.1 Length of time employed at current facility

The length of time participants had been working at their current PHC ranged from three months to 17 years and 6 months, with an average of six-and-a-half years (SD 4.7).

#### 3.10.2 Frequency of consulting adult patients on ART

Most nursing participants (n=40; 53.3%) consulted adult patients on ART ‘every day’ or ‘a few days a week’ (n=19; 25.3%). (Figure 3.11).



**Figure 3.11 Frequency of consulting adult patients on ART**

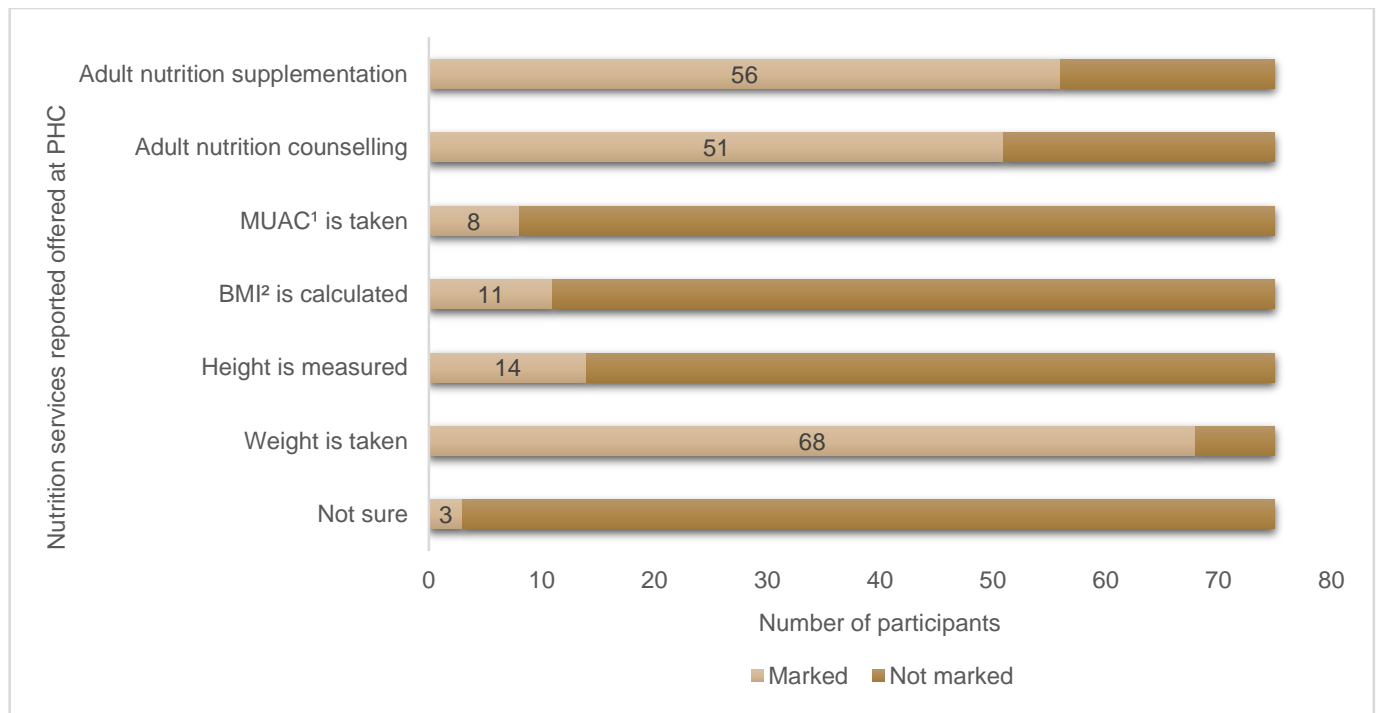
### 3.10.3 Additional training

Just over a half (n=39; 52%) of the participants were trained in NIMART, while 11.1 % (n=4) of those who were not NIMART trained, reported having received additional training or had attended courses related to the nutritional care of patients on antiretroviral therapy (mostly a nutrition assessment, counselling and support initiative known as ‘NACS’).

## 3.11 NUTRITION CARE

### 3.11.1 Nutrition services offered

When asked to indicate the nutrition-related services offered at the PHC facility from a list of seven options, most participants reported that ‘weight is taken’ (n=68; 90.1%), ‘adult nutrition supplementation is offered’ (n=56; 74.7%) and ‘adult nutrition counselling is offered’ (n=51; 68%). (Figure 3.12.)



<sup>1</sup>MUAC: mid-upper arm circumference; <sup>2</sup>BMI: body mass index

**Figure 3.12 Nutrition services offered at PHC facility**

### 3.11.2 Calculation of BMI

Participants were asked to calculate BMI from a given weight and height (calculation only, without interpretation). Just over a third of participants calculated BMI correctly from a given weight and height (n=29; 38.7%), while 23 participants (30.7%) reported that although they knew how to calculate BMI they could not, because they did not have a calculator or BMI chart/wheel available. Other participants did not know how to calculate BMI (n=9; 12%), did not know what BMI was (n=6; 8%), calculated BMI incorrectly (n=4; 5.3%), or left the question blank (n=4; 5.3%).

Of the 71 participants who answered the true and false section on BMI fully, most were correct that BMI cannot be used if a woman is pregnant (n=42; 59.2%), BMI cannot be used if a patient is in a wheelchair (n=54; 76.1%) and that BMI can be used in patients with HIV/AIDS (n= 69; 97.2%).

### 3.11.3 MUAC measurement

Forty-six participants (62.2%) reported having used an adult MUAC tape before; however fewer than half (n=36; 48.6%) felt confident using an adult MUAC tape. Only one participant (1.3%) gave the correct MUAC reading for an adult who is not malnourished; others did not know (n=35; 46.7%), answered incorrectly (n=29; 38.7%) or left the question blank (n=10; 13.3%).

### 3.11.4 Nutrition supplementation programme

The majority of nursing participants were aware of a nutrition supplementation programme (NSP) (n=54; 74%), while fewer were aware of the national nutrition supplementation programme guidelines (NNSPG) (n=34; 45.3 %).

Two brands of enriched instant maize porridges and energy drinks for adults were marked as nutrition supplements usually available to issue to adult patients: *Brand A* (n=43; 57.3%) and *Brand B* (n=35; 46.7%) porridges, *Brand C* (n=31; 41.3%) and *Brand D* (n=29; 38.7%) energy drinks.

Most participants reported that there were some nutrition supplements in stock at the PHC facility at the time of the study (n=51; 71.8%); others did not have any stock at the time of the study (n=19; 26.8%) or did not know (n=1; 1.4%).

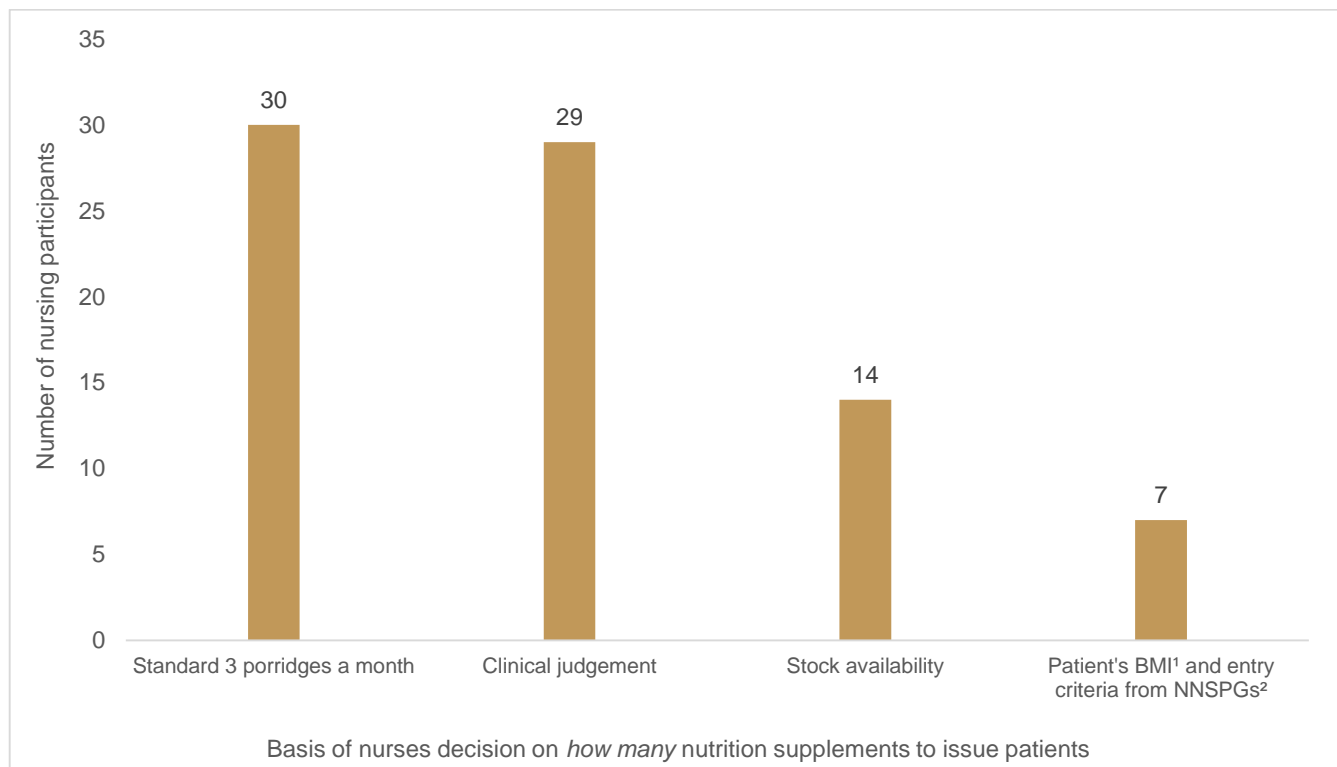
Nursing participants were asked an open-ended question, 'What are the entry criteria to receive nutrition supplements?' Three participants (4%) gave the correct entry criteria, according to the NNSPG<sup>41</sup>, to receive nutrition supplementation with a BMI<18.5, while 33 participants (44%) gave responses that were non-specific but along the correct line of thinking, such as 'malnutrition which needs supplementation', 'BMI and body weight', 'when the patient is not gaining weight', 'by weighing the patient' or 'patients who meet the criteria'. Eighteen participants (24%) gave incorrect answers (mostly related to poverty/food insecurity, including *all* immune-compromised patients or 'if the patient does not *look* healthy'). Other participants left the question blank (n=11; 14.6%), misunderstood the question (n=5; 6.7%), or responded that they did not know (n=5; 6.7%).

When asked what the aim of the NSP was in the form of an open-ended question, 51 nursing participants (68%) gave vague (correct) answers such as to: 'improve nutritional status', 'gain weight', 'improve malnutrition', and 'promote health'. Fourteen participants' (18.7%) responses related to providing nourishment when there is food insecurity, poverty or hunger. The remaining participants left the question blank (n=8; 10.6%) or said they did not know the aim of the programme (n=2; 2.7%).

When asked to identify the exit criteria for nutrition supplementation, 25 nursing participants (33.3%) gave non-specific (correct) answers relating to the patient's having gained weight. Twelve participants (16%) gave more specific correct answers such as achieving 'a normal weight' or 'a BMI above 18.5'. Seven participants (9.3%) gave answers relating to improved health, such as 'when a patient looks healthy', while six participants' (8%) responses related to food security/poverty such as 'does not have financial problem', 'can afford to buy food' or 'when receiving a grant'. Other participants responded 'there are none' (n=3; 4%), while one participant misunderstood the question. Many participants left the question blank (n=19; 25.3%), while two participants (2.7%) reported that they did not know.

The nutrition supplements issued to patients are recorded according to 67 nursing participants (89.3%), not recorded according to seven participants (9.3%) and 'sometimes' recorded according to one participant (1.3%). Fifty-three participants (70.7%) reported their PHC to have a malnutrition register, while five participants (6.7%) did not know whether their PHC had a malnutrition register. Of the participants who reported that nutrition supplements issued are recorded, most said they are recorded in the patient's file (n=36), on a clinic statistics form (n=35), malnutrition register (n=27), stock cards (n=3) or in a 'nutrition book' (n=2). Participants were asked to select all choices that apply and were free to mark more than one option.

When deciding *on the quantity of* nutrition supplements to be issued to a patient, 30 nursing participants (37.5%) reported giving 'the standard three porridges a month to patients who look malnourished', while 29 participants (36.3%) use their 'clinical judgement'. Fourteen participants (17.5%) base this decision on stock availability: 'giving more or less depending on how much stock is available', while only seven participants (8.7%) reported that this decision depends on 'the patient's BMI and how many they qualify for according to the national supplementation guidelines' (Figure 3.13). Five participants selected two responses to this question.



<sup>1</sup>BMI: body mass index; <sup>2</sup>NNSPG: national nutrition supplementation programme guidelines

**Figure 3.13 Basis of decision on *how many* nutrition supplements to issue patients**

When deciding *which* nutrition supplements to issue a patient, the majority of respondents (n=44; 54.3%) based this decision on stock availability, by selecting the response 'depending on which supplements are available'. Twenty-four participants (29.6%) used their 'clinical judgement', while nine participants (11.1%) selected 'depending on the patient's BMI and how many they qualify for according to the national supplementation protocol'. For three participants (3.7%), this depends on 'which supplements the patient likes', while one participant felt 'depending on their age'. Six participants selected two responses to this question.

Most nursing participants (n=45; 60%) believe nutrition supplements are better than food. Responses selected from a closed-ended question as to why nutrition supplements are perceived to be superior to food are summarised in Table 3.11. Participants could select more than one response.

**Table 3.11 Responses selected why nutrition supplements are better than food**

Response	Number of participants (n)
Supplements have more vitamins and minerals than food	21
Supplements have more energy and protein than food	18
Supplements are easier and safer to make than food	10
Patients gain weight better with supplements	9
Supplements are 'super-foods' with more goodness than food	3
Supplements are easier to issue than to give nutrition counselling on healthy eating	2
Patients like supplements better than food	1

### 3.11.5 Healthy eating counselling

Most nursing participants (n=44; 58.7%) reported that healthy eating counselling is provided to only some patients, while others (n=31; 41.3%) reported it to be given to all patients. Explanations as to why some patients are not counselled on healthy eating was a fairly even split between 'not all patients need healthy eating counselling' (n=20; 45.5%) and 'there are too few nursing professionals for the large number of patients on ART to include dietary counselling' (n=22; 54.5%). Nursing participants reported spending an average time of 9.7 minutes (range 3–30 minutes) on healthy eating counselling. It was not asked how often healthy eating counselling was given.

Counselling was mostly guided by 'general knowledge' (n=49; 66.2%), while 19 nursing participants (25.7%) used the South African Food-Based Dietary Guidelines (SAFBDGs). The remaining participants used 'other guidelines', unspecified (n=2; 2.7%), NACS (n=1; 1.35%), infant & young child feeding (n=1; 1.35%), prevention of mother to child transmission of HIV (PMTCT) (n=1; 1.35%) and South African National Guidelines for PLWHA (n=1; 1.35%).

Of the 19 nursing participants who reported that the SAFBDGs guided their counselling, only four participants (21%) were able to write down two of the guidelines correctly; most left the question blank (n=12; 63.2%), and three participants (15.8%) gave incorrect answers.

Most nursing participants reported that their PHC facility did not have counselling cards with key educational messages to use for nutrition counselling (n=54; 72%), while others did (n=7;

9.3%). Five participants (6.7%) said 'they do not know' while nine participants (12%) left the question blank.

Sixty-eight participants (90.7%) felt confident to give nutrition counselling to HIV-positive adult patients, and all participants agreed that it is important for patients to eat a healthy diet when they are receiving nutrition supplements.

### **3.11.6 Nutrition-related guidelines**

The nutrition-related guidelines nursing participants were most familiar with were the South African National Guidelines for PLWHA (n=40; 53.3%), NACS (n=16; 21.3%), while fewer were familiar with the South African Supplementary Feeding Guidelines for At-Risk and Malnourished Children and Adults (n=13 participants; 17.3%). Twenty-one participants (28%) were not familiar with any nutrition-related guidelines.

### **3.12 PERCEPTIONS OF A 'HEALTHY WEIGHT'**

When asked to identify 'a healthy weight' using Stunkard figures<sup>63</sup>, 51 nursing participants (68.9%) correctly selected figures representing 'a normal weight range'. Twenty-one participants (28.4%) selected figures representing 'overweight', whereas two participants (2.7%) selected figures representing 'underweight'. No participants selected the obese-representing figures.

When asked to identify 'a healthy weight *for a person with HIV/AIDS on ART*', most nursing participants selected figures representing 'a normal weight range' (n=43; 58.1%), while others selected those representing 'overweight' (n=27; 36.5%), 'obese' (n=2; 2.7%) and 'underweight' (n=2; 2.7%).

### **3.13 RATING OF NUTRITION CARE PROVIDED**

Most nursing respondents rated the quality of nutrition care received by patients at the clinic as 'Good' (n=44; 58.7%), while others rated the care as 'Fair' (n=19; 25.3%), 'Excellent' (n=8; 10.7%) and the minority rated the care as 'Poor' (n=4; 5.3%).



### 3.14 SUGGESTIONS GIVEN BY NURSING PROFESSIONALS TO IMPROVE NUTRITION CARE

Suggestions given on how to improve the nutrition care received by patients at the PHC facility are summarised in Table 3.12. Some nursing participants marked more than one suggestion.

**Table 3.12 Suggestions to improve nutrition care**

Response	Number of participants (n)
Improve training, on the nutrition care to adult patients with HIV, for nursing staff	48
Create posts at PHC facilities for a nutrition expert (nutritionist/dietitian)	30
Purchase more equipment (such as scales)	22
Employ more nursing professionals at PHC facilities	20
Have sufficient stock of nutrition supplements	1

### 3.15 INTRODUCTION TO RESULTS OF PHC FACILITY ASSESSMENT TOOL

A PHC facility assessment tool was completed for all 19 facilities within the Mbombela North area of Ehlanzeni district, Mpumalanga. Assessments were carried out between 30 May 2014 and 7 August 2014.

### 3.16 ANTHROPOMETRIC EQUIPMENT AND MATERIAL

#### 3.16.1 Scales

All 19 PHC facilities had a functional scale available to weigh adult patients. The scale used at the facility to weigh adults at the time of data collection was targeted as 'the scale'. Most were bathroom-type scales (n=16; 84.2%), the remaining facilities used electronic scales. Only one of the electronic (digital) scales used batteries and spare batteries were not available for the scale.

Most scales (n=17; 89.5%) had a tare (zero) function and measured to the nearest 100g (n=10; 52.6%) or to the nearest 1kg (n=9; 47.4%). Two scales (10.5%) did not have the

needle (bathroom-type scale) or digital reading on zero. When a known weight of 5kg was placed on the scale, most read 5kg (n=14; 73.7%), while the rest ranged from 4.5kg to 5.1kg. The maximum weights the scales could hold were 100kg (n=1; 5.3%); 130kg (n=2; 10.5%); 150kg (n=15; 78.9%) and 200kg (n=1; 5.3%). When examining the total number of scales the facility had versus how many were functional, it was found that at nine clinics all scales were functional, while at other clinics it ranged from only one-third being functional to three-quarters being functional. Most facilities could not provide evidence of a maintenance plan to service equipment (n=15; 78.9%).

### 3.16.2 Other

Most facilities had adult MUAC tapes (n=14; 73.7%), a BMI chart/wheel or calculator (n=16; 84.2%) and a stadiometer (n=16; 84.2%).

## 3.17 FOOD COMMODITIES

Nutrition supplements usually in stock were *Brand C* (n=17; 89.5%), *Brand A* (n=16; 84.2%), *Brand B* (n=14; 73.7%) and *Brand D* (n=11; 57.9%). Of the 17 PHC facilities that usually have *Brand C* available, only three (17.6%) had stock available at the time of the assessment. Six (37.5%) of the facilities that usually have *Brand A* available, had stock, while three (21.4%) of the facilities that usually have *Brand B*, had stock. No facility had *Brand D* stock at the time of data collection.

Fourteen (87.5%) of the facilities that usually have *Brand A* reported being out of stock in the last month. All 17 facilities that usually receive *Brand C* had run out of stock in the last month, while 13 (92.9%) of the facilities that usually receive *Brand B* had been out of stock in the last month. All 11 clinics that usually receive *Brand D* had been out of stock in the last month. At most of the PHC facilities, stock availability was insufficient or none at the time of the PHC assessment. However, at two of the PHC facilities, most *Brand A* stock had expired, while at another two facilities some had expired.

### **3.18 STORAGE CONDITIONS**

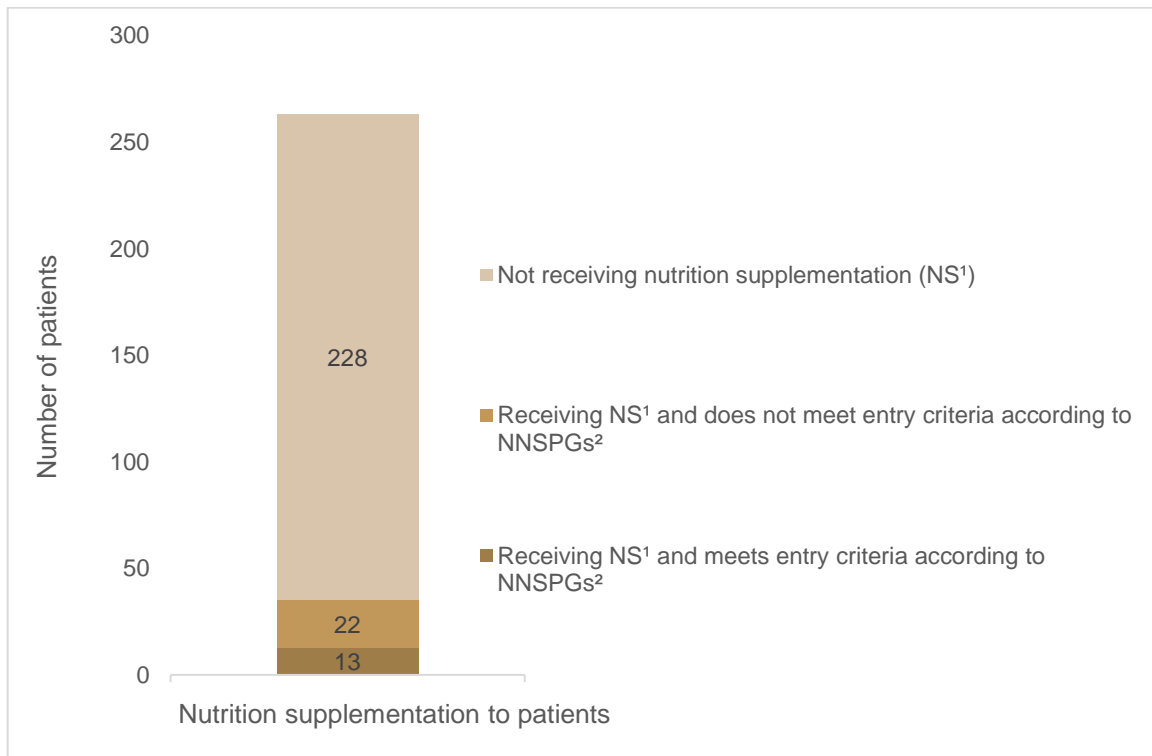
Nutrition supplements were mostly stored off the ground (n=16; 84.2%) and protected from direct sunlight (n=15; 78.9%). Two facilities (10.5%) had a temperature controlled environment, one had a pest control system and one had evidence of stock rotation (first in, first out). Most facilities (n=14; 73.7%) did not have evidence of stock control, and none had evidence of a supplementation ordering system.

### **3.19 AVAILABILITY OF DOCUMENTATION / POLICIES / MATERIALS / TOOLS**

Most PHC facilities had a nutrition supplementation register (n=14; 73.7%). Only one facility (5.2%) had a readily available copy of the South African Supplementary Feeding Guidelines for At-Risk and Malnourished Adults and Children, while six facilities (31.6%) had a copy of the South African Food-Based Dietary Guidelines (Table 18). Four facilities (21%) had a healthy eating poster/pamphlet, but none had counselling cards with key nutrition education messages available to guide nutrition counselling.

### **3.20 COMPARISON OF NUTRITION SUPPLEMENTATION PRACTICES TO GUIDELINES**

While only 13 patients (4.9%) qualified for nutrition supplementation according to the NNSPG<sup>41</sup>, 35 participants (13.3%) were receiving nutrition supplementation at the time of the study (Figure 3.14). Nutrition supplementation practises differed from the NNSPG.



<sup>1</sup>NS: nutrition supplementation

<sup>2</sup>NNSPG: national nutrition supplementation programme guidelines (entry criteria to receive NS: BMI<18.5)

**Figure 3.14 Comparison of nutrition supplementation practices to national guidelines**

## **Chapter 4. DISCUSSION**

This study was designed to evaluate and describe the nutrition care received by adult patients on HAART attending PHC facilities in the Mbombela sub-district, in Ehlanzeni district, Mpumalanga. This was investigated by interviewing and taking anthropometric measurements, medical and nutrition information from patients, interviewing nursing staff, and conducting an assessment of the 19 PHC facilities within the selected study area.

Main findings were that a large percentage of patients (particularly female patients) are overweight or obese, potentially negatively affecting health and increasing the risk of non-communicable diseases (NCDs). It was further ascertained that nursing staff, although generally aware of a nutrition supplementation programme, were not well informed of the programme details and there were problems with correct implementation according to national nutrition supplementation programme guidelines. Contributing factors appeared to be poor calculation of BMI, reliance on 'clinical judgement', inconsistent supply of nutrition supplementation stock, and lack of guideline documentation. More patients were receiving nutrition supplementation than those who qualified according to the guidelines. Nursing professionals expressed confidence in nutrition-related topics, but this did not match actual knowledge. Still, 76% of patients and 69% of professional nurses rated the nutrition care received/provided as 'Good' or 'Excellent'.

### **4.1 PATIENTS' NUTRITION ASSESSMENTS**

#### **4.1.1 Overweight and obesity prevalence**

It was of concern that a combined total of more than 40% of adults on HAART were found to be overweight or obese in this study, although this concurred with similar studies that found 58%<sup>43</sup> and 67%<sup>44</sup> of South African adults on HAART to be overweight or obese. The latter study<sup>44</sup> was small and included only female participants, which could account for the higher prevalence of over-nutrition. The study<sup>44</sup> reported a slightly higher overweight and obesity prevalence among females, compared with the 51.8% of females found to be overweight or obese in the current study. Furthermore, the recent SANHANES-1 study<sup>54</sup> reports an

increasingly high overweight and obesity prevalence in the general South African population. Similar to the SANHANES-1 findings, there was a greater prevalence of over-nutrition than under-nutrition in this study, especially in females, who tended to be shorter and heavier. Gender differences were significant, with the current study finding 29.8% of females were overweight and 22.0% were obese, in comparison with 24.9% of African females who were overweight and 39.9% found to be obese in the SANHANES-1 report. Results from the SANHANES-1 study showed that 19.1% of African males were overweight, while 9.4% were classified as obese. This study found 21.1% of males to be overweight, and 2.1% to be obese. In both males and females the prevalence of overweight was higher in this study, while the prevalence of obesity was lower in comparison with the SANHANES-1 report. The high prevalence of overweight and obesity found in patients in this study is worrying.

#### **4.1.2 Prevalence of under-nutrition**

Severe malnutrition was uncommon, with one participant having a BMI<16. From the mid-upper arm circumference (MUAC) measurements taken, no participant was classified as severely malnourished. A possible explanation for the low prevalence of severe malnutrition may be that this study focused on clinically stable, HAART-receiving patients, compliant with treatment and attending a PHC facility for chronic care. HIV-positive individuals with acute illness in hospital, those in home-based care, not willing to start ART, defaulting on ART, or particularly vulnerable patients such as refugees, migrant workers, alcoholics, sex workers and homosexual individuals may represent a different sub-group of patients, less likely to be retained in care and more likely to have a greater prevalence of severe malnutrition.<sup>9</sup> Understandably pre-2004 and in the early stages of the ART rollout, a greater prevalence of under-nutrition among South African HIV-positive individuals existed. Contributing factors possibly included HIV 'denialism', stigma, lack of access to ART and less advanced treatment, care from medical professionals who were not as experienced in HIV management as today, and care that was less streamlined than currently.<sup>7</sup> This resulted in patients presenting with more advanced disease progression, AIDS-related complications and generally lower CD4 counts than in this study. CD4 is a valuable marker of immune function<sup>12</sup>

and with a greater immune function there is a diminished vulnerability to common co-morbidities such as TB.

A low prevalence of co-morbidities was reported in this study. The majority of this study's participants had no co-morbidities, while TB was the most common co-morbidity (13.3%). Few patients had nutrition-related symptoms that could directly affect nutrition status, with nausea (14%), vomiting (11%) and poor appetite (11%) being most frequent, and diarrhoea uncommon. In the current study, patients' CD4 counts were relatively high, with women having significantly higher mean counts than men (411 versus 340 respectively), although there was a large variation found between patients. Most participants were on an FDC pill (ATRIPLA® or equivalent) and had been on HAART for a fairly long time (average of 28 months). Most patients were found to be maintaining a stable weight, possibly owing to improved treatment regimens, earlier initiation of HAART, higher CD4 counts, fewer opportunistic infections and nutrition-related symptoms.

#### **4.1.3 Possible factors contributing to, and risks associated with, over-nutrition in HIV**

Although weight loss and underweight are independently associated with increased risk of disability and death<sup>40</sup>, this study suggests that many patients, especially females, clinically stable and on life-long HAART, are at greater risk of overweight and obesity than severe malnutrition. This is consistent with other studies that found obesity more prevalent than wasting in patients on lifelong HAART<sup>42,44,65</sup> and non-white females to be at greater risk.<sup>42,65</sup> South African studies<sup>43-44</sup> have reported weight gain following the initiation of ART, particularly in African females, and possible reasons proposed for this include the stigma of weight loss, thinness being associated with HIV and/or TB infection and poor health, cultural norms regarding what is considered to be ideal body size, and the belief that 'bigger is better'.<sup>43,55</sup>

It has also been found that among African females, weight perceptions are often inaccurate, with women tending to judge themselves as weighing less than their true weight.<sup>43,65</sup> In the study by Hurley et al.<sup>43</sup>, individuals wanting to gain weight gained almost three times more weight than those who were happy with their weight. It appears there is a strong association between PLWHAs' perception of body weight, their desire to gain weight

and their actual weight gain on ART.<sup>43</sup> It was interesting to note that some nurses also appear to have a perception that it is 'healthier' for HIV-positive patients on ART to be overweight. When asked to identify a 'healthy weight *for a person with HIV on ART*', fewer selected a healthy BMI, while more (39%) selected an overweight or obese figure. It appears that nurses have a perception, although not as entrenched as in the study by Matoti-Mvalo & Puoane<sup>55</sup>, that it is better for HIV-positive individuals to be larger.

This is consistent with other studies<sup>43</sup> also reporting a desire for HIV-positive individuals to achieve and maintain what is considered to be a 'healthy' overweight body size. As studies<sup>43,65</sup> have reported that African females tend to perceive their overweight as healthy and are often unaware of the health risks associated with being overweight or obese<sup>55</sup>, it is worrying that most patients have never been counselled on whether they are a healthy weight or not. Furthermore, the risk of CVD among HIV-positive patients may be higher than non-HIV-infected individuals<sup>47-48</sup> and the increasing number of overweight and obese HIV-positive patients on HAART<sup>42-43,65</sup> may compound this risk. Interventions most likely to be effective in preventing excess weight gain and NCD, in particular for African women, would need to be culturally sensitive and address possible misperceptions about 'a healthy weight'.

Findings relating to an increased risk of metabolic complications and CVD, based on WCM ( $\geq 102$ cm for men and  $\geq 88$ cm for women), were comparable between this study and the SANHANES-1 report, with 52.7% vs. 51.1% females and 8.4% vs. 8.0% males found to be at an increased risk of metabolic complications and CVD in this study and SANHANES-1<sup>54</sup> respectively. The risk of NCDs such as CVD and DM increase with over-nutrition. With effective HAART, people with HIV are living longer and are at a greater risk of developing an array of NCDs, including CVD, DM, chronic lung disease and some types of cancers.<sup>30</sup> The higher prevalence of over-nutrition than under-nutrition, together with increased WCM, would suggest the risk of NCDs in this population to be relatively high. It is important for nursing professionals to be attentive to the possibility of co-morbid conditions such as DM and CVD, rather than only the more traditional ones, such as TB and sexually transmitted diseases (STDs). Almost all patients had received TB and STD screening; however most did not have



biochemical information on blood lipids or blood glucose. There is growing evidence that ART-receiving patients are increasingly experiencing NCDs associated with ageing.<sup>30</sup> In this document<sup>30</sup>, a correlation was not made between age, BMI and NCDs, but it was acknowledged that both HIV and NCDs require the delivery of effective acute and chronic care, as well as support for adherence to treatment. Lifelong HIV care provides the opportunity for screening, monitoring and managing NCDs, especially at PHC level. Integrating interventions such as nutrition assessment, dietary counselling and support, healthy lifestyle promotion, monitoring of blood pressure, blood glucose, and where available, cholesterol, as part of HIV care, provide opportunities for reducing the risks of NCDs among people living with HIV.<sup>30</sup>

#### **4.1.4 Opportunities for health interventions at PHC facilities**

Studies have found that women visit healthcare facilities more often than men<sup>66-67</sup> (because of reproductive health reasons or for their dependents' health) and therefore have greater exposure and easier access to participation in voluntary counselling and testing (VCT), PMTCT and HAART-initiating programmes.<sup>67</sup> Accordingly, women tend to be more likely to know their HIV status and have access to treatment, while men were found to have poorer access to HIV care. Women are more likely to start treatment at an earlier stage of their disease<sup>66-67</sup> as focus is placed on the healthcare of HIV-positive women who are pregnant and breastfeeding, and who qualify for and start HAART earlier.

Men are also more likely to delay seeking medical care, believing that asking for help or taking care of one's health are 'feminine' traits. To add to this, males tend to view clinics as female dominated, which makes it difficult for them to discuss personal sexual-related information with female staff. Many perceive visiting a clinic as uncomfortable and emasculating.<sup>67</sup> The continuity of care is often more problematic for men as they are more likely to move between different areas, depending on work, and more likely to default on treatment than women.<sup>66-67</sup> For these reasons it seems as if it may be easier to target women for intensive health-intervention strategies at PHC facilities. This also provides a research

opportunity to explore interventions aiming to decrease the prevalence of overweight and obesity among HAART-receiving females regularly attending PHC facilities.

#### **4.1.5 Unemployment and food insecurity**

It appeared that high levels of unemployment (43%) and food insecurity (45%), often found in HIV-affected communities<sup>37,68</sup>, may exist in this study population, although food security was not examined in detail. Although various tools are available to assess food security more thoroughly, this study only obtained a brief indication of the prevalence of food security. The seemingly high levels of unemployment and food insecurity were not unexpected, since the vicious, intertwined cycle existing between food insecurity and HIV/AIDS<sup>69</sup> is well known. The unemployment crisis was larger in this study population than in the general South African population, consistent with literature linking higher unemployment rates to HIV-positive individuals.<sup>70</sup> In fact, Levinsohn et al.<sup>70</sup> found that being HIV positive is associated with a six to seven percentage point increase in the likelihood of being unemployed, while South Africans with less than a high school education are ten to eleven percentage points more likely to be unemployed if they are HIV positive. Despite general high unemployment rates in the country, being infected with HIV confers an added disadvantage. Even so, it is of concern that despite most patients being in relatively good health and actively seeking work, so few were employed.

According to the International Labour Organization<sup>71</sup>, the country has had a consistent, exceptionally high level of unemployment of approximately 25% since 2010. Future unemployment predictions are bleak, with SA ranked among the top ten countries for the highest predicted unemployment rates for 2015. Furthermore, incomes earned are low and support unemployed family members, so a considerable percentage of household income is spent on food. Similarly, the SANHANES-1 survey<sup>54</sup> reported high levels of food insecurity in the South African population and found 60.7% of African households were food insecure\*.

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\* Household food security exists when households are able to ensure that all people at all times have physical, social and economic access to sufficient, safe and nutritious food to meet their food preferences and dietary needs for an active and healthy life<sup>68</sup>

The higher percentage of food insecurity found in the survey<sup>54</sup> compared with the current study may be due different methods of assessment. The current study used a less extensive assessment to assess food security, which may have resulted in more people appearing to be food secure.

The high levels of unemployment and food insecurity may complicate nutrition supplementation since the wording from the NNSPG that “Supplementary feeding becomes necessary whenever individuals cannot meet or are deficient in terms of micronutrients and energy requirements”<sup>41</sup> may be interpreted by some nursing professionals to include the many patients who do not always have enough food.

Food insecurity can result in negative effects on health through its effects on obesity and poor diet quality. In addition, food insecurity has been associated with HPT, obesity, DM, and hyperlipidaemia.<sup>69</sup> Researchers have suggested that these associations may be driven by replacements of cheaper, energy-dense foods; overeating during periods of food availability; and compensatory changes in metabolism. HIV infection may be an antagonistic moderator of the link between food insecurity and worsened metabolic outcomes, because HIV infection itself is known to be associated with a variety of metabolic abnormalities, including endothelial dysfunction, atherogenic dyslipidaemia, and impaired glucose metabolism. So, it is likely that the effect of food insecurity on metabolic outcomes may be even more evident among PLWHA. These abnormalities, together with the fact that the prevalence of obesity among PLWHA is increasing, highlights the need to study the relationship between food insecurity and metabolic outcomes so that preventive interventions can be implemented.<sup>69</sup>

#### **4.1.6 Access to clean, safe water**

Almost a quarter of patients do not have access to potable tap water. The lack of access to potable tap water is disturbing since primary health care is expected to provide “at least an adequate supply of safe water” as stated in the Declaration of the Alma Ata under point three, section VII, of the primary health care section. The declaration highlights the need for access to safe drinking water in conjunction with other health services in order to protect and promote health.<sup>72</sup> Furthermore, the “right of access to health care, food, water and social security” is

included in the South African Bill of Rights and the government has a duty to provide clean running water to all communities.<sup>73</sup> Both water access and quality are important, since the nutrition supplements issued as part of the NSP require mixing with water prior to consumption. It is assumed that the water used to mix the supplements is safe for human consumption (potable). Another assumption is that tap water will be cleaner and safer to drink, while water obtained from other sources is more likely to be contaminated and unsafe for human consumption. The quality of tap and non-tap water was not assessed in this study, but is an important consideration when issuing nutrition supplements. It is also possible that many patients most in need of nutrition supplements may have limited access to clean water to prepare the nutrition supplements. The risk of contamination when preparing nutrition supplements is a concern (similar to the preparation of infant formulas), and may cause harm. The importance of food safety and the prevention of food or water-borne illness are particularly important in patients with HIV, and it has been recommended that special attention is paid to prevent persons becoming ill from unsafe food or water.<sup>1</sup> Advice to wash hands regularly and use previously boiled water to prepare nutrition supplements may help to decrease this risk. However, since the right to water and health is indivisible<sup>73</sup> efforts to provide safe water to all South Africans need to continue in order to improve the health of the population.

## **4.2 NURSES' KNOWLEDGE AND IMPLEMENTATION OF NUTRITION CARE**

### **4.2.1 Nutrition services, including the taking of anthropometric measurements**

Weighing, nutrition supplementation and nutrition counselling are nutrition services most frequently offered at PHC facilities. Height, BMI and MUAC measurements are not frequently done, according to nursing professionals. This information mirrored actual findings from patients' files, where over 93% of patients have never had their height taken and recorded in their files, despite all except three of the PHC facilities having a stadiometer available. The taking of height measurements is problematic and appears to be a common problem at almost all PHC facilities. The lack of height measurements was an unexpected finding, since

height taking is included as one of the nurses' key areas of responsibility in the nutrition care of HIV-positive patients<sup>11</sup> (Table 1.4). Height is a relatively quick and simple measurement to take, and plays a crucial role in determining BMI to assess whether a patient is a normal, healthy weight or not; it also assess entry into the NSP.<sup>41</sup>

Weight is adequately taken. Just over 70% of participants have a weight from their previous visit documented, decreasing to 65% who have a weight for their previous three visits. The reason that patients' weight is not always taken is generally that patients had previously sent a relative to collect HIV treatment on their behalf and the actual patient was not available to weigh. This implies that approximately one-third of a patient's weight trend over the previous three months cannot be assessed from the information contained in the patient's files. Although this is a disadvantage, it should be carefully weighed up against the reasons why patients did not collect the treatment themselves, which most often was due to work or other commitments and not due to being too ill to come to the PHC facility. Alternative practices that other facilities use to overcome this problem were not found.

The lack of correct calculating and recording of BMI is of concern. Linked with the fact that heights were not frequently taken, fewer than 5% of participants had a BMI documented in the file, and almost half of these were incorrectly calculated. The BMI 'block' on the treatment care sheet is visible to complete but almost always left blank. The poor understanding of BMI is also evident from results of the nurses' questionnaire, although here just over a third can calculate BMI correctly from a given weight and height. A third do not know what BMI is, or how to calculate it, while the remaining nurses say that although they know how to calculate BMI, they cannot without a BMI chart/wheel/calculator. Most nurses have cellular phones with calculators at hand, so an assumption may be made that many nurses cannot calculate BMI on a calculator, and rely solely on a chart or wheel. The BMI charts currently available at PHC facilities may contribute to errors in BMI calculation since the charts have height in inches and weight in pounds as the main axis, and colours for the different weight categories (obese, overweight, normal, and underweight) are not consistent. BMIs of 30 and 25 are sometimes classified as obese or overweight, and as overweight or normal respectively.

Around 40% of nurses do not know that BMI cannot be used in pregnancy. Improving the understanding of BMI is important and needs prompt corrective action, since BMI is a fundamental part of entry and exit criteria to the NSP as stipulated in the guidelines. Nurses should also be able to counsel patients on whether they are a healthy weight or not, and what goal weight to work towards if they are overweight or obese. Increased awareness of the relevance of BMI may also encourage height to be taken more frequently and BMI to be calculated correctly for every patient.

The understanding and taking of mid-upper arm circumference (MUAC) measurements is also of concern. Most nurses have used adult MUAC tapes before, but fewer than half feel confident using them and only one participant knew the cut-off for an adult to be classified as 'not malnourished' through the use of a MUAC tape. Participants mentioned that there is a greater awareness and confidence in using MUAC tapes on children.

#### **4.2.2 Awareness and implementation of the nutrition supplementation programme**

Awareness of a nutrition supplementation programme (NSP) was good, although nurses were generally unaware of the national nutrition supplementation programme guidelines<sup>41</sup> (NNSPG). Lack of awareness of the guidelines is understandable since the guidelines have not yet been formally introduced. This provides evidence that although the SA DoH expects the NNSPG to be followed, nutrition supplementation is currently not being implemented in a standardised manner, but rather on nursing professionals using their own initiative and 'clinical judgement'. The NNSPG were readily available at only one PHC facility, and a minority (17%) of nurses were familiar with them, in comparison with more than half the nurses who were familiar with the older SA National Guidelines for PLWHA<sup>56</sup>. Most nurses were unable to correctly identify entry criteria, exit criteria or the aim of the programme, highlighting the need for increased awareness of the programme details.

Formal training on the guidelines needs to be conducted so that nursing staff are familiar with the NNSPG and the SA DoH goal of having patients enter and exit the nutrition supplementation programme in an objective, standardised manner based on BMI achieved, regardless of PHC facility attended. Possibly because nursing staff were not familiar with

entry and exit criteria of the NNSPG, many patients also did not know why they were receiving nutrition supplements or for how long they would receive them, although most patients had been given information on how to prepare and take the supplements by nursing staff.

The majority of nurses base the decision for a patient to receive nutrition supplementation on 'clinical judgement' rather than the NNSPG specified entry criteria of a BMI<18.5. Fortunately, the nurses' ability to judge a healthy BMI (using Stunkard<sup>63</sup> figures) was relatively good, with 68% correctly able to recognise a 'healthy weight'. However a perception that being overweight is 'healthy' for HIV-positive individuals by some nurses, combined with a belief by 60% of nurses that nutrition supplements are better than food, may increase the likelihood of patients who do meet entry criteria to receive supplementation. One of the study's key findings was that more patients were receiving nutrition supplements (13.3%) than met the entry criteria (4.9%), that is, having a BMI<18.5 according to the NNSPG. Additional contributors to over-issuing of nutrition supplements in a minority of cases may possibly be a perception that those who cannot afford food should be provided with nutrition supplements (more as a food aid).

#### **4.2.3 The need for more nutrition information**

Another of the study's main findings is that most patients express a need for more nutrition education, while fewer want nutrition supplementation. This is interesting, since most participants reported having received nutrition counselling, for more than ten minutes, and recently. In fact, the majority of patients believe that by giving more nutrition information, the quality of nutrition care could be improved. This is encouraging and offers nursing professionals (and other healthcare workers) an opportunity for health promotion/healthy eating activities which should be utilised. Patients appear to have a keen interest in nutrition and a readiness to learn more about the role of nutrition in health, and deserve high-quality relevant nutrition counselling.

Although it was not asked specifically whether nutrition counselling was conducted individually or in a group setting, through observation and informal feedback it became

apparent that the focus was on groups. While standard healthy eating information is discussed in a group, it appears patients seek continuous, more detailed nutrition advice that is tailored to their individual needs. While nurses report spending an average of ten minutes on nutrition counselling per patient, this is often in a group setting and not during one-on-one nutrition counselling from a nursing professional. The most commonly received nutrition information from the group counselling sessions is to eat more fruit and vegetables (68%), and decrease the intake of fat (19%), salt (7%) and alcohol (7%). Patients understand the need to eat healthily even when receiving nutrition supplementation, and fewer patients (43%) than nurses believe nutrition supplementation is better than food. This provides an opportunity, in future NIMART trainings, to discuss the value of macro- and micro-nutrient contributions from a varied diet of 'actual' foods and how nutrition supplementation may fit in for a limited number of eligible patients.

As this study included many facets of nutrition care, dietary information gathered was not in great detail. However, it was found that the majority of patients consume fruits and vegetables two to three times a week. Dietary intakes of fruit and vegetables, although less than the recommended intake by the WHO (2003)<sup>74</sup> of five portions of fruit and vegetables a day, are not dissimilar from habitual intakes found among the general South African population of African ethnicity.<sup>54</sup> Also, fruit and vegetable intakes tend to be lowest in rural, compared with urban areas. In the SANHANES-1 survey<sup>54</sup>, vegetables were consumed more frequently than fruits, likely due to the generally higher cost of fruits, particularly those out of season. However, intakes were similar between fruit and vegetables in the current study, possibly due to the wide variety of sub-tropical fruit grown locally. Increased consumption of fruits and vegetables to the recommended intakes is believed to be protective against obesity, type-2 DM and CVD.<sup>74</sup> The SA DoH advocates for an increased consumption of fruit and vegetables through the food-based dietary guideline: "Eat plenty of vegetables and fruit every day." However, achieving this goal appears to be tricky.<sup>75</sup> When there is household food insecurity, the likelihood of being able to purchase multiple servings of fruit or vegetables every day is poor, although encouraging value-for-money, nutritious balanced meals and including fruits



and vegetables as regularly as possible are important components of medical nutrition therapy in the context of HIV and should continue to be encouraged.<sup>1</sup>

#### **4.2.4 Confidence and knowledge of nurses regarding nutrition-related topics**

Although 90% of nurses feel confident to give nutrition counselling to HIV-positive adults on HAART, this can be worrying as they indicate that counselling is based on general knowledge rather than recognised guidelines. For instance, most nurses mistakenly perceive nutrition supplementation as superior to food because it contains more vitamins and minerals, or as giving more energy and protein than eating real foods would provide. While a quarter of nurses seemingly use food-based dietary guidelines for nutrition counselling, only four nurses could correctly list two of the guidelines. Additional education regarding nutrition counselling for patients on HAART making use of recognised guidelines seems important to improve the quality of nutrition counselling received by HAART-receiving patients attending PHC facilities. It was encouraging that nursing professionals agreed. Improved training on the nutrition care to adult patients with HIV for nursing staff is considered by the majority of nursing professionals to be the best way the quality of nutrition care could be improved, and provides a key opportunity for action. These findings were similar to those of the Landscape Analysis<sup>76</sup>, where 30.7% of health workers indicated the need for nutrition and HIV-related training. The research also found the lack of knowledge by nursing professionals not to influence their confidence in nutrition-related topics.

#### **4.2.5 Nutrition counselling in the context of HIV infection**

Nutrition counselling is acknowledged to be a valuable component of nutrition care and important in the medical nutrition therapy of HIV-positive patients.<sup>1,38</sup> A suitable dietary intake is best accomplished through eating healthy, balanced, nutrient-dense meals.<sup>1,38,74</sup> Good-quality nutrition counselling can assist patients to make better informed, healthier food choices<sup>38</sup> and is included in the national supplementation guidelines.<sup>41</sup> Since there is low-quality evidence of nutrition supplementation versus good-quality nutrition counselling to meet macro- and micro-nutrient needs<sup>40,51</sup>, and currently high levels of over-nutrition and lower levels of under-nutrition, it would seem sensible to continue putting effort into good-quality

nutrition education and change the perception among healthcare workers issuing nutrition supplements that they are 'superior' to food. Nutrition supplementation, although appropriate for a few eligible patients, should not overshadow other crucial aspects of nutrition care such as HAART and nutrition counselling.

### **4.3 PHC FACILITY ASSESSMENT**

All PHC facilities have at least one functional scale to weigh adults. Although the majority of scales are functional and reasonably accurate, it was of concern that most facilities do not have a maintenance plan for 'non-medical' equipment (such as scales). However, it is pleasing that at most facilities nutrition supplements were stored off the ground, away from direct sunlight and at two facilities the storeroom was temperature controlled.

#### **4.3.1 Nutrition supplementation stock supply**

A major study finding was an inconsistent supply of nutrition supplements evident from stock availability and observed when the PHC facility assessment tool was completed. Results from the nurses' questionnaire showed that stock availability dictated for 19% of nurses the quantity and for 59% the type of nutrition supplements issued. At the time of the PHC facility assessment, stock availability was little or non-existent at most facilities, and at four facilities expired *Brand A* stock was present. A recent study<sup>77</sup> evaluating certain aspects of the nutrition therapeutic programme offered to HIV-positive women in the Western Cape reported similar problems with stock shortages, and 21.9% of health workers interviewed during the Landscape Analysis<sup>76</sup> complained of nutrition supplementation stock shortages for children. More than 85% of facilities in this study had been out of stock of nutrition supplements during the previous month. Despite the majority of facilities not having sufficient stock available, it is of concern that only one nursing professional noted the need to sustain supply levels.

Most facilities had no evidence of a stock-ordering system, stock-control system or stock rotation. According to results of the nurses' questionnaire, an estimated 70% of facilities had some nutrition supplementation stock available, while around 30% had no stock at the time of the nurses' questionnaire being completed. Also while it was positive that close to 90% of

nutrition supplements issued were recorded, according to nursing professionals there were differences in where these were recorded. Most supplements were recorded in patients' files and/or on a statistics form, while fewer were recorded in a malnutrition register, despite almost three-quarters of PHC facilities having a malnutrition register available.

It is possible that shortages in nutrition supplementation stock pose a major barrier to implementing the NSP effectively. An inconsistent supply of supplements available to issue to patients appears to be a problem. Better channels of communication between PHC facilities requiring nutrition supplements and the provincial office ordering and delivering the supplements may be needed to maintain a constant supply. Furthermore, it seems that the recording of nutrition supplements issued is inconsistent and does not provide useful statistics for the SA DoH to plan and provide a consistent supply of adequate nutrition supplementation stock.

#### **4.3.2 Documentation availability**

In the current study, only one PHC facility was able to produce a copy of the South African Supplementary Feeding Guidelines for At-Risk and Malnourished Children and Adults (NNSPG), while others had copies of the national nutrition guidelines for PLWHA<sup>56</sup> published in 2007. Relevant, up-to-date documents and guidelines to assist clinic staff in providing good nutrition care to HIV-positive patients and assess entry criteria into the NSP were not always readily available at PHC facilities. These findings were similar to those of the Landscape Analysis report<sup>76</sup> where it was found that although most (59%) health workers could name a protocol relating to the nutritional management of PLWHA and 63% of facilities had such guidelines available, health workers were not always informed about which guidelines, policies and protocols were available at their facility. As a result, existing guidelines are not always used in practice to provide effective nutrition care to the patients they are aimed at.

#### **4.4 RATING OF NUTRITION CARE**

It was encouraging that most patients (76%) rate the nutrition care they receive at the PHC facility attended as 'Good' or 'Excellent'. Similarly most nursing professionals (69%) rate the

nutrition care provided to HAART-receiving patients also as 'Good' or 'Excellent'. This was a positive finding, and based on this subjective rating alone, the evaluation of nutrition care received by adult patients on HAART attending primary healthcare facilities in Mbombela North, Mpumalanga, could be considered satisfactory. However, a more extensive look into other aspects relating to the nutrition care of adults on HAART shows that while certain parts of nutrition care are good, there is room for improvement in other areas. In agreement with findings from the Landscape Analysis,<sup>76</sup> the main suggestions for improving nutrition care to patients are employing more nutrition experts at PHC facility level and improved nutrition training to healthcare staff.

#### **4.5 CONCLUDING REMARKS**

This research gathered information relating to:

- What is working well and needs to be continued or expanded, and positive feedback given.
- What is not working well and needs to be changed or discontinued.
- What can be done, introduced, and adapted and how to improve current nutrition care.
- What the implementation barriers of the national nutrition supplementation programme are.

Based on evidence from the research findings, the taking of patients weights is done well for most patients. Positive feedback can be given to staff to encourage that weight continues to be correctly taken for each patient.

However, what is not working well is that nutrition interventions vary from one facility to another, and currently there is a lack of a full nutrition assessment, adequate nutrition counselling and support and these are not done collectively. Adapting the currently disjointed nutrition services to integrate nutrition assessment, counselling and support (such as the NACS model) may assist to ensure the quality of nutrition care to HAART patients is improved. It may be worthwhile to consider modifying the supplementation programme to better meet the needs of the majority of patients who are not undernourished, but who are food insecure, and ensure that nursing professionals are familiar with the programme details.

Current nutrition care can be improved through the formation of a clear nutrition core package that includes an integration of nutrition care services that is clearly communicated to staff at PHC facilities. Regular, relevant and high-quality training on nutrition care to HAART clients is essential for improving the quality of nutrition care provided.

Factors hindering the correct implementation of the national nutrition supplementation program appear to be a lack of awareness of, and access to, the guidelines relating to the program (including entry and exit criteria), lack of a consistent supply of nutrition supplements to issue to patients and a different interpretation of the aim and relevance of the program between different nursing professionals at different PHC facilities, resulting in non-standardized implementation of the national nutrition supplementation program.

#### **4.6 STUDY LIMITATIONS**

A convenience (rather than a random) sampling strategy was needed to protect the confidentiality of potential participants, which may have introduced bias. In this study there were more female than male participants. More females were present at the PHC facility, and were also more willing to participate. Males withdrew from participating or declined to participate in the study more frequently than females, although the response rate was still greater than 80%. Also, more male patients had sent relatives to collect treatment on their behalf and were therefore not present themselves to participate in this study. Participants who were employed were less willing to participate in the study owing to time constraints that resulted in a greater representation of unemployed participants which may have influenced the results.

Co-morbid conditions were assessed by whether patients had been diagnosed and were currently receiving medication for that condition. There may be a larger number of participants with co-morbid conditions that have not yet been diagnosed. Symptoms were self-reported, and not evaluated by a medical practitioner.

## Chapter 5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

### 5.1 SUMMARY

In this study there was a greater prevalence of over-nutrition than under-nutrition among HAART-receiving adults, especially in women. A combined 40% of participants were found to be overweight or obese. Results from this study add to the increasing awareness that over-nutrition is a major problem associated with the growing number of clinically stable HIV-positive adult outpatients on HAART in this era. Similar to the general South African population, the prevalence of overweight and obesity among HIV-positive adults on ART is high, and urgent, appropriate interventions are needed to protect against NCDs, in particular for females of African ethnicity.

While severe malnutrition is uncommon in clinically stable patients attending PHC facilities, high levels of food insecurity and unemployment appear to remain and may contribute to poor health, with diets having surplus energy but lacking in nutrient density. Opportunities for improved efforts in regular, individualised high-quality nutrition counselling from trained nursing professionals to patients at PHC facility level exist and may assist in modifying lifestyle factors and improving health.

Problems exist with the current national NSP and it was found that nursing professionals were generally unaware of the programme details, unfamiliar with the guidelines, and implementation of the programme was not standardised, resulting in more patients receiving nutrition supplementation than met specified entry criteria. Another major problem with the NSP is stock shortage of nutrition supplements.

Although PHC facilities mostly had adequate equipment, height, MUAC and BMI measurements were seldom recorded. This needs corrective action so that patients' anthropometric measurements can be monitored, appropriate counselling be given based on individual findings, and the correct entry criteria into and exit criteria from the NNSPG be used.

The majority of nurses and patients were satisfied with the quality of nutrition care provided/received. However, patients sought more nutrition information, and although nurses felt confident to give nutrition counselling, this was generally guided by general knowledge rather than recommended guidelines. A difference was observed that while nurses have a high degree of confidence in nutrition-related topics, particularly nutrition counselling, there is a lack knowledge in this area.

A need for more HIV-nutrition training for healthcare workers as well as additional nutrition experts to be employed at PHC facilities was apparent.

## **5.2 CONCLUSION**

Findings from this study indicate that although certain aspects of nutrition care provided to adult patients on HAART attending PHC facilities are good, there is room for improvement. A high prevalence of overweight and obesity was found, adding to the growing evidence that over-nutrition and associated increased risk of metabolic complications and NCDs require urgent attention and effective interventions.

Nutrition care to adult patients on HAART can be improved through training and support to professional nurses. This training should include the importance of anthropometry, particularly height taking and BMI. Nurses should be well equipped to give nutrition counselling to HIV-positive individuals to encourage the consumption of appropriate portions of safe, balanced meals and to promote household food security. Greater attention needs to be paid to healthy lifestyle counselling and encouragement of people living with HIV, in particular females, to achieve and maintain a healthy weight. Culturally appropriate interventions and counselling are needed to address potential misperceptions among African HIV-positive females regarding their weight and health, so as not to undermine strategies for encouraging the maintenance of a healthy weight to prevent chronic non-communicable diseases. Nutrition counselling should be guided by recognised guidelines and focused towards both under- and over-nutrition. Nurses should be familiarised with the NNSPG through formal training and have a constant nutrition supplement supply to implement them correctly. It may be worthwhile to consider modifying the NSP to better meet the needs of the majority of patients

who are not undernourished, but who are food insecure. Continuous efforts involving key stakeholders such as the government, private sector and NGOs to alleviate the high levels of unemployment in the country as far as possible need to be strengthened, since unemployment may be exacerbating the obesity problem. However, better monitoring and evaluation of nutrition care to adult patients receiving HAART from PHC facilities are needed.

### **5.3 RECOMMENDATIONS**

Attention should be given to improving the regular, diligent, correct taking of anthropometric measurements for all patients; the currently non-systematic methods of record keeping; and provision of regular, high quality, nutrition education. A constant supply of appropriate nutrition supplements for those who qualify should be provided.

Opportunities exist for healthcare workers to provide good quality, relevant nutrition education to adult patients on HAART. Advantages specific to HAART-receiving adults are that they attend ART-adherence classes prior to starting treatment, as well as making regular visits to the PHC, thereby providing regular opportunities for nutrition education. Healthcare workers should meet the patients' plea for more nutrition information to improve the quality of nutrition care received as part of the 'package of HIV care'. It could be beneficial to consider having nutrition experts provide training to healthcare workers (such as professional nurses) on nutrition education for adults on HAART, or based at PHC level to provide nutrition education directly to patients.

The appointment of more dietitians or other nutrition experts at PHC facilities, as recommended by nursing professionals and previous studies, should be considered to assist in improving the quality of nutrition care offered to adult patients on HAART.

The possibility that ward-based outreach teams can contribute to nutrition care by conducting nutrition assessment, counselling and support services during routine home visits to HAART patients should be explored.

An improved, simple and easy-to-use BMI chart with weight in kilograms and height in meters, appropriate for use in South Africa and with equipment available at PHC facilities,



may be a helpful tool to improve nursing professionals' ability to quickly and accurately calculate BMI.

A better ordering and delivery system of nutrition supplementation stock (improved logistics) could help to prevent interruptions in the supply of stock needed to implement the NSP correctly. In addition, standardisation in how the nutrition supplements issued are recorded may assist the provincial DoH with more accurate forecasts of stock required at PHC facilities. Operational managers of PHC facilities should be involved in the requisition and stock control of nutrition supplements.

The integration of nutrition-related services may be more beneficial to HAART clients than stand-alone nutrition interventions.<sup>79</sup>

The development of a clear core package on nutrition interventions for PLWHA could go a long way in ensuring that nutrition services are standardized throughout the province.

Additional monitoring and evaluation indicators such as number of patients who receive nutrition assessment, counselling and support with specific details regarding the type of assessment/counselling/support provided would be helpful to monitor nutrition care for PLWHA and provide more meaningful information than only recording nutritional supplements issued.

In summary, the following key recommendations can be made:

- Development of a clear core package on nutrition interventions for PLWHA
- Improvement of quality and relevance of integrated 'nutrition care' training for professional nurses to adults on HAART, including nutrition counselling.
- Better co-ordination of the various programmes aimed to improve nutrition care to HIV-positive individuals.
- Increased attention paid to overweight and obesity, especially among female HAART-receiving patients with associated risk of NCDs.
- Maintenance of an uninterrupted supply of sufficient and appropriate nutrition supplement stock.

- Availability of standard nutrition supplementation guidelines at all facilities
- Detailing the entry and exit criteria, type of supplements, quantities to be issued, and period of supplementation.

#### **5.4 FUTURE RESEARCH RECOMMENDATIONS**

Future research recommendations include:

- Evaluating the effectiveness of various comprehensive, integrated nutrition care interventions for adults on HAART
- Exploring innovative ways to train nursing professionals on nutrition care for HIV-positive patients and to simplify the everyday rendering of nutrition services at PHC level.
- Evaluating possible interventions to reduce the prevalence of over-nutrition among female HAART-receiving patients of African ethnicity.
- Assessing the role micronutrient supplementation may have on HAART-receiving adult patients.
- Evaluating interventions aimed at strengthening food security among HIV-positive individuals.

## REFERENCE LIST

1. Mahan LK, Escott-Stump S. Krause's food & nutrition therapy. 12<sup>th</sup> ed. St Louis, MO: Saunders Elsevier; 2008.
2. Republic of South Africa. National consolidated guidelines for the prevention of mother-to-child transmission of HIV (PMTCT) and the management of HIV in children, adolescents and adults. Pretoria: Department of Health; April 2015.
3. WHO (World Health Organization). Global database on body mass index: BMI classification [Online]. 2006 [updated 2015 Jun 29; cited 2015 Jul 1]. Available from: [http://apps.who.int/bmi/index.jsp?introPage=intro\\_3.html](http://apps.who.int/bmi/index.jsp?introPage=intro_3.html)
4. Coetzee D, Metcalf C, Coetzee N. Outbreak investigation. In Joubert G, Ehrlich R, editors. Epidemiology: A research manual for South Africa. 2<sup>nd</sup> ed. Cape Town: Oxford University Press Southern Africa; 2007. pp 229–
5. KZN Department of Health. Definitions of health facilities [Online]. 2001 [updated 2001; cited 2015 Jun 24]. Available from: <http://www.kznhealth.gov.za/definitions.htm>
6. UNAIDS (Joint United Nations Programme on HIV/AIDS). World AIDS Day 2014 Report: Fact sheet [Online]. 2014 [cited 2015 Jan 4]. Available from: <http://www.unaids.org/en/resources/campaigns/World-AIDS-Day-Report-2014/factsheet>
7. AVERT. History of HIV & AIDS in South Africa [homepage on the internet]. 2014 [updated 2014 Aug 4; cited 2015 April 8]. Available from: <http://www.avert.org/history-hiv-aids-south-africa.htm>
8. UNAIDS (Joint United Nations Programme on HIV/AIDS). UNAIDS Together we will end AIDS [Online]. 2012. [cited 2013 Nov 3]. Available from: [http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2012/jc2296\\_unaids\\_togetherreport\\_2012\\_en.pdf](http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2012/jc2296_unaids_togetherreport_2012_en.pdf)
9. UNAIDS (Joint United Nations Programme on HIV/AIDS). Gap Report [Online]. 2014 [cited 2015 Jan 4]. Available from: <http://www.unaids.org/en/resources/campaigns/2014/2014gapreport/gapreport>
10. Shisana O, Rehle T, Simbayi LC, Zuma K, Jooste, S, Zungu N, et al. South African national HIV prevalence, incidence and behaviour survey, 2012 [homepage on the internet]. 2014 [published 2014; cited 2015 April 8]. Cape Town: HSRC Press; 2014. Available from: <http://www.hsrc.ac.za/uploads/pageContent/4565/SABSSM%20IV%20LEO%20final.pdf>
11. Republic of South Africa. Framework for implementing nutrition interventions for people living with TB, HIV and AIDS. Pretoria: Department of Health; 2007.

12. Beers MH, Fletcher AJ, Jones TV, Porter R, Berkwits M, Kaplan JL. The Merck manual of medical information. 2<sup>nd</sup> ed. New York (NY): Simon & Schuster; 2004.
13. Marieb EN, Hoehn K. Human anatomy & physiology. 8<sup>th</sup> ed. San Francisco (CA): Pearson Benjamin Cummings; 2010.
14. Bekker L, Venter F, Cohen K, Goemare E, Van Cutsem G, Boulle A et al. Review: Provision of antiretroviral therapy in South Africa: The nuts and bolts. *Antiviral Therapy* [Online]. 2014 [cited 2015 Jul 3]; 19 Suppl (3):105–116. doi: 10.3851/IMP2905.
15. Venter WDF. What have we learnt from the last ten years of ART? *S Afr J HIV Med* [Online]. 2014 [cited 2014 Dec 15];15(1):39–40. DOI:10.7196/SAJHIVMED.1029.
16. Moorhouse M. Closer to zero: Reflections on ten years of ART rollout. *S Afr J HIV Med* [Online]. 2014 [cited 2014 Dec 15];15(1):9. DOI:10.7196/SAJHIVMED.1030.
17. Maartens G, Goemaere E. Building on the first decade of ART. *S Afr J HIV Med* [Online]. 2014 [cited 2014 Dec 15];15(1):7–8. DOI:10.7196/SAJHIVMED.1031.
18. UNAIDS (Joint United Nations Programme on HIV/AIDS). Global Report: UNAIDS report on the global AIDS epidemic 2013 [Online]. 2013. [cited 2013 Nov 7]. Available from: <http://www.unaids.org/en/resources/campaigns/globalreport2013/globalreport>
19. WHO (World Health Organization). Global update on HIV treatment 2013: Results, impact and opportunities [homepage on the internet]. 2013 [published 2013; cited 2015 April 8]. Available from: [http://www.unaids.org/sites/default/files/media\\_asset/20130630\\_treatment\\_report\\_summary\\_en\\_0.pdf](http://www.unaids.org/sites/default/files/media_asset/20130630_treatment_report_summary_en_0.pdf)
20. UNAIDS (Joint United Nations Programme on HIV/AIDS). How AIDS changed everything — MDG6: 15 years, 15 lessons of hope from the AIDS response [Online]. 2015 [released 2015 Jul 14; cited 2015 Jul 16]. Available from: [http://www.unaids.org/en/resources/documents/2015/MDG6\\_15years-15lessonsfromtheAIDSresponse](http://www.unaids.org/en/resources/documents/2015/MDG6_15years-15lessonsfromtheAIDSresponse)
21. Statistics South Africa. Mid-year population estimates 2013 [homepage on the internet]. c. 2013. No date [cited 2013 Nov 3]. Available from: <http://www.statssa.gov.za/publications/P0302/P03022013.pdf>
22. Health Systems Trust. Health indicators: People living with HIV [Online]. 2012 [cited 2013 Nov 14]. Available from: <http://indicators.hst.org.za/healthstats/293/data>
23. Republic of South Africa. The National Strategic Plan on HIV, STIs and TB 2012–2016 [homepage on the internet] Pretoria: Department of Health [updated 2011; cited 2015 Apr 9]. Available from: [http://sanac.org.za/component/docman/doc\\_download/7-national-strategic-paln-on-hiv-stis-and-tb?Itemid=](http://sanac.org.za/component/docman/doc_download/7-national-strategic-paln-on-hiv-stis-and-tb?Itemid=)

24. Fin 24. Govt awards R10bn ARV tenders [homepage on the internet] 2014. [updated 2014 Dec 24; cited 2014 Dec 24]. Available from: <http://www.fin24.com/Companies/Health/Aspen-Cipla-among-winners-in-R10bn-aids-tender-20141224>
25. WHO (World Health Organization) TB/HIV Working Group. HIV-associated TB facts 2013 [homepage on the internet] [updated 2013; cited 2015 Apr 9]. Available from: [http://www.who.int/tb/challenges/hiv/tbhiv\\_factsheet\\_2013\\_web.pdf](http://www.who.int/tb/challenges/hiv/tbhiv_factsheet_2013_web.pdf)
26. Statistics South Africa. Mortality and causes of death in South Africa, 2010: Findings from death notification [homepage on the internet]. [updated 2013; cited 2015 Apr 8] Available from: <http://www.statssa.gov.za/publications/P03093/P030932010.pdf>
27. Peters A. CDC's HIV/AIDS care and treatment programs in South Africa: TB and HIV [homepage on the internet] [updated 2011 Dec 5; cited 2015 Apr 9]. Available from: [http://www.cdc.gov/globalhealth/countries/southafrica/what/tb\\_hiv.htm](http://www.cdc.gov/globalhealth/countries/southafrica/what/tb_hiv.htm)
28. Republic of South Africa. HIV & AIDS and STI Strategic Plan for South Africa 2007–2011 [homepage on the internet]. Pretoria: Department of Health [updated 2007 Jun; cited 2015 April 6]. Available from: [http://data.unaids.org/pub/ExternalDocument/2007/20070604\\_sa\\_nsp\\_final\\_en.pdf](http://data.unaids.org/pub/ExternalDocument/2007/20070604_sa_nsp_final_en.pdf)
29. Siegfried N, Uthman OA, Rutherford GW. Optimal time for initiation of antiretroviral therapy in asymptomatic, HIV-infected, treatment-naive adults. *Cochrane Database Syst Rev* [Online]. 2010 [cited 2015 Feb 2]; Mar 17;(3):CD008272. doi: 10.1002/14651858.CD008272.pub2.
30. WHO (World Health Organization). Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection: Recommendations for a public health approach [Online] 2013 [cited 2013 Nov 12]. Available from: <http://www.who.int/hiv/pub/guidelines/arv2013/en/>.
31. Doherty M, Ford N, Vitoria M, Weiler G, Hirschall G. The 2013 WHO guidelines for antiretroviral therapy: evidence-based recommendations to face new epidemic realities. *Curr Opin HIV AIDS* [Online]. 2013 [cited 2013 Nov 3];8(6):528–534. doi: 10.1097/coh.0000000000000008.
32. Republic of South African. Department of Health. Fixed-dose combination ARVs: Everything you need to know [Online]. No date [cited 2015 Apr 16]. Available from: <http://www.sanews.gov.za/special-features-archive/fixed-dose-combination-arvs-everything-you-need-know>
33. Matsolo M. HIV patients still waiting for easier-to-take drugs [Online] [updated 2013 Apr 10; cited 2015 Apr 2]. Available from: [http://groundup.org.za/article/hiv-patients-still-waiting-easier-take-drugs\\_895.13](http://groundup.org.za/article/hiv-patients-still-waiting-easier-take-drugs_895.13)
34. NAM. Antiretroviral drugs chart [Online] [updated 2014 Oct 10; cited 2015 Mar 30]. Available from: <http://www.aidsmap.com>

35. Southern African HIV Clinicians Society. Fixed-dose combination for adults accessing antiretroviral therapy (Advice document) *S Afr J HIV Med* [Online]. 2013 [cited 2015 Apr 8];14(1 Suppl):41–43.  
doi:10.7196/SAJHIVMED.913. Available from:  
<http://www.sahivsoc.org/upload/documents/Fixed%20dose%20combination%20for%20adults%20accessing%20%20antiretroviral%20therapy.pdf>
36. Spencer D. A history of ART and fixed-dose combination pills [Online] [updated 2013 Jul 25, cited 2015 Apr 1]. Available from: <http://www.medicalchronicle.co.za/a-history-of-art-and-fixed-dose-combination-pills/>
37. Academy of Science of South Africa (ASSAF). HIV/AIDS, TB and Nutrition: Scientific enquiry into the nutritional influences on human immunity with special reference to HIV infection and active TB in South Africa [homepage on the internet] [updated 2007 Jul; cited 2015 Apr 9]. Available from:  
[http://www.assaf.co.za/wpcontent/uploads/reports/evidence\\_based/3060%20ASSAF%20HIV%20TB%20and%20Nutrition.pdf](http://www.assaf.co.za/wpcontent/uploads/reports/evidence_based/3060%20ASSAF%20HIV%20TB%20and%20Nutrition.pdf)
38. FANTA (Food and Nutrition Technical Assistance). 2012. Defining Nutrition Assessment, Counseling, and Support (NACS). Technical Note No. 13. [Online]. 2012 [cited 2015 Jul 3]. Washington, DC: FHI 360/FANTA. Available from: <http://www.fhi360.org/sites/default/files/media/documents/FANTA-NACS-TechNote-Jul2012.pdf>
39. Grobler L, Siegfried N, Visser ME, Mahlangu SSN, Volmink J. Nutritional interventions for reducing morbidity and mortality in people with HIV. *Cochrane Database of Systematic Reviews* [Online] 2013 [cited 2013 Dec 13]. doi: 10.1002/14651858.CD004536.pub3.
40. Willumsen J. Macronutrient supplementation for people living with HIV/AIDS: Biological, behavioural and contextual rationale. WHO e-Library of Evidence for Nutrition Actions [Online] 2013 [cited 2013 Sep 13]. Available from: [http://www.who.int/elena/bbc/macronutrient\\_supplementation\\_HIV/en/](http://www.who.int/elena/bbc/macronutrient_supplementation_HIV/en/)
41. Republic of South Africa. The South African supplementary feeding guidelines for at risk and malnourished children and adults. Pretoria: Department of Health; 2012.
42. Keithley JK, Duloy AMS, Swanson B, Zeller JM. HIV infection and obesity: A review of the evidence. *J Assoc Nurses AIDS Care* 2009;20:260–274. doi:10.1016/j.jana.2009.02.006.
43. Hurley E, Coutsoodis A, Giddy J, Knight SE, Loots E, Esterhuizen TM. Weight evolution and perceptions of adults living with HIV following initiation of antiretroviral therapy in a South African urban setting. *SAMJ* [serial online]. 2011 [cited 2015 Jul 1];101(9):645–650. Available from:  
[http://www.scielo.org.za/scielo.php?pid=S025695742011000900021&script=sci\\_arttext](http://www.scielo.org.za/scielo.php?pid=S025695742011000900021&script=sci_arttext)

44. Esposito FM, Coutsooudis A, Visser J, Kindra G. Changes in body composition and other anthropometric measures of female subjects on highly active antiretroviral therapy (HAART): A pilot study in KwaZulu-Natal, South Africa. *SA J HIV Med* 2008; (Spring):36–42.
45. Achra AC, Mocroft A, Reiss P, Sabin C, Ryom L, de Wit S et al. Impact of short-term change in body mass index (BMI) after antiretroviral therapy (ART) initiation on subsequent risk of cardiovascular disease (CVD) and diabetes in HIV-positive individuals: the D:A:D study [online] 2014 [cited 2015 Apr 20] Abstract presented at 20th International AIDS Conference, Melbourne, Australia, July 20–25, 2014. Available from: <http://pag.aids2014.org/Abstracts.aspx?SID=1141&AID=6485>
46. The DAD Study Group. Class of antiretroviral drugs and the risk of myocardial infarction. *N Engl J Med* [Online]. 2007 [cited 2015 Apr 20];356(17):1723–1735. Available from: <http://www.nejm.org/doi/pdf/10.1056/NEJMoa062744>
47. Cerrato E, Calcagno A, D'Ascenzo F, Biondi-Zoccai G, Mancone M, Marra WG et al. Cardiovascular disease in HIV patients: From bench to bedside and backwards. *Open Heart* [Online]. 2015 [cited 2015 Jul 2];2. Available from: <http://openheart.bmj.com/content/2/1/e000174> full doi:10.1136/openhrt-2014-000174
48. Bavinger C, Bendavid C, Niehaus K, Olshen RA, Olkin I, Sundaram V et al. Risk of cardiovascular disease from antiretroviral therapy for HIV: A systematic review. *PLoS One* [Online]. 2013 [cited 2015 Jul 2];8(3):e59551. doi: <http://dx.doi.org/10.1371/journal.pone.0059551>
49. Tang AM, Lanzillotti J, Hendricks K, Gerrior J, Ghosh M, Woods M et al. Micronutrients: Current issues for HIV care providers. *AIDS* [Online]. 2005 [cited 2015 Apr 9];19(9):847–862. Available from: [http://www.medscape.com/viewarticle/505659\\_4](http://www.medscape.com/viewarticle/505659_4)
50. Drain PK, Kupka R, Mugusi F, Fawzi WW. Micronutrients in HIV-positive persons receiving highly active antiretroviral therapy. *Am J Clin Nutr* [Online]. 2007 [cited 2015 Apr 9];Feb;85(2):333–345. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17284727>
51. Irlam JH, Visser MME, Rollins NN, Siegfried N. Micronutrient supplementation in children and adults with HIV infection. *Cochrane HIV/AIDS Group* [Online] [updated 2010 Feb 25; cited 2015 Aug 14]. doi: 10.1002/14651858.CD003650.pub3. Available from: <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD003650.pub3/epdf>
52. Lategan R, Steenkamp L, Joubert G, Le Roux M. Nutritional status of HIV-infected adults on antiretroviral therapy and the impact of nutritional supplementation in the Northern Cape Province, South Africa. *S Afr J Clin Nutr* 2010;23(4):197–201.

53. Koethe JR, Marseille E, Giganti MJ, Chi BH, Heimburger D. Estimating the cost-effectiveness of nutrition supplementation for malnourished, HIV-infected adults starting antiretroviral therapy in a resource-constrained setting. *Cost Eff Resour Alloc* [Online]. 2014 [cited 2015 Jan 15];12:10. Available from: <http://www.resource-allocation.com/content/12/1/10>. doi:10.1186/1478-7547-12-10.
54. HSRC (Human Sciences Research Council). The South African National Health and Examination Survey SANHANES–1 [Online] 2013 [cited 2013 Nov 20]. Available from: [http://www.hsrc.ac.za/uploads/pageContent/3893/SANHANESlaunch%20edition%20\(online%20version\).pdf](http://www.hsrc.ac.za/uploads/pageContent/3893/SANHANESlaunch%20edition%20(online%20version).pdf)
55. Matoti-Mvalo T, Puoane T. Perceptions of body size and its association with HIV/AIDS. *S Afri J Clin Nutr* 2011;24(1):40–45.
56. Republic of South Africa. South African national guidelines on nutrition for people living with HIV, AIDS, TB and other chronic debilitating conditions [Online]. Pretoria: Department of Health; 2007 [cited 2015 Jun 1] Available from: [http://sun025.sun.ac.za/portal/page/portal/Health\\_Sciences/English/Centres%20and%20Institutions/Nicus/Nutrition%20HIVAIDS/National%20guidelines%20on%20nutrition%20for%20people%20living%20with.pdf](http://sun025.sun.ac.za/portal/page/portal/Health_Sciences/English/Centres%20and%20Institutions/Nicus/Nutrition%20HIVAIDS/National%20guidelines%20on%20nutrition%20for%20people%20living%20with.pdf)
57. Republic of South Africa. Roadmap for Nutrition in South Africa 2013–2017. Pretoria: Department of Health; 2013.
58. Republic of South Africa. Ehlanzeni Clinic Directory. Department of Health [Online] [cited 2013 Sep 24] Available from: <http://www.mpuhealth.gov.za/Ehlanzeni%20District%20Clinic.html>
59. CDC (Centre for Disease Control and Prevention). National Health and Nutrition Survey (NHANES). Anthropometry Procedures Manual [internet]. 2009 [cited 2013 May 22]. Available from: [http://www.cdc.gov/nchs/data/nhanes/nhanes\\_09\\_10/BodyMeasures\\_09.pdf](http://www.cdc.gov/nchs/data/nhanes/nhanes_09_10/BodyMeasures_09.pdf)
60. Lee RD, Nieman DC. Anthropometry. In *Nutritional assessment*. 4<sup>th</sup> ed. Chapt. 6. London: McGraw-Hill; 2007.
61. WHO (World Health Organization). Obesity: preventing and managing the global epidemic: report of a WHO consultation on obesity. Geneva, Switzerland: World Health Organization [Online]. 1998 [cited 2013 May 22]. Available from: [http://apps.who.int/bmi/index.jsp?introPage=intro\\_3.html](http://apps.who.int/bmi/index.jsp?introPage=intro_3.html)
62. Queensland Government. Using Body Mass Index. Consensus document from Dietitian/Nutritionists from the Nutrition Education Materials Online, "NEMO" team [Online]. 2014 [reviewed 2014 Oct; cited Jul 14]. Available from: [https://www.health.qld.gov.au/nutrition/resources/hphe\\_usingbmi.pdf](https://www.health.qld.gov.au/nutrition/resources/hphe_usingbmi.pdf)



63. Stunkard ET, Sorenson T, Schlusinger T. Use of the Danish adoption registers for the study of obesity and thinness. In Kelly SS, Rowland LP, Sidman RL, Matthys SW, editors. *Genetics of neurological and psychiatric disorders*. New York (NY): Raven Press; 1983. pp.115–129.
64. Mciza Z, Goedecke JH, Steyn NP, Charlton KE, Puoane T, Meltzer S et al. Development and validation of instruments measuring body image and body weight dissatisfaction in South African mothers and their daughters. *Public Health Nutr* 2005;8(5):509–519. Available from: <http://ro.uow.edu.au/cgi/viewcontent.cgi?article=158>
65. McCormick CL, Francis AM, Iliffe K, Webb H, Douch CJ, Pakianathan M et al. Increasing obesity in treated female HIV patients from sub-Saharan Africa: Potential causes and possible targets for intervention. *Front Immunol* [online]. 2014 [cited 2015 Jul 1];5:507. Available from: <http://journal.frontiersin.org/article/10.3389/fimmu.2014.00507/full>. doi: 10.3389/fimmu.2014.00507.
66. Cornell M, Schomaker M, Garone DB, Giddy J, Hoffmann CJ, Lessells R et al. ; for the International Epidemiologic Databases to Evaluate AIDS. Gender Differences in Survival among Adult Patients Starting Antiretroviral Therapy in South Africa: A Multicentre Cohort Study. *PLoS medicine* [online]. 2012 [cited 2015 Oct 5];9 (9). e1001304. ISSN 1549-1277. Available from: <http://researchonline.lshtm.ac.uk/375788/1/pmed.1001304.pdf>
67. Myburgh H. The clinic as a gendered space: Masculinities, health seeking behaviour and HIV & AIDS [online] [updated 2011 May 16; cited 2014 Dec 15]. Available from: [http://www.consultancyafrica.com/index.php?option=com\\_content&view=article&id=760:the-clinic-as-a-gendered-space-masculinities-health-seeking-behaviour-and-hiv-a-aids&catid=61:hiv-aids-discussion-papers&Itemid=268](http://www.consultancyafrica.com/index.php?option=com_content&view=article&id=760:the-clinic-as-a-gendered-space-masculinities-health-seeking-behaviour-and-hiv-a-aids&catid=61:hiv-aids-discussion-papers&Itemid=268)
68. FAO (Food and Agriculture Organization of the United Nations). The impact of HIV on food security. Committee on World Food Security. 27th session held in Rome, 28 May–1 June 2001 [Online] [cited 2015 Jul 3]. Available from: <http://www.fao.org/docrep/meeting/003/Y0310E.htm>
69. Weiser S, Young S, Cohen C, Kushel MB, Tsai AC, Tien PC et al. Conceptual framework for understanding the bidirectional links between food insecurity and HIV/AIDS. *Am J Clin Nutr* [Online]. 2011 [cited 2015 Jul 3];94(6):1729S–1739S. Available from: <http://ajcn.nutrition.org/content/94/6/1729S.full>. doi: 10.3945/ajcn.111.012070.
70. Levinsohn J, McLaren Z, Shisana O, Zuma K. HIV status and labor market participation in South Africa. NBER [Online]. 2011 [cited 2015 Jul 3] Working Paper No. 16901, NBER Program. Issued in March 2011. Available from <http://www.nber.org/papers/w16901>.doi: 10.3386/w16901

71. ILO (International Labour Organization). World employment and social outlook: Where will unemployment be the highest over the next five years? [Online] [updated 2015 Jan 20; cited 2015 Jan 21]. Available from: [http://www.ilo.org/global/about-the-ilo/multimedia/maps-and-charts/WCMS\\_336950/lang--en/index.htm](http://www.ilo.org/global/about-the-ilo/multimedia/maps-and-charts/WCMS_336950/lang--en/index.htm)
72. Declaration of Alma-Ata [online]. International Conference on Primary Health Care, Alma-Ata, USSR, 6-12 September 1978 [cited 2015 Oct 6]. Available from: [http://www.who.int/publications/almaata\\_declaration\\_en.pdf](http://www.who.int/publications/almaata_declaration_en.pdf)
73. Republic of South Africa. The South African Constitution; Bill of Rights Chapter 2, Section 7-39. 2012 [cited 2015 Oct 6]. Available from: <http://www.justice.gov.za/legislation/constitution/chp02.html>
74. WHO (World Health Organization). Global strategy on diet, physical activity and health: Promoting fruit and vegetable consumption around the world [Online]. 2015 [updated 2003; cited 2015 Jul 3]. Available from: <http://www.who.int/dietphysicalactivity/fruit/en/>
75. Schönfeldt HC, Hall N, Bester M. Relevance of food-based dietary guidelines to food and nutrition security: A South African perspective. Nutrition Bulletin [Online]. 2013 [cited 2015 Oct 16];38: 226-235. Available from: <http://onlinelibrary.wiley.com.ez.sun.ac.za/doi/10.1111/nbu.12027/epdf>
76. WHO (World Health Organization). 2010. Landscape analysis on countries' readiness to accelerate action to reduce maternal and child undernutrition: Nationwide country assessment in South Africa. 2010 [released 2010; cited 2015 Aug 13]. Available from : [http://www.who.int/entity/nutrition/landscape\\_analysis/SouthAfricaLandscapeAnalysisCountryAssessmentReport.pdf?ua=1](http://www.who.int/entity/nutrition/landscape_analysis/SouthAfricaLandscapeAnalysisCountryAssessmentReport.pdf?ua=1)
77. Hansen TT, Herselman M, Du Plessis L, Daniels L, Bezuidenhout T, van Niekerk C et al. Evaluation of selected aspects of the Nutrition Therapeutic Programme offered to HIV-positive women of childbearing age in Western Cape Province, South Africa. S Afr J HIV Med [Online]. 2015 [cited 2015 Jul 3];16(1),Art. #338, 5 pages. doi: <http://dx.doi.org/10.4102/sajhivmed.v16i1.338>
78. WHO (World Health Organization). WHO case definitions of HIV for surveillance and revised clinical staging and immunological classification of HIV-related disease in adults and children [Online]. Geneva, Switzerland: WHO Press; 2007 [cited 2015 Aug 16]. Available at <http://www.who.int/hiv/pub/guidelines/hivstaging/en/index.html>
79. Tang AM, Quick T, Chung M, Wanke CA. Nutrition Assessment, Counseling, and Support Interventions to Improve Health-related Outcomes in People Living With HIV/AIDS: A Systematic Review of the Literature. J Acquir Immune Defic Syndr [Online]. 2015 [cited 2015 Oct 16];68(S3):S340-S349. Available from: <http://www.medscape.com/viewarticle/843178>

**Addendum 1: WHO clinical staging of HIV/AIDS for adults and adolescents (≥15 years)<sup>78</sup>**

<b>Clinical Stage</b>	<b>Clinical Conditions or Symptoms</b>
<b>Primary HIV Infection</b>	Asymptomatic Acute retroviral syndrome
<b>Clinical Stage 1</b>	Asymptomatic Persistent generalized lymphadenopathy
<b>Clinical Stage 2</b>	Moderate unexplained weight loss (<10% of presumed or measured body weight) Recurrent respiratory infections (sinusitis, tonsillitis, otitis media, and pharyngitis) Herpes zoster Angular cheilitis Recurrent oral ulceration Papular pruritic eruptions Seborrheic dermatitis Fungal nail infections
<b>Clinical Stage 3</b>	Unexplained severe weight loss (>10% of presumed or measured body weight) Unexplained chronic diarrhea for >1 month Unexplained persistent fever for >1 month (>37.6°C, intermittent or constant) Persistent oral candidiasis (thrush) Oral hairy leukoplakia Pulmonary tuberculosis (current) Severe presumed bacterial infections (e.g., pneumonia, empyema, pyomyositis, bone or joint infection, meningitis, bacteremia) Acute necrotizing ulcerative stomatitis, gingivitis, or periodontitis Unexplained anemia (hemoglobin <8 g/dL) Neutropenia (neutrophils <500 cells/μL) Chronic thrombocytopenia (platelets <50,000 cells/μL)

<p><b>Clinical Stage 4</b></p>	<p>HIV wasting syndrome, as defined by the CDC</p> <p><i>Pneumocystis pneumonia</i></p> <p>Recurrent severe bacterial pneumonia</p> <p>Chronic herpes simplex infection (orolabial, genital, or anorectal site for &gt;1 month or visceral herpes at any site)</p> <p>Esophageal candidiasis (or candidiasis of trachea, bronchi, or lungs)</p> <p>Extrapulmonary tuberculosis</p> <p>Kaposi sarcoma</p> <p>Cytomegalovirus infection (retinitis or infection of other organs)</p> <p>Central nervous system toxoplasmosis</p> <p>HIV encephalopathy</p> <p>Cryptococcosis, extrapulmonary (including meningitis)</p> <p>Disseminated nontuberculosis mycobacteria infection</p> <p>Progressive multifocal leukoencephalopathy</p> <p>Candida of the trachea, bronchi, or lungs</p> <p>Chronic cryptosporidiosis (with diarrhea)</p> <p>Chronic isosporiasis</p> <p>Disseminated mycosis (e.g., histoplasmosis, coccidioidomycosis, penicilliosis)</p> <p>Recurrent nontyphoidal <i>Salmonella</i> bacteremia</p> <p>Lymphoma (cerebral or B-cell non-Hodgkin)</p> <p>Invasive cervical carcinoma</p> <p>Atypical disseminated leishmaniasis</p> <p>Symptomatic HIV-associated nephropathy</p> <p>Symptomatic HIV-associated cardiomyopathy</p> <p>Reactivation of American trypanosomiasis (meningoencephalitis or myocarditis)</p>
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## Addendum 2: Nutrition assessment of patients

AN EVALUATION OF NUTRITION CARE TO ADULT PATIENTS ON ANTIRETROVIRAL THERAPY (ART)  
ATTENDING CLINICS IN MBOMBELA NORTH, MPUMALANGA

### NUTRITION STATUS ASSESSMENT (Patients)

Data to be gathered by trained research assistant (section A & B) and researcher (C, D & E) after obtaining written consent.

Date

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
D	d	m	m	y	y	y	y

Facility Code	<input type="text"/>	<input type="text"/>
Participant Code	<input type="text"/>	<input type="text"/>

#### SECTION A – Socio-demographic Information

Completed by trained research assistant. Information obtained from interview.

1. Gender

	Response (X)
1 Male	<input type="text"/>
2 Female	<input type="text"/>

2. How old are you? \_\_\_\_\_ Years

3. Race (tick one)

African	<input type="checkbox"/>	White	<input type="checkbox"/>	Coloured	<input type="checkbox"/>	Indian	<input type="checkbox"/>
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4. What is your highest level of education obtained?

	Response (X)
1 No formal schooling	<input type="text"/>
2 Less than Grade 7	<input type="text"/>
3 Grade 7	<input type="text"/>
4 Grade 10	<input type="text"/>
5 Grade 12 ( Matric)	<input type="text"/>
6 Tertiary (Diploma/Degree)	<input type="text"/>

5. What is your current work/employment status?

		Response (X)
1	Unemployed, looking for work	
2	Unemployed, not looking for work	
3	Temporary employment /'piece' jobs	
4	Permanent employment	
5	Self-employed	

6. Are you currently receiving a social grant (e.g. disability grant)?

		Response (X)
1	No	
2	Yes Please specify :	

7. What is your total household income per month?

		Response (X)
1	None	
2	R1 – R500	
3	R501 – R1000	
4	R1001 – R3000	
5	R3001 – R5000	
6	More than R5000	

8. What amount of money is spent on food for your household every month?

		Response (X)
1	R1 – R500	
2	R501 – R1000	
3	R1001 – R3000	
4	More than R3000	

9. % household income spent on food (*to be calculated & completed later*).

**SECTION B – Information on clinical signs & symptoms, dietary information and nutrition care received at PHC**

Completed by trained research assistant. Information obtained from interview.

10. For how long have you been receiving ARVs?

	Years		Months
--	-------	--	--------

11. For how long have you been receiving ARVs from this clinic?

	Years		Months
--	-------	--	--------

12. How often do you come to this clinic to receive your medication?

		Response (X)
1	Once every month	
2	Other (please specify) :	

13. Are you currently experiencing any of the following signs/symptoms/conditions?

		Response (X)
1	Loss of appetite/Poor appetite	
2	Taste changes	
3	Diarrhoea	
4	Nausea	
5	Vomiting	
6	Mouth sores/Oral or oesophageal thrush	
7	Constipation	
8	Missing teeth/Painful teeth	
9	Other (please specify)	

14. When you come to this clinic, are you weighed at each visit?

		Response (X)
1	Yes	
2	No	
3	Sometimes	

15. Has your height ever been measured at this clinic?

		Response (X)
1	Yes	
2	No	

16. Have you ever been counselled at this clinic on whether you are a healthy weight or not?

		Response (X)
1	Yes	
2	No	

17. Have you ever received nutrition counselling from any of the clinic staff members?

		Response (X)
1	Yes	
2	No	

If patient answered YES, please complete Question 17.1–17.3, otherwise cont. to Question 18.

17.1 How recently did you receive nutrition counselling?

		Response (X)
1	Within the last 3 months	
2	Within the last 6 months	
3	Within the last year	
4	Within the last two years	
5	I can't remember	



17.2 Approximately how long did the nutrition counselling take?

		Response (X)
1	Less than 2 minutes	
2	Between 2–5 minutes	
3	Between 5–10 minutes	
4	More than 10 minutes	
5	Other (please specify)	

17.3 What information did you receive during the nutrition counselling session? Please specify.

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18. How often do you eat fruit?

		Response (X)
1	Every day	
2	2–3 times a week	
3	Once a month	
4	Never	

19. How often do you eat vegetables?

		Response (X)
1	Every day	
2	2–3 times a week	
3	Once a month	
4	Never	

20. Does everyone in your household always have enough safe and healthy food to eat?

		Response (X)
1	Yes	
2	No	

21. Where do you access your drinking water from?

		Response (X)
1	Tap in home	
2	Tap nearby, but not in home or yard	
3	Other source (please specify)	

22. Have you ever received nutrition supplements (eg. porridge, energy drink) from this clinic?

		Response (X)
1	Yes	
2	No	

23. Are you currently receiving any nutrition supplements from the clinic?

		Response (X)
1	Yes	
2	No	

If you answered YES, please continue to answer Question 23.1–23.5, otherwise continue to Question 24.

23.1 What do you think is the main reason why you are receiving these nutrition supplements?

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23.2 For how long have you been receiving nutrition supplements?

	Years		Months
--	-------	--	--------

23.3 For how long do you think you will receive the nutrition supplements?

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---

23.4 Which of the following did the clinic staff explain to you when issuing your nutrition supplements?

		Response (circle)	
1	How to mix your nutrition supplements?	Yes	No
2	How often to take the nutrition supplements?	Yes	No

23.5 Do you think it is important to eat healthily when you are receiving nutrition supplements?

		Response (X)
1	Agree strongly	
2	Agree	
3	Disagree	
4	Disagree strongly	

24. Do you think nutrition supplements are better than food?

		Response (X)
1	Yes	
2	No	

If patient answered YES, please complete Question 24.1, otherwise cont. to Quest. 25

24.1 Why do you think nutrition supplements are better than food?

		Response (X)
1	Nutrition supplements are 'super-foods' with more goodness than food	
2	Nutrition supplements have more energy and protein than food	
3	Nutrition supplements have more vitamins and minerals than food	
4	I gain weight better with nutrition supplements	

5	I like nutrition supplements better than food	
6	Nutrition supplements are easier and safer to make than food	
8	Other (please specify)	

25. How would you rate the quality of nutrition care and service you receive at this clinic?

		Response (X)
1	Excellent	
2	Good	
3	Fair	
4	Poor	

26. What do you think can be done to improve the nutrition care and service at this clinic?

---

Thank you for your participation

### SECTION C – Medical Information

Completed by researcher. Information obtained from file review.

27. Current ARV drug regimen

		Response (X)
1	TDF + FTC + EFV	
2	FDC	
3	TDF + 3TC + EFV	
4	Other (please specify) :	

28. When was ART initiated?

Length of time on ARVs

	Year		Month
	Years		Months

29. Date and value of most recent CD4 count

Date: \_\_\_\_\_ CD4 count: \_\_\_\_\_ N/A from file

30. When was most recent CD4 count taken?

		Response (X)
1	≤ 6mths ago	
2	≤ 12mths ago	
3	≥ 1yr ago	
4	N/A CD4 count not available from file	

31. Co-morbidities currently receiving treatment for

		Response (X)
1	TB	
2	HPT	
3	DM	
4	Other (please specify)	

32. Recent weight change in previous 3 months

		Response (X)
1	Unchanged	
2	Loss (-)            kg	
3	Gain (+)            kg	
4	Unknown – not available from file	

33. Has patient lost >5% body weight in previous month?

		Response (X)
1	Yes	
2	No	
3	Unknown – not available from file	

### SECTION D – Recording of anthropometric information by clinic staff

Completed by researcher. Information obtained from file review

	<b>RESPONSE</b>
34. Weight from last visit recorded in file?	1 Yes      2 No
35. Weight for last three consecutive visits recorded in file?	1 Yes      2 No
36. Height ever been recorded in file?	1 Yes      2 No
37. BMI (body mass index) calculated, and recorded in file?	1 Yes      2 No

### SECTION E – Anthropometry

Completed by researcher. Information obtained from physical assessment.

		Measurement
38.	<b>Weight</b> (kg)	
39.	<b>Height</b> (m)	
40.	*BMI (can be calculated later from above info.)	

#### 41. BMI classification

			Response (X)
1	BMI < 16	Severe malnutrition	
2	BMI 16–18.5	Moderate malnutrition	
3	BMI 18.6–19.9	Marginal malnutrition	
4	BMI 20–24.9	Within normal range	
5	BMI 25–30	Overweight	
6	BMI >30	Obese	

		Measurement
42.	<b>Waist circumference (WC)</b> (cm)	

43. Waist circumference classification

		Response (X)
1	Male with WC < 94 cm      Not at increased risk CVD	
2	Male with WC btw. 94–102cm      Increased risk CVD	
3	Male with WC > 102cm      Substantially increased risk	

		Response (X)
1	Female with WC < 80 cm      Not at increased risk CVD	
2	Female with WC btw. 80–88cm      Increased risk CVD	
3	Female with WC > 88cm      Substantially increased risk	

		Measurement
44.	<b>Mid-upper arm circumference (MUAC) (cm)</b>	

45. MUAC classification

		Response (X)
1	MUAC > 22 cm      Not malnourished	
2	MUAC 18–22cm      Moderately malnourished	
3	MUAC < 16cm - oedema or 16-18.5 cm + oedema      Severely malnourished	

### Addendum 3: Self-administered questionnaire to nursing professionals

AN EVALUATION OF NUTRITION CARE TO ADULT PATIENTS ON ANTIRETROVIRAL THERAPY (ART)  
ATTENDING CLINICS IN MBOMBELA NORTH, MPUMALANGA

Date									
	d	d	m	m	y	y	y	y	

#### SELF-ADMINISTERED QUESTIONNAIRE (Nursing Professionals)

<b>CLINIC :</b>	Facility Code	
<b>NAME OF PARTICIPANT :</b>	Participant Code	

Thank you for agreeing to participate in this research study.

#### Instructions:

- This questionnaire must be completed after reading cover page and signing informed consent form.
- Please complete the questionnaire honestly (without help from others). Remember your identity is kept completely confidential.
- Answer all the questions below by making a cross (X) in the relevant box/es, by circling yes/no, or writing your answer on the lines provided.
- Do not leave any questions unanswered unless instructed to skip to another question.
- If you are unsure of the meaning of any question, you may ask the researcher for assistance.

#### SECTION A: DEMOGRAPHIC INFORMATION

1. Please select your health profession

	Response (X)
1	Enrolled nursing assistant
2	Enrolled nurse
3	Professional nurse
4	Chief professional nurse
5	Other (please specify)



2. Please select your gender

		Response (X)
1	Male	
2	Female	

3. How old are you?                      Years

4. Please indicate your highest level of education obtained

		Response (X)
1	Grade 10 (Standard 8)	
2	Grade 12 (Matric)	
3	College degree/diploma	
4	University degree	
5	Other (please specify)	

5. For how long have you been working at this clinic?

Years	<input type="text"/>	Months	<input type="text"/>
-------	----------------------	--------	----------------------

**SECTION B**

6. How often do you consult with adult patients who are on antiretroviral therapy (ART)?

		Response (X)
1	Every day	
2	A few days a week	
3	A few days a month	
4	Never	

7. Are you an NIMARTS trained nurse?

		Response (X)
1	Yes	
2	No	

8. Have you received any additional training or attended courses related to the nutritional care of patients on ART?

		Response (X)
1	No	
2	Yes (please specify)	

9. When an HIV positive adult comes to the clinic to collect their monthly ART, what nutrition-related services are offered at this clinic?

		Response (X)
1	I am not sure what nutrition-related services are offered	
2	Weight is taken	
3	Height is measured	
4	Body Mass Index (BMI) is calculated	
5	Mid-upper arm circumference (MUAC) is taken	
6	Adult nutrition counselling	
7	Adult nutrition supplementation	

10. For each of the following services that are offered, please mark if they are  
 - done for every patient?  
 - done every month?

		Response (please circle)			
		For every patient		Every month	
1	Weight	Yes	No	Yes	No
2	Height	Yes	No	Yes	No
3	Body Mass Index (BMI) is calculated	Yes	No	Yes	No
4	Mid-upper arm circumference (MUAC) taken	Yes	No	Yes	No
5	Adult nutrition counselling	Yes	No	Yes	No
6	Adult nutrition supplementation	Yes	No	Yes	No

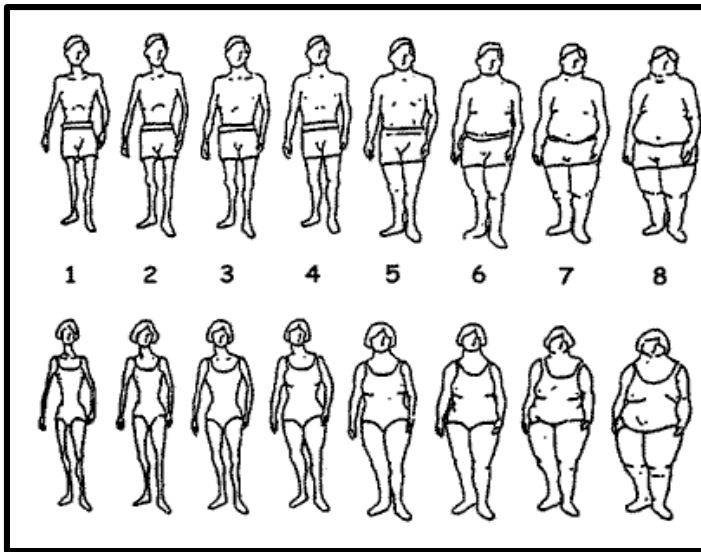
11. Are you aware of a nutrition supplementation programme?

		Response (X)
1	Yes	
2	No	

12. Are you aware of a national nutrition supplementation protocol?

		Response (X)
1	Yes	
2	No	

13. Please take some time to look at the 8 pictures below closely. (Stunkard ©)



13.1 Which picture shows a 'healthy' weight?  
 (Please choose only one answer)

Response (X)	
1	
2	
3	
4	
5	
6	
7	
8	

13.2. Which picture shows a 'healthy' weight for a person with HIV/AIDS on ART?  
 (Please choose only one answer)

Response (X)	
1	
2	
3	
4	
5	
6	
7	
8	

**SECTION C**

14. Indicate the BMI of a patient with a weight of 58 kg and a height of 1.7m.

		Response (X)
1	BMI = 20	
2	BMI = 22	
3	BMI = 24	
4	I don't know what BMI is	
5	I don't know how to calculate BMI	
6	I know how to calculate BMI but do not have a BMI chart/wheel/calculator available to work it out	

15. Please indicate whether the following statements are True or False

		Response (please circle)
1	BMI cannot be used if a woman is pregnant	True or False
2	BMI cannot be used if a patient is in a wheelchair	True or False
3	BMI cannot be used in a patient who has HIV/AIDS	True or False

16. Have you ever used an adult mid-upper arm circumference (MUAC) tape?

		Response (X)
1	Yes	
2	No	

17. Do you feel confident using an adult mid-upper arm circumference (MUAC) tape?

		Response (X)
1	Yes	
2	No	

18. What would the reading on a MUAC tape be for an adult who is not malnourished?

		Response (X)
1	More than _____ cm	
2	I don't know	

**SECTION D**

19. What nutrition supplements are usually available to issue to adult patients?

		Response (X)
1	UNITY instant porridge	
2	Philani	
3	NUTRI-Mil adult (blue)	
4	Excel energy drink	
5	Other (please specify)	

20. Does this facility currently have nutrition supplements in stock?

		Response (X)
1	Yes	
2	No	
3	I don't know	

21. What are the entry criteria to receive nutrition supplements?

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22. What is the aim of the nutrition supplementation programme?

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23. Which of the following nutrition-related guidelines are you familiar with?  
(Please mark all the answers that apply)

		Response (X)
1	Nutrition Assessment Counselling and Support (NACS)	
2	The SA Supplementary Feeding Guidelines for at-risk and malnourished children and adults	
3	SA National Guidelines on Nutrition for People Living with HIV/Aids	
4	None of the above	
5	Other (please specify)	

24. Are the nutrition supplements given to patients recorded?

		Response (X)
1	Yes	
2	No	
3	I don't know	

25. Does this clinic have a malnutrition register?

		Response (X)
1	Yes	
2	No	
3	I don't know	

If you answered YES to Question 24 please complete Question 25.1, otherwise continue to Question 26.

25.1 Where are the nutrition supplements issued, recorded?  
(Please choose all the answers that apply)

		Response (X)
1	In the patient's file	
2	In a malnutrition register	
3	On a clinic statistics form	
4	I don't know	
5	Other (please specify)	

26. How do you decide how many nutrition supplements to issue to a patient?

		Response (X)
1	Depending on my clinical judgement	
2	Depending on the patient's BMI and how many they qualify for according to the national supplementation protocol	
3	I give the standard 3 porridges a month to patients who look malnourished	
4	I give more or less depending on how much stock is available	
5	Other (please specify)	

27. How do you decide which nutrition supplements to issue to a patient?

		Response (X)
1	Depending on my clinical judgement	
2	Depending on the patient's BMI and how many they qualify for according to the national supplementation protocol	
3	Depending on which supplements are available	
4	Depending on which supplements the patient likes	
5	Other (please specify)	

28. Do you think nutritional supplements are better than food?

		Response (X)
1	Yes	
2	No	

If you answered YES above, please answer Question 28.1, otherwise continue to Question 29.

28.1 Why do you think nutritional supplements are better than food?

		Response (X)
1	Supplements are 'super-foods' with more goodness than food	
2	Supplements have more energy and protein than food	
3	Supplements have more vitamins and minerals than food	
4	Patients gain weight better with supplements	
5	Patients like supplements better than food	
6	Supplements are easier and safer to make than food	
7	Supplements are easier to issue than to give nutrition counselling on eating healthily	
8	Other (please specify)	

29. Do you counsel patients on healthy eating?

		Response (X)
1	Yes – all patients	
2	Yes – some patients	
3	No	

If you answered YES above please, answer Questions 29.1 – 29.4, leave out Question 29.5, and continue with Question 30.

If you answered NO, please continue to Question 29.5.

29.1 How much time do you spend on healthy eating counselling?

\_\_\_\_\_ Minutes per patient

29.2 What guides your healthy eating counselling?

		Response (X)
1	The South African Food-Based Dietary Guidelines	
2	My general knowledge	
3	Other guideline/training (please specify)	

29.3 If you use the SA Food-Based Dietary Guidelines for counselling – please write down two of the food-based dietary guidelines.

\_\_\_\_\_

\_\_\_\_\_

29.4 Do you have counselling cards with key educational messages in your facility, to use for nutrition counselling?

		Response (X)
1	Yes	
2	No	
3	I don't know	



29.5 If patients are not counselled on healthy eating, please indicate why.

		Response (X)
1	Not all patients need healthy eating counselling	
2	There are too few nursing professionals for large number of patients on ART to include dietary counselling	
3	Other (please specify)	

30. Do you feel confident to give nutrition counselling to HIV-positive adult patients?

		Response (X)
1	Yes	
2	No	

31. Do you think it is important for patients to eat a healthy diet when they are receiving nutrition supplements?

		Response (X)
1	Yes	
2	No	

32. What are the exit criteria for patients to stop receiving nutrition supplementation?

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33. How would you rate the quality of nutrition care patients receive at this clinic?

		Response (X)
1	Excellent	
2	Good	
3	Fair	
4	Poor	

34. What can be done to improve the nutrition care patients receive at this clinic?

		Response (X)
1	There is nothing needed to improve the care	
2	Purchase more equipment such as scales	
3	Employ more nursing professionals at clinic	
4	Improve training on the nutrition care to adult patients with HIV for nursing professionals	
5	Create posts at PHCs for a nutrition expert such as a nutritionist/dietitian	
6	Other (please specify below)	

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Thank you for your participation.

#### Addendum 4: Permission to use Stunkard figures

<b>Subject:</b>	Re: Permission to use Stunkard scale
<b>To:</b>	Jane Webster <janewebster@webmail.co.za>
<b>From:</b>	Kelly Allison <kca@mail.med.upenn.edu>
<b>Date:</b>	Mon, 13 Jan 2014 05:17:34 +0200

Dear Jane,

Dr. Stunkard is fully retired now, and he is no longer checking his email. I can provide you with permission to use the figure rating scales, though, in his stead. I give permission to use Dr. Stunkard's silhouettes (copyrighted) subject to clear attribution of authorship.

Reprinted from Stunkard AJ, Sorenson T, Schulsinger F. Use of the Danish Adoption Register for the study of obesity and thinness. IN: SS Kety, LP Rowland, RL Sidman, SW Matthysse (Eds.) The Genetics of Neurological and Psychiatric Disorders. New York: Raven Press, 1983, pp. 115-120.

Kelly C. Allison, Ph.D. for  
Albert Stunkard, M.D.  
University of Pennsylvania  
Center for Weight & Eating Disorders

Kelly C. Allison, Ph.D.  
Assistant Professor of Psychology in Psychiatry  
Perelman School of Medicine at the University of Pennsylvania  
Center for Weight and Eating Disorders (Suite 3027) and  
Stunkard Weight Management Program (Mezzanine)  
3535 Market Street  
Philadelphia, PA 19104-3309  
ph. 215-898-2823  
[kca@mail.med.upenn.edu](mailto:kca@mail.med.upenn.edu)

### Addendum 5: Assessment tool for primary healthcare (PHC) facilities

AN EVALUATION OF NUTRITION CARE TO ADULT PATIENTS ON ANTIRETROVIRAL THERAPY (ART)  
ATTENDING CLINICS IN MBOMBELA NORTH, MPUMALANGA

#### ASSESSMENT TOOL FOR PRIMARY HEALTHCARE FACILITIES

Date									
	d	d	m	m	y	y	y	y	

Facility Code							
---------------	--	--	--	--	--	--	--

INFORMATION FROM VISUAL CONFIRMATION AT CLINIC	RESPONSE
<b>A. ANTHROPOMETRIC EQUIPMENT AND MATERIAL</b> <i>(Weighing scale used on day of data collection by staff to weigh patients on ART to be targeted as 'scale')</i>	
A1. Weighing scale for adults available?	1 Yes      2 No
A2. Weighing scale 'functional'? (Turns on/needle moves/not broken.)	1 Yes      2 No
A3. Type of scale?	1 Bathroom   2 Electronic 3 Other _____
A4. Spare batteries available (if applicable)	1 Yes      2 No      3 N/A
A5. Tare (zero) function?	1 Yes      2 No
A6. Scale measures to nearest _____g	
A7. Is the needle/digital reading on zero?	1 Yes      2 No
A8. Reading of scale with known weight of 5kg placed on scale	±
A9. What is the maximum weight this scale can hold? _____kg?	
A10. Number of functional scales available at facility to weigh adults?	out of
A11. Adult MUAC tapes available	1 Yes      2 No

A12. BMI chart/wheel or calculator available	1 Yes	2 No
A13. Stadiometer available	1 Yes	2 No
A14. Evidence of a maintenance plan to service equipment?	1 Yes	2 No

*Additional comments*

**B. FOOD COMMODITIES**

B1	Products	PHC usually receives	Stock available		Out of stock during the last month		Within expiry date 3 randomly selected samples				Too little stock	Adequate stock	Too much stock
			Y	N	Y	N	Y (all)	Y (most)	N (most expired)	N (all expired)	Y/N	Y/N	Y/N
1	UNITY instant porridge		Y	N	Y	N							
2	Philani (adult)		Y	N	Y	N							
3	NUTRI-MIL		Y	N	Y	N							
4	Excel		Y	N	Y	N							
5	Immunut		Y	N	Y	N							
6	Other Specify:		Y	N	Y	N							
7	Other Specify:												

*Additional Comments*

B2. Storage conditions and evidence of stock rotation/control and ordering system		
-Stored off the ground	1 Yes	2 No
-Protected from direct sunlight	1 Yes	2 No
-Temperature controlled	1 Yes	2 No

-Pest control system. If yes specify: _____	1 Yes	2 No
-Evidence of stock rotation (FIFO)	1 Yes	2 No
-Evidence of stock control (eg. stock charts / sheets)	1 Yes	2 No
-Evidence of supplementation ordering system	1 Yes	2 No
<i>Comments</i>		
<b>C. AVAILABILITY OF DOCUMENTATION/POLICIES/MATERIALS/TOOLS</b>		
C1. Copy of Protocol “The South African Supplementary Feeding Guidelines for At-Risk and Malnourished Children and Adults”	1 Yes	2 No
C2. Copy of “South African Food-Based Dietary Guidelines” or “South African Food Guide”	1 Yes	2 No
C3. Healthy eating poster and/or pamphlet available for patients to see/receive	1 Yes	2 No
C4. Counselling cards with key educational nutrition messages	1 Yes	2 No
C5. Nutrition supplementation register	1 Yes	2 No
<i>Comments</i>		

## Addendum 6: Ethics Approval from Stellenbosch University Health Research Ethics Committee



UNIVERSITEIT-STELLENBOSCH-UNIVERSITY  
o&u. keho&svnuu&ant - o&au knowledge partner

### Approval Notice New Application

20-May-2014  
Schiever, Jane JF

**Ethics Reference #:** S14/04/076

**Title:** An evaluation of nutrition care to adult patients on antiretroviral therapy (ART) attending primary healthcare facilities in Mbombela North, Mpumalanga.

Dear Mrs Jane Schiever,

The New Application received on 03-Apr-2014, was reviewed by members of Health Research Ethics Committee 1 via Minimal Risk Review procedures on 14-May-2014 and was approved.

Please note the following information about your approved research protocol:

Protocol Approval Period: 14-May-2014 -14-May-2015

Please remember to use your protocol number (S14/04/076) on any documents or correspondence with the HREC concerning your research protocol.

Please note that the HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

#### After Ethical Review:

Please note a template of the progress report is obtainable on [www.sun.ac.za/rds](http://www.sun.ac.za/rds) and should be submitted to the Committee before the year has expired. The Committee will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.

Translation of the consent document to the language applicable to the study participants should be submitted.

Federal Wide Assurance Number: 00001372

Institutional Review Board (IRB) Number: IRB0005239

The Health Research Ethics Committee complies with the SA National Health Act No.61 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 Part 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes 2004 (Department of Health).

#### **Provincial and City of Cape Town Approval**

Please note that for research at a primary or secondary healthcare facility permission must still be obtained from the relevant authorities (Western Cape Department of Health and/or City Health) to conduct the research as stated in the protocol. Contact persons are Ms Claudette Abrahams at Western Cape Department of Health ([healthres@pgwv.gov.za](mailto:healthres@pgwv.gov.za) Tel: +27 21 483 9907) and Dr Helene Visser at City Health ([Helene.Visser@capetown.gov.za](mailto:Helene.Visser@capetown.gov.za) Tel: +27 21 400 3981). Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.

For standard HREC forms and documents please visit: [www.sun.ac.za/rds](http://www.sun.ac.za/rds)

If you have any questions or need further assistance, please contact the HREC office at 0219389657.


#### **Included Documents:**

CV Schiever

Investigator declaration JS

Nutrition Assessment for patients

Assessment tool  
CV Visser  
Supervisor declaration Visser  
Application form  
Informed consent  
Protocol  
Questionnaire  
CV Van der Merwe  
Cover letter  
Informed consent  
Supervisor declaration Van der Merwe  
Synopsis  
HREC Checklist

Sincerely,   
Franklin Weber  
HREC Coordinator  
Health Research Ethics Committee 1

## Addendum 7: Ethics Approval from Mpumalanga Department of Health Research Ethics Committee

### MPUMALANGA PROVINCIAL GOVERNMENT

Building No.3  
No. 7 Government Boulevard  
Riverside Park Extension 2  
Nelspruit  
1200  
Republic of South Africa



Private Bag X 11285  
Nelspruit, 1200  
Tel: 013 766 3429  
int: +27 13 766 3429  
Fax: 013 766 3458  
int: +27 13 766 3458

### Department of Health

Litiko Letemphilo      Umnyango WezaMaphilo      Departement van Gesondheid

Enquiries: Themba Mulungo (013) 766 3511

03 June 2014

Mrs. Jane Schiever  
House 6 Union Farm  
Karino  
1203


Dear Mrs. Jane Schiever

**APPLICATION FOR RESEARCH & ETHICS APPROVAL: AN EVALUATION CARE TO ADULT PATIENTS ON ANTIRETROVIRAL THERAPY (ART) ATTENDING PRIMARY HEALTH FACILITIES IN MBOMBELA NORTH, MPUMALANGA**

The Provincial Research and Ethics Committee has approved your research proposal in the latest format that you sent.

Kindly ensure that you provide us with the soft and hard copies of the report once your research project has been completed.

Kind regards

  
DR. JOVEN ONGOLE  
CHAIRPESON: PHREC



2014/06/03  
DATE





## **Addendum 8: Informed consent form for patients (*English*)**

# **PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM FOR PATIENTS**

### **TITLE OF THE RESEARCH PROJECT:**

AN EVALUATION OF NUTRITION CARE TO ADULT PATIENTS ON ANTIRETROVIRAL THERAPY (ART) ATTENDING PRIMARY HEALTHCARE FACILITIES IN MBOMBELA NORTH, MPUMALANGA

### **REFERENCE NUMBER:**

**PRINCIPAL INVESTIGATOR:** Mrs Jane Schiever (RD) SA

**ADDRESS:** Box 209 Karino 1204

**CONTACT NUMBER:** 083 2468 993

You are being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the study staff any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the **Health Research Ethics Committee at Stellenbosch University** and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

### **What is this research study all about?**

- This study is looking at the nutrition care patients like you on antiretroviral therapy receive at the clinic you attend.
- The study is happening at all the clinics in the Mbombela North area.
- We are randomly choosing people who are at the clinic to get their ARV's to speak to, and learn more about you and the care you receive at the clinic.
- We would also like to take some measurements, which will not be painful, like taking your weight and height and measuring with a measuring tape around your waist and upper arm.
- We would also like to look at the notes in your file. This information will be used only in the study and not be told to anyone else. We will give you a code and this information will match the code not your name. Your confidentiality will be protected.

**Why have you been invited to participate?**

- You are someone who attends the targeted clinic and is on ART. It is patients like you that the study wants to get information about.

**What will your responsibilities be?**

- You will be interviewed and asked to answer some questions about your health, your eating and the care you have receive at this clinic. You will also have measurements taken (weight, height, mid-upper arm circumference, waist circumference).

**Will you benefit from taking part in this research?**

- The information we get from this study can hopefully help future patients benefit and get better nutrition care at clinics.

**Are there in risks involved in your taking part in this research?**

- There are no risks in this study. This study does not include giving any medication.

**If you do not agree to take part, what alternatives do you have?**

- If you would not like to participate in the study, you can continue to wait at the clinic to receive your treatment. It is your choice to participate or not to.

**Who will have access to your medical records?**

- All information collected as part of this study will be treated as confidential. The information will be protected and no one not directly involved with the study will have access to the information. Your name will not be recorded and matched to your measurements, your medical records, or your interview
- Findings and recommendations from this study will be written in a report to the Mpumalanga Department of Health and will be shared with other people who want to improve the health of people on ART in Mpumalanga and South Africa.

**Will you be paid to take part in this study and are there any costs involved?**

No, you will not be paid to take part in the study but there will be no costs involved for you, if you do take part.

**Is there anything else that you should know or do?**

- You can contact the Health Research Ethics Committee at 021-938 9207 if you have any concerns or complaints that have not been adequately addressed by your study investigator.
- You can contact the researcher Jane Schiever on 083 2468 993 if you would like any further information regarding the study.

## Declaration by participant

By signing below, I ..... agree to take part in a research study entitled AN EVALUATION OF NUTRITION CARE TO ADULT PATIENTS ON ANTIRETROVIRAL THERAPY (ART) ATTENDING PRIMARY HEALTHCARE FACILITIES IN MBOMBELA NORTH, MPUMALANGA

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.

Signed at (*place*) ..... on (*date*) ..... 2014.

**Signature of participant**

**Signature of witness**

## Declaration by investigator

I (*name*) ..... declare that:

- I explained the information in this document to .....
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did not use an interpreter. The conversation was conducted in siSwati/English

Signed at (*place*) ..... on (*date*) ..... 2014.

**Signature of investigator**

**Signature of witness**

**Addendum 9: Informed consent form for patients (siSwati)**

**LIPHEPHA LEMININGWANE LALOCWANIKWAKO  
NELIPHEPHA SIVUMELWANO SETIGULANE.**

**SIHLOKO SELUCWANINGO:**

KUHLOLWA KWENDLELA LETINAKEKELWA NGAYO NGETEKUDLA TIGULANE LETIDZALA LETIDLA EMAPHILISI ENGCULAZI LETIHAMBELA IMITFOLAMPHILO YASE MBOMBELA NORTH, MPUMALANGA.

**I-REFERENCE NUMBER: S14/04/076**

**UMCWANINGI LOMKHULU:** Mrs Jane Schiever (RD) SA

**LIKHELI:** Box 209 Karino 1204

**INOMBOLO YEKUCHUMANA:** 083 2468 993

Uyamenywa kutsi ungenele lolucwaningo. Uyacelwa kutsi utsatse sikhatsi sakho kutsi ufundze lomningwane loniketwe wona, lochaza kabanti ngalolucwaningo. Uyacelwa kutsi ubute bacwaningi imibuto lapho ungavisisi khona. Kubalulekile kutsi unetiseke ngekuvisisa kahle kutsi lolucwaningo lufakani futsi kutsi wena ungatibandzakanya njani. Futsi ,kumele wati kutsi awuka phoceleki kutsi ubeyincenye yalolucwaningo futsi uvumelekile kwala kubayincenye yalolucwaningo. Kungangeneli kwakho angeke kube nemiphumela lemibi kuwe. Uvumelekile kuyekela kubayincenye yalolucwaningo nome kunini ,nome bovumile kubayincenye.

Lolucwaningo luniketwe yimvumo yi-**Health Research Ethics Committee ye- nyuvesi yase-Stellenbosch** futsi litochutjwa ngendlela nemigomo ye- international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

**Lungani lolucwaningo ?**

- Lolucwaningo lubuke kunakekelwa ngekwetekudla kwetigulane letinjengawe letidla emaphilisi engculaza letivakashela umfolamphilo lohambela wona.
- Lolucwaningo lentenka emitfolamphilo yase- Mbombela North .
- Sito khetsa ngalokungakahleleki bantfu labete emfolamphilo kutotfolo emaphilisi engculaza sikhulume nabo, sifundze kabanti ngawe nangekunakekelwa kwakho emfolamphilo.
- Sitawucela kukumeda, njengekumeda Sisindvo sakho semtimba kanye neBudze bakho, sitawusebentisa i-Tape yekumeda lukhalo nasemkhonweni wakho, konkhe lesitokwenta umesikumeda ngeke kube buhlungu nome kube yingoti emphilweni yakho.
- Sitawucela kubuka emanotsi kulifayela lakho. Lomningwane utawusetjentiswa kulolucwaningo futsi ngete wanketwa muntfu. Ngete safaka ligama lakho kulomningwane lesiwutfolako sitofaka I –code .

### **Kungani kumele ungenele lolucwaningo?**

- Ungumunftu lovakashela lomtfolamphilo lesiwkhetsile futsi lonatsa emaphilisi engculaza. Lolucwaningo ludzinga inmningwane ngetigulane letinje ngawe.

### **Kumele wenteni?**

- Utawucelwa uphendvule imibuto mayelana nesimo semphilo yakho, ngedlela udla ngayo nangedlela unakekelwa ngaya kulomtfolampilo. Utawumedwa (sisindvo, budze, umkhono kanye nelukhalo) .

### **Ingabe Kukhona longakuzuza kulolucwaningo?**

- Lomningwane lotawutfolwa kulelicwaningo ungasita tigulwane kutsi tizuze kulo futsi tikhone kutfola tinsita letincono ngekunakekelwa ngetekudla emitfola mphilo.

### **Bukhona yini bungoti nawungenelala lolucwaningo?**

- Abukho bungoti kulolucwaningo. Akunikwa mitsi kulolucwaningo.

### **Uma ungavumi kungenelela , yini longakwenta?**

- Uma ungeke utsandze kungenelela kulolucwaningo, ungachubeka umele kutsatsa emaphilisi. Futsi kusi ncumo sakhokho kutsi ungenele noma ungangeneleli.

### **Ngubani lakenemvumo yekuvula lifayela lakho?**

- Wonke Umningwane lotawutfolwa kulolucwaningo utaba yimfihlo. Lomningwane utawuvikelwa futsi ngete watfolwa nome ngabe ngubani longakaze sasebentisana naye ekuchubeni lolucwaningo. Ngete sabhala ligama lakho kutsi lihambisane nekumedwa kwakho, lifayela lakho nome timphendvulo losinike tona ngesikhatsi sikuhloma ngemibuto.
- Kutawubhalwa imiphumela yalolucwaningo iniketwe litiko letempilo lasempumalanga futsi lemiphumela itawu niketwa bantfu kuzebasitakale bente imphilo yalabadla emaphilisi engculaza ibencono, empumalanga Kanye nase ningizimu Africa.

### **Utawukhokhelwa na kutsi ungenele lolucwaningo futsi tikhona na tindleko letidzingekeko?**

Cha , ngete wakhokhelwa kungenelela kulolucwaningo ,futsi akukho tindleko lekumele utikhokhe nawutawu ngenela.

### **Kukhona yini lekunye lokumele ukwati nome ukwente?**

- Ungachumana neHealth Research Ethics Committee ku 021-938 9207 nangabe kunemibuto longakaphenduleki kahle ngumcwaningi.
- Ungachumana ne mcwaningi lomkhulu Jane Schiever ku 083 2468 993 nawudzinga umningwane lohambisana nalolu cwningo .

### **Sifungo semgcwaningwa**

Ngeku sayinda ngaphansi , mine ..... ngiyavuma kungenelela kulolucwaningo lelinesihloko lesitsi KUHLOLWA KWENDLELA LETINAKEKELWA NGAYO NGETEKUDLA TIGULANE LETIDZALA LETIDLA EMAPHILISI ENGCULAZI LETIHAMBELA IMITFOLAPMPHILO YESE MBOMBELA NORTH, E MPUMALANGA

Ngiyafunga kutsi:

- Ngifundzile nobe bangifundzele lomningwane futsi lencwadzi sivumelwano ibhalwe ngelulwimi lengiluvisisako.
- Nginiketiwe litfuba lekubuta imibuto futsi ngaphendvuleka kahle.
- Ngiyavisisa kutsi kungenela kulolucwaningo kungekufuna kwami kantsi futsi angikaphocelelwa kutsi ngingenelele.
- Ngingakhetsa kuyekela kuba incenye yalolucwaningo noma nini futsi ngete ngajeziswa.

Isayindwe e(*indzawo*)..... ngeti (*lusuku*) ..... 2014.

**Umsayindo we Mcwaningwa**

**umsayindo wafakazi**

**Sifungo semcwaningi**

mine (*ligama*) ..... ngifunga kutsi:

- Ngichazile umningwane lolapha kuleliphepha ku .....
- Ngimcugcugutele kutsi abute imibuto futsi ngatsatsa nesikhatsi lesanele kutsi ngiphendule.
- Ngenetisekile kutsi uyavisisa konkhe lokuphatselane nalolucwaningo, njengoba kushilo ngetulu.
- Angika sebentisi umhumushi , lengcoco beyentiwa ngesiswati nome ngesingisi.

Isayindwe e (*indzawo*) ..... ngeti (*lusuku*) ..... 2014.

**Umsayindo wemncwaningi**

**umsayindo wafakazi**

**Sifungo semcwaningwa**

Ngeku sayinda ngaphansi , mine ..... ngiyavuma kungenelela kulolucwaningo lelinesihloko lesitsi KUHLOLWA KWENDLELA LETINAKEKELWA NGAYO NGETEKUDLA

TIGULANE LETIDZALA LETIDLA EMAPHILISI ENGCULAZI LETIHAMBELA IMITFOLAPMPHILO YESE  
MBOMBELA NORTH, E MPUMALANGA

Ngiyafunga kutsi:

- Ngifundzile nobe bangifundzele lomningwane futsi lencwadzi sivumelwano ibhalwe ngelulwimi lengiluvisisako.
- Nginiketiwe litfuba lekubuta imibuto futsi ngaphendvuleka kahle.
- Ngiyavisisa kutsi kungenela kulolucwaningo kungekufuna kwami kantsi futsi angikaphocelwa kutsi ngingenelele.
- Ngingakhetsa kuyekela kuba incenye yalolucwaningo noma nini futsi ngete ngajeziswa.

Isayindwe e(*indzawo*)..... ngeti (*lusuku*) ..... 2014.

**Umsayindo we Mcwaningwa**

**umsayindo wafakazi**

**Sifungo semcwaningi**

mine (*ligama*) ..... ngifunga kutsi:

- Ngichazile umningwane lolapha kuleliphepha ku .....
- Ngimcugcugcutele kutsi abute imibuto futsi ngatsatsa nesikhatsi lesanele kutsi ngiphendule.
- Ngenetisekile kutsi uyavisisa konkhe lokuphatselane nalolucwaningo, njengoba kushilo ngetulu.
- Angika sebentisi umhumushi , lengcoco beyentiwa ngesiswati nome ngesingisi.

Isayindwe e (*indzawo*) ..... ngeti (*lusuku*) ..... 2014.

**Umsayindo wemncwaningi**

**umsayindo wafakazi**

## **Addendum 10: Informed consent form for nursing professionals (*English*)**

# **PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM FOR NURSING PROFESSIONALS**

### **TITLE OF THE RESEARCH PROJECT:**

AN EVALUATION OF NUTRITION CARE TO ADULT PATIENTS ON ANTIRETROVIRAL THERAPY (ART) ATTENDING PRIMARY HEALTHCARE FACILITIES IN MBOMBELA NORTH, MPUMALANGA

**REFERENCE NUMBER: S14/04/076**

**PRINCIPAL INVESTIGATOR:** Mrs Jane Schiever (RD) SA

**ADDRESS:** Box 209 Karino 1204

**CONTACT NUMBER:** 083 2468 993

You are being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the study staff any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the **Health Research Ethics Committee at Stellenbosch University** and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

### **What is this research study all about?**

- This study will look at the nutrition care to HIV positive adults on ART
- The study will be conducted at all the clinics in the Mbombela North area
- All nursing professionals employed at the targeted clinics will be invited to participate and we would like get at least 80 nurses in total to participate
- Information will be collected via a self-administered questionnaire asking questions relating to various parts of nutrition-related care

### **Why have you been invited to participate?**

- Nursing professionals play a crucial role in the care patients attending primary healthcare facilities receive. We would like to find out what you think and what you experience.

### **What will your responsibilities be?**

- During our visit we will ask you to complete a self-administered questionnaire.



**Will you benefit from taking part in this research?**

- Information obtained from this research will be communicated to the Department of Health, hopefully resulting in nursing professionals being assisted to offer excellent nutrition care to patients on ART.
- **Are there any risks involved in your taking part in this research?**
- No, there are no risks involved in taking part in this study.

**If you do not agree to take part, what alternatives do you have?**

- If you would not like to participate in the study, you may continue with your work commitments. It is your choice to participate or not to.

**Who will have access to your questionnaire?**

- All information collected as part of this study will be treated as strictly confidential. The information will be protected and no one not directly involved with the study will have access to the information.
- Findings and recommendations from this study will be written in a report to the Mpumalanga Department of Health and will be shared with other people who want to improve the health of people on ART in Mpumalanga and South Africa.

**Will you be paid to take part in this study and are there any costs involved?**

- No, you will not be paid to take part in the study but there will be no cost to you, if you take part.

**Is there anything else that you should know or do?**

- You can contact the Health Research Ethics Committee at 021-938 9207 if you have any concerns or complaints that have not been adequately addressed by your study investigator.
- You can contact the researcher Jane Schiever on 083 2468 993 if you would like any further information regarding the study.

**Declaration by participant**

By signing below, I ..... agree to take part in a research study entitled AN EVALUATION OF NUTRITION CARE TO ADULT PATIENTS ON ANTIRETROVIRAL THERAPY (ART) ATTENDING PRIMARY HEALTHCARE FACILITIES IN MBOMBELA NORTH, MPUMALANGA

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.

Signed at (*place*) ..... on (*date*) ..... 2014.

**Signature of participant**

**Signature of witness**

**Declaration by investigator**

I (*name*) ..... declare that:

- I explained the information in this document to .....
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did not use an interpreter. The conversation was conducted in siSwati/English

Signed at (*place*) ..... on (*date*) ..... 2014.

**Signature of investigator**

**Signature of witness**

**Declaration by participant**

By signing below, I ..... agree to take part in a research study entitled AN EVALUATION OF NUTRITION CARE TO ADULT PATIENTS ON ANTIRETROVIRAL THERAPY (ART) ATTENDING PRIMARY HEALTHCARE FACILITIES IN MBOMBELA NORTH, MPUMALANGA

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.
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- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.

Signed at (*place*) ..... on (*date*) ..... 2014.

**Signature of participant**

**Signature of witness**

**Declaration by investigator**

I (*name*) ..... declare that:

- I explained the information in this document to .....
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did not use an interpreter. The conversation was conducted in English

Signed at (*place*) ..... on (*date*) ..... 2014.

**Signature of investigator**

**Signature of witness**