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The Role of Socio-demographics factors in Voluntary Counselling and Testing uptake in South-Africa.

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Abstract

The Role of Socio-Demographic Factors in Voluntary Counselling and Testing Uptake in South Africa

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Dissertation Submitted in Partial Fulfillment

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Abstract

Many researchers have alluded to the inequity in distribution of HIV preventive services in South Africa (SA). Other researchers have demonstrated that socio-demographic factors are main determinants of distribution of preventive services like voluntary counseling and testing (VCT) in SA. VCT is a primary HIV prevention tool through which infected persons enter the treatment, care, and support programs; identifying the impact of socio-demographic determinants (SDDs) on VCT uptake in SA could help direct VCT services to areas and individuals that need them most. The research question in this study examined what and how SDDs impact the uptake of VCT in SA using the integrated theory of health behavior change (ITHBC) as its theoretical framework. A quantitative study with a cross-sectional design using secondary data from a population-based survey by the John Hopkins Education and Health SA (2012) was conducted. In a multivariate logistic regression analysis, SDDs like province, settlement, employment, races, and age were statistically significant while marital status, education, and SES (socio-economic status) did not have statistically significant impact on VCT uptake. This study demonstrated that Black, unemployed men of low to medium SES between the ages of 15-49 years living in peri-urban and urban-informal areas of all provinces but especially Eastern Cape, Northern Cape, and North West provinces of SA had the lowest VCT uptake. This study advocates policies and programs to improve VCT distribution and accessibility in places and individuals with lowest uptake. Improved uptake will help reduce new HIV infection, HIV-associated morbidity, and mortality; as well as ensure equity, equality, and social justice in the distribution of HIV preventive services in SA.

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Dedication

This Dissertation is dedicated to my Father who though is bed-ridden with stroke and Hypertension has kept tract of my work in this Doctoral dissertation, encouraging me through it. My father-in-law who passed-away during my work on this dissertation, I know he would have been proud of me. My family, wife, and children have been of immense help and support; tolerating my times away during the weekends and through the nights.

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Abbreviation of Key Words

CICT- Client initiated Counseling and Testing

DOHSA- Department of Health, South Africa

HCP(s) - Health care providers

HCT -HIV counseling and testing

HSRC- Human Sciences Research Council

JHHESA- Johns Hopkins Health and Education in South Africa

JHU-CCP- Johns Hopkins University, Center for Communication Programs, Bloomberg

MSP- Multiple sexual partners

NCS- National HIV Communication Survey

PEP- Post-exposure prophylaxis

PICT- Provider initiated counseling and testing

PIS- Program Information Session

PLHIV- People living with HIV

PMTCT- Prevention of mother-to-child transmission of HIV

PSU- Primary sampling unit

STI- Sexually transmitted infection

SDD- Socio-Demographic Determinants

UNAIDS- Joint United Nations Program on HIV/AIDSSA

CUSES-Condom use self-efficacy scale

VMMC-Voluntary medical male circumcision

Chapter 1: Introduction to the Study

Introduction

Approximately 35 million people live with HIV all over the world and about 10% of these are under the age of 15 (UNAIDS, 2014; WHO, 2014). In 2013, 2.1 million people (240 people per hour) were newly infected, 1.5 million died of AIDS-related diseases and 12.9 million had access to Anti-retroviral therapy (UNAIDS, 2014; WHO, 2014). Sub-Saharan Africa is most affected, contributing 70% of people living with HIV (PLWHIV),73% of the world's AIDS death, and 91% of children infected with HIV(UNAID, 2014).

South Africa (SA) bears the worst HIV burden in Africa and the world; with a population of 52 million and a prevalence of about 5.7 million people living with HIV. The epidemic was largely driven by heterosexual transmission (National Planning Commission Report, 2011) and in the age group15-49 years, an estimated 16.6% of people are infected with HIV (National Planning Commission Report, 2011). The extent of the South African problem is clearer when one compares it with the United States with a population of over 320 million and despite this, its HIV prevalence is 1.2million (about 3.5%) in all age groups and incidence less than 50,000 persons per year (CDC, 2014). This raises questions about circumstances that impact HIV propagation in SA.

Socio-demographic determinants are probably the most significant factors that impact HIV propagation and strategies at a public health and community levels are needed to reduce the impact and spread of the disease in SA. Voluntary Counseling and Testing (VCT) is a useful, inexpensive and priceless tool that can improve contextualized HIV control considering that the prevalence of HIV in SA is not showing satisfactory improvement. Current HIV preventive efforts in South Africa are called to question, suggesting that more need be done in this area.

The latest national HIV survey in SA found decrease in condom use, earlier sexual activity in boys, increased HIV infection in women, and increase in HIV prevalence (HRSC, 2012). HIV prevalence varied from 15.2% in Western Cape Province to 39.1% in Kwa-Zulu Natal Province (HRSC, 2012) and on average, about 19% of adult between ages of 15- 49 years that live in South Africa are infected (UNAIDS, 2013). HIV prevention requires protecting oneself, protecting partners, and children through condom use, accessing treatment early, prevention of mother to child transmission, and most importantly, voluntary counseling and testing for all concerned (UNAIDS, 2014).

VCT is the voluntary testing of HIV after counseling. VCT is an important primary and secondary preventive tool against HIV (Department of Health, South Africa [DOHSA], 2009). It is an entry point for the prevention, treatment, and care of HIV-positive patients. This could also mark a significant time in the lives of discordant couples or individuals just confirmed positive. This study seeks to reduce risk of HIV propagation through improved VCT uptake, and an understanding of the socio-demographic determinant of VCT uptake could help improve VCT.

HIV risk taking behaviors are significant predictors of HIV infection (Peltzer, 2012) and VCT can mark the beginning of risk-reduction. On the other hand, risk-reduction by prevention of new infection is an important tool in HIV prevention (Newcombe, 2010). Risk-reduction that could be associated with VCT uptake includes couples testing, protecting each other from infection, re-infection, utilization of safer sex methods, and Prevention of Mother to Child Transmission HIV (PMTCT). It also informs the utilization of PEP (Post-exposure Prophylaxis) and encourages people requiring treatment to avail themselves the opportunity (outcome management).

Several research studies on the determinants of VCT have shown conflicting results on patterns of uptake in SA. In respect to the impact of socio-demographic determinants on use of VCT in HIV risk-reduction; a study of these determinants will help identify factors associated with lower VCT uptake and implement policies and programs among socio-demographic groups which will improve VCT uptake. Knowledge of the socio-demographic determinants of VCT could also help in treatment, allocation of resources, and direct public health practitioners on the best ways of impacting prevention messages of VCT uptake in a community. According to the WHO (2014), VCT services need be universal, client and community centered and require political commitment to normalize; this makes it necessary to understand which and how socio-demographic factors impact VCT.

In this chapter the background of the study and VCT uptake patterns in SA will be discussed; this will provide an understanding of the study and its problem statement which forms the basis of the research questions. The purpose of this study will be enumerated and the theoretical framework which provides a backbone for the research questions mentioned. Finally, the nature of the study, definition of terms, its limitations, and significance will be elucidated.

Background

In the past, HIV transmission in South Africa was largely ascribed to socio-economic factors, past history (apartheid), and gender violence. In recent times, the role of behavioral, socio-cultural, and structural influences have become significant and difficult to ignore. In addition, mobility, migration, extreme poverty, race, Alcohol and drug use are significant factors. Other factors are early sexual activity, inconsistent condom use, and engendered relationship dynamics like male dominated households; Men are sole breadwinners in most families and

perpetuate violence for economic reason (JHHESA, 2012). Considering the above factors, it is necessary to understand the impact of socio-demographic factors on VCT uptake as this will help in formulating contextualized VCT programs.

VCT may involve provider-initiated counseling testing (PICT), client initiated counseling and testing (CICT) or self-testing. HIV counseling and testing is the first step in accessing health care for persons of unknown status and those that will proceed to receive ART (Nöthling & Kagee, 2013). It may also be performed for a variety of other reasons: Basic patient care, pregnancy as part of the PMTCT program, clinical diagnosis, research, and post-exposure prophylaxis (PEP). Post-exposure prophylaxis may be necessary for health care workers, domestic violence, sexual assault, after a needle stick injury, rape, and consensual sex. Other reasons include per court order of an accused in sexual offence cases, abandoned babies, and children (DOHSA, 2009). The application of VCT is legion and more indications are emerging daily; making it one of the commoner medical tests done in the doctor's room and beyond.

The counseling process of VCT needs address several issues: Confidentiality, right to privacy, right to refuse testing, knowledge of the HIV virus including methods of infection, treatments, and process of testing. It also includes education on discrimination, stigmatization, PMTCT, and vulnerable groups (DOHSA, 2009). Evidence-based medicine, knowledge of new areas of research, and core ethical issues underlying testing are also addressed (DOHSA, 2009). Considering the volume of potential areas that can be covered, practitioners often prioritize on the reasons for testing, background, and need of the patient during counseling.

VCT uptake in SA has gradually improved. It has increased from 21% in 2002, to 30% in 2005, then to 50% in 2008, and to 64.3% in 2012 (HRSC, 2012; Pettifor et al., 2004; Shisana& Simbayi, 2002). This gradual improvement is due to the concerted effort of the DOHSA, leading

to increased uptake in all areas of the society. The DOHSA (2000) developed the *Rapid HIV Testing programs and guidelines: HIV and AIDS Policy Guideline and Testing for HIV, and the HIV and AIDS Policy Guideline on the Minimum standards for counseling and training.* These *guidelines* are aligned with international organizations like the CDC, the Joint United Nations Program on HIV and AIDS (UNAIDS), and the World Health Organization (WHO). These Policy Statements on HIV testing cover several areas of VCT including adults in public and private setting, PMTCT, accelerated PMTCT Plan, management of Pediatric HIV and integrated management of childhood illnesses (IMCI) strategy. These documents and tool are laudable steps taken by the DOHSA to improve management, applicability, use of VCT in all settings, and improve availability of training and skills at point of service (DOHSA, 2009).

The National Strategic Plan (NSP) released by the DOHSA (2009) seeks to improve the number of people testing for HIV by 50%, coverage of the ART program to 80%, and increase the number of people accessing VCT services from 25% to 70% (DOHSA, 2009). By the end of May 2009, 4624 health facilities including hospitals, clinics, community health centers, and other public facilities offered VCT services (DOHSA, 2009). About 8% of VCT services are also offered through mobile clinics and 7% through non-medical sites. The Health Department also supports about 8000 lay counselors on stipends to provide services at medical and non-medical sites (DOHSA, 2009). The number of people reporting access to VCT already reached 64.3% in 2012 (HRSC, 2012). Despite the above statistics and effort made by DOHSA to improve access and availability of VCT, there is still a disproportionately high prevalence and incidence of HIV. This Suggest more than a simplistic relationship between socio-demographic determinants and VCT uptake.

The use of VCT as a focus in HIV prevention is informed by its low cost and usefulness despite socio-demographic circumstances. Fonner, Denison, Kennedy, O'Reilly, and Sweat (2012) showed the advantage of VCT irrespective of socio-demographic circumstances in a study where twelve persons underwent clinic-based VCT, three underwent employment based, one underwent home, and one mobile based VCT respectively. In this study, the individuals who had no VCT had an increased odd of having more sexual partners compared to those who had VCT. When sero-status was considered, there was a significant odd of condom use in individuals who had tested positive on VCT compared to individual that did not know their status. The inference from this is that VCT is important in reducing HIV-related sexual risk behaviors despite socio-demographic circumstances (Fonner et al., 2012). My study seeks to find ways of improving VCT uptake through understanding, recognizing, and ameliorating socio-demographic factors that may negatively impact uptake.

The extent of this study will involve how multiple socio-demographics may impact VCT. Various studies have shown that socio-demographic determinants do not have a uniform impact on VCT uptake: The impact of education on VCT was studied by Venkatesh et al. (2011) in a community randomized prevention trial ACCEPT/HPTN043 in a predominantly black South African township to determine uptake of VCT and repeated testing patterns among people who had frequent conversation around HIV/AIDS and the availability of ARV. The above study showed a positive correlation between VCT uptake and Anti-retroviral therapy support. However, it did not demonstrate correlation between VCT and demographics, socio-economic status, or if education acts alone to impact VCT uptake. My study will explore the impacts of these multiple factors on VCT uptake in South Africa considering its peculiar demographics and efforts made by the DOHSA to make VCT available, accessible, and fashionable.

Finally, I wish to provide a model for the determinants of VCT in SA stratifying for sex and race as independent factors, and by adding interaction terms and retaining those that have statistically significant change in uptake of VCT. This will help in developing a model that best describes the South African situation. Further, this study as a population based survey using secondary data from the whole country will provide a more comprehensive picture for most age groups and races; this will be closer to the truth and be more generalizable as respondent are drawn from the whole country.

Problem Statements

The importance of socio-demographic determinants in VCT uptake in South Africa has often been conflicting in different studies. VCT uptake can be affected by enhancing and limiting socio-demographic variables in a community. A study of socio-demographic determinant and the uptake of VCT undertaken to identify the barriers to VCT in a peri-urban township in Northern Limpopo Province looked at the motivations for, and barriers to VCT uptake among black South Africans. It concluded that enhancing the communication between partners and family members in the community would facilitate HIV testing (De Koker, Lefèvre, Matthys, van der Stuyft, & Delva, 2010). This study further suggests that how and methods used in conducting communication is important in dissemination of VCT messages. In this study the barriers to communication for VCT uptake was the main focus; it is my intention to look further at both barriers and enhancing factors, as well as considers how these factors could interact to improve VCT uptake.

VCT prevention messages impact uptake differently in various demographic groups and communities. This was demonstrated in a cross-section of men and women investigated to

ascertain how VCT prevention messages impact Uptake in different socio-demographic groups (Onoya, Zuma, Zungu, Shisana, & Mehlomakhulu, 2014). It was found that men between ages of 15-24years were more likely to have multiple sexual partners (MSP) if they used condom at their last sex encounter. They were also more likely to have MSP if they were young at sexual debut, lived in urban rather than rural area, and were economically vulnerable (Onoya et al., 2014). The above demonstrates why the socio-demographic groups are important factors in VCT uptake messages; it is apparent that messages to specific group may need to consider the predisposing factors (fundamental cause) in that group since messages targeting all may not have the same effect for the different demographic groups within that society. My study could further demonstrate what socio-demographic determinants need be an important consideration in formulation and planning of VCT uptake messages and services.

Previous studies (Mhlongo et al., 2013; Mall, Middelkoop, Mark, Wood, & Bekker, 2012;Venkatesh, Madiba, De Bruyn, Lurie, Coates, & Gray, 2011; De Koker et al., 2010) on the determinants of VCT uptake in South Africa concentrated on how different single demographic factors affect VCT uptake albeit without a comprehensive consideration, consistent result or confounding effects like Venkatesh, et al. (2011) looked at the impact of gender; De Koker et al. (2010) on education; Mall et al. (2012) on education in a peri-urban settlement, and Mhlongo et al. (2013) on socio-demographics in peri-urban town of Soweto. This study will provide a comprehensive consideration of socio-demographic factors with a representative data from the whole country. One gap that will be filled by this study is a new explanation of previous studies results which until now have used a section of the SA population to explain VCT uptake in SA.

At the HIV/AIDS conference in Atlanta, Georgia, 2012, the (JHHESA, 2012) presented the National HIV Communication Survey (NCS) findings on the positive effects of media on

communicating HIV prevention messages in SA. It demonstrated an improvement in all measures of self-efficacy: Condom use self-efficacy scale (CUSES), VCT (voluntary counseling and testing), and voluntary medical male circumcision (VMMC) through various media communications. However, it fell short of clarifying the considerations made before choosing the type of medium. It also failed to state if all age groups, employed and unemployed, and all socio-economic groups were targeted by the same message type and if so what were the relative effects of the methods in improving VCT uptake?

Contrary to the above findings, the South African National HIV Prevalence, Incidence and Behaviors Survey by the Human Sciences Research Council, HRSC (2012) painted a different picture: The survey showed a decline in condom use, increase in multiple sexual partnerships from 2008 to 2012, and unsatisfactory increase in VMMC (14.6% in 2008 to 18.6% in 2012) amidst persisting high levels of traditional circumcisions (25.2% in 2008 to 26.1% in 2012). HRSC (2012) data for VCT uptake by race, locality type showed no significant differences in HIV testing history, but showed a significant difference among provinces.

In addition, the JHHESA (2012) data showed that sexually active men (38%) were less likely to undergo testing than sexually active women (52%) in the past year. It was also demonstrated that men between ages of 15-24years were more likely to have Multiple Sexual Partners (MSP) if they used condom at their last sex encounter and women were more likely to have MSP if they were young at sexual debut, lived in urban rather than rural area, and were economically vulnerable (Onoya et al., 2014). On the other hand, Carey and Forsyth (2013) demonstrated a shift in the peak prevalence of HIV from young men to middle aged married men between 35-39 years. These findings emphasize the role men play in the epidemic. It also indicate that as men with HIV get older there is an increasing pool of infected men (prevalence)

due to the success of the HIV prevention programs including VCT uptake in SA. This pool is one reason why HIV prevalence and incidence is sustained in SA.

The inferences from the foregoing are that first, socio-demographic factors like education, employment, and demographics (age, sex, residential area) act alone or together to predict VCT uptake in an individual or a group (Wringe et al., 2008). Second, VCT uptake could be amenable to certain socio-demographic factors and not to others since the incidence of VCT uptake differed by province but not necessarily by locality, and by race and gender, but not by age (HRSA, 2012; JHHESA, 2012). In addition, VCT uptake is affected by educational status and not strictly the number of years spent in school (Mhlongo et al., 2013).

From the above, it is clear that the relationships between VCT uptake and socio-demographic factors are more than just a simple arithmetic relationship. In the light of the above dilemma, there is need to clarify and understand the relationship, and how the different socio-demographic determinants impact VCT uptake. This has led to the problem statement of this study: What and how socio-demographic determinants act and interact to impact VCT uptake among South Africans, and to this end, determine which model best fit the SA situation. It also important to understand how packaging of VCT messages could impact uptake; how the index person, health provider, health facility and social facilitating factors could bring about social integration of VCT uptake programs as suggested by the integrated theory health behavior change (ITHBC). This study also seeks to fill the gap on how we can use the knowledge on the different settings to positively modify VCT uptake.

Purpose of Study

This study used a quantitative methodology to describe the impact of socio-demographic factors on the uptake of VCT in SA; in so doing develop a model that fits the South African situation, using a country wide secondary survey data. It also demonstrated how these determinants differ with different sex and race in SA, and if this can enhance VCT uptake.

This study also sought to determine if educational level act as a modifier to the impact of other socio-demographic factors. As demonstrated by Chimbindi, McGrath, Herbst, San Tint, and Newell (2010) belonging to a household with higher socio economic status (SES) increased the likelihood of condom use in a study in rural KwaZulu-Natal, South Africa. Chimbindi et al. (2010) concluded that by providing all forms of supportive interventions families need condom use was enhanced ; this has yielded some results so far in some communities in Kwazulu-Natal. The present study will use this type of reasoning to suggest what kind of intervention could improve VCT uptake in various setting.

In addition to the above, this study demonstrated that VCT uptake is an important step for harm reduction of HIV infection. It is hoped that with harm minimization for infected and non-infected persons the result of this study would go a long way to reducing the impact of HIV in SA. The understanding here is that if non-infected persons uptake VCT and recognize their negative status, they would take steps to reduce transmission to themselves. In the same vein, positive persons could take steps to protect their partners.

In the light of the above, the dependent variable will be the uptake of VCT specifically the number of persons answering yes or no to having done a HIV test in the past one year before data collection while the independent variables are socio-demographic factors or variables like social (education and employment) and demographic (age, race, sex, residential area) factors.

Research Question and Hypothesis

Research question 1:

What is the impact of socio-demographic determinants on VCT uptake?

The null hypothesis:

Socio-demographic determinants do not have any impact on VCT uptake.

Alternative Hypothesis:

Socio-demographic determinants have impact on VCT uptake.

Research Question 2:

What socio-demographic determinants interact to impact VCT uptake?

The null hypothesis:

Socio-demographic determinants interact do not interact to impact VCT uptake?

Alternative Hypothesis:

Socio-demographic determinants do interact to improve VCT uptake.

Research Question 3:

Does racial group interact with gender to impact VCT uptake in South Africa?

The null hypothesis:

Racial groups do not interact with gender to impact VCT uptake in South Africa.

Alternative Hypothesis:

Racial groups interact with gender to impact VCT uptake in SA.

The 3 questions above are separate and not sub questions; hence each set of hypothesis were tested separately.

Definition of Terms

Impact: According to the Merriam-Webster dictionary and as used in the above questions means to act upon as to have a response.

Main effect: This is the primary effect of one independent variable.

Interaction effect: This is when there is a change in the effect of an independent variable due to the presence of another.

Confounding effect: This is the effect of a variable that is related to the dependent and independent variable. Confounders are any risk factors that will have an effect on the factor under study (Bailey, Vardulaki, Langham & Chandramohan, 2005)

In these sets of questions the question 1 assesses the main effects and 2 assess the confounders while question 3 assesses the interaction effects of racial group and gender.

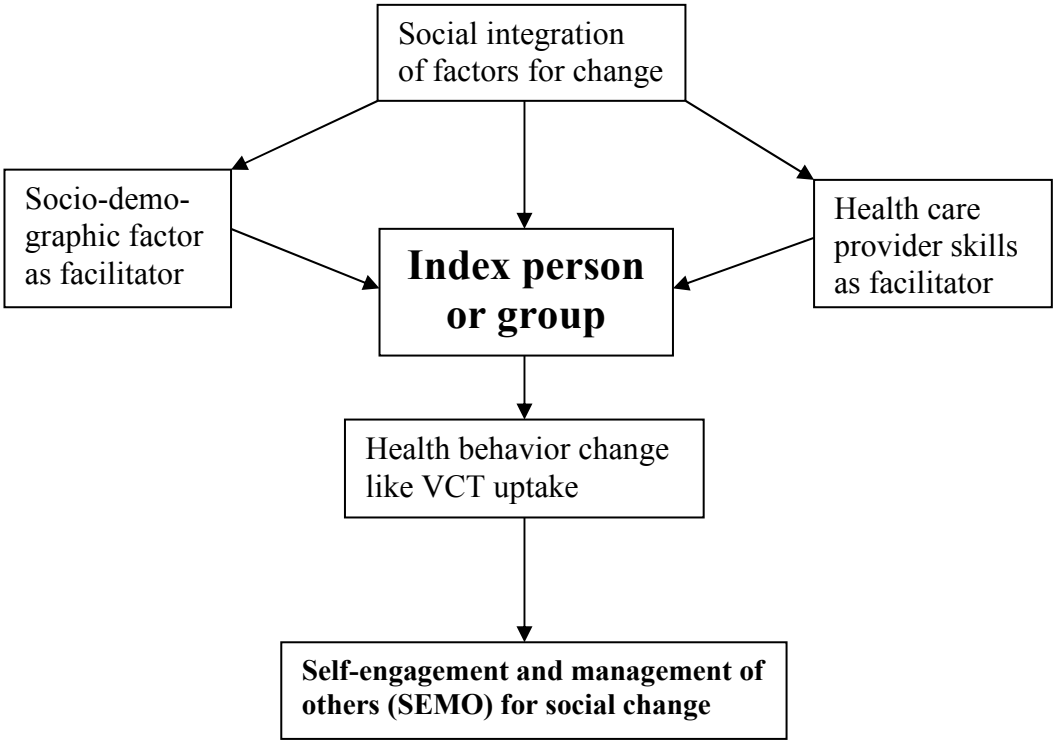
The measurement of variable will use secondary data from the National Communication Survey data collected by the JHHESA (2012). This data contain all the variable of interest for this study.

Theoretical Framework

The integrative theory of health behavior change (ITHBC)

This research is framed on the integrative theory of health behavior change (ITHBC), a brainchild of Polly Ryan (2009). In formulating this theory, Ryan considered the various theories that guide behavior change which are inter-related in their principle, initiation, continuity and purpose. The ITHBC is a tool for change in health behavior that includes knowledge and skills, ability to acquire it, health outcome, social facilitation and integration. It is also associated with health provider skills, research and its dissemination. This theory recognizes that health and

change are multifaceted phenomenon involving an interaction and integration of socio-demographic variable at the individual, cultural, psychological, social, and environmental levels taking into consideration individuals, inter-personal, community, and societal factors which act together to enable a person make the necessary change(VCT uptake).



Schematic flow chart of the Integrated Behavior Change Theory and VCT

This ITHBC suggests that health behavior can be improved by knowledge, self-regulation, skills, and fostering social facilitation (Ryan, 2009). It suggests that knowledge in itself do not lead to change in health behavior (VCT uptake) but knowledge and belief by the person making the change, health education and research by health provider, social facilitation by positive socio-demographics and integration of these entire factors are more likely to motivate

VCT uptake. Social facilitation as a component of ITHBC enhances self-regulation and engagement in self-management behavior and socio-demographic factor can act alone or together to enhance uptake of VCT.

In this study it is hoped that the socio-demographic predictors of VCT uptake can be determined quantitatively and knowledge derived from this used to enhance VCT uptake, and with knowledge of enhancing factors, planning, development and uptake of VCT programs can be encouraged in SA.

Nature of the Study

This study will use quantitative secondary data for hypothesis testing. It will investigate the role of multiple independent socio-demographic factors (education, employment, age, sex, and residential area) that will affect the patterns of VCT uptake. The outcome or dependent variable is uptake of VCT and is measured on a dichotomous scale. Interaction models will be built depending on the socio-demographic factors producing statistically significant changes. The quantitative methods would provide a quantitative description of VCT trends in the SA population since the data from the population based survey are in numerical form (Creswell, 2009).

Further, the result obtained would be applied towards suggesting alternative ways of communicating health message for VCT uptake; since studies on socio-demographic factors can positively or negatively impact VCT uptake (Onoya et al., 2014). In the National Communication Survey 10,034 participants were interviewed from 398 sub places during February to May 2012 and included persons aged 16-55 years came from across the nine provinces of South Africa.

Structured questionnaire on HIV/AIDS knowledge, socio-demographic characteristics, attitude, behavior, and exposure to HIV communication programs were used to ascertain trends in respondent behavior. A 10% validation check was undertaken in person or telephonically to review the work by each interviewer including time of interview, use of home language, use of structured questionnaire, and coverage of socio-demographic variables (JHESSA, 2012). Validation check was sufficient to show reliability and validity of results obtained in the survey. Data was converted to SPSS (From STATA originally used in the NCS), analyzed after the data was manipulated, merged, and split where necessary to suit the purpose of this study. Data was from participants of the third South African National HIV Communication Survey (JHHESA, 2012): A cross-sectional study. A written confirmation was obtained for data use from the JHHESA.

Variables

Independent variable: Race, Age, Marital status, Gender, Employment and Educational status, socio-economic status.

Dependent variable: Done VCT in previous 1 year preceding survey.

Assumptions

The use of voluntary counseling and testing (VCT) is interchangeable with and include all forms of HIV counseling and testing (HCT) that is voluntarily taken by the patients after a counseling session and result made available to patient if needed. It therefore includes self, client, or provider initiated counseling. It also includes HIV testing associated with PEP,

PMTCT, and PICT and may be by mobile, stationary, or point of care testing. It also includes VCT performed for specific purposes like researches and experimental purposes.

The methods of HIV testing was not a determinant in this study and whichever avenue the patient seized to test is commendable as long as it fits the circumstances of the patients. It is also important to acknowledge these options as they serve as avenues for VCT uptake and must be regarded as alternatives for making HIV counseling and testing accessible and available for the entire populace. It is also assumed that all reported testing results are confirmed and meets the standard of the WHO on the diagnosis of HIV infection (WHO, 2014).

Finally, in the process of this study it was expected that social desirability, recall, and misclassification biases was kept to a minimum by the design of the study and that all measures were taken to ensure the validity and reliability of the study.

Scope and Delimitations

While condom use and medical circumcision are accepted methods of HIV prevention, they are not included in this study which focused on VCT. VCT in this study referred to and represented all forms of HIV Counseling and Testing which are intentionally and voluntarily performed by the patient. It does not include any form of VCT by coercion or duress like employment or travel purposes.

The scope of this study was limited to VCT and did not preclude cases where persons did not return for results or choose not to know their results. This study did not include cases where indirect markers are used to predict HIV status or cases of predicting HIV status from spouses, sexual partner or children. This study is limited to tests performed within a year before questions on uptake is answered. It did not include tests results obtained during or before such periods, or

performed outside the 1 year limit. Finally, this study was subject to all the delimitations of the primary study it derive its data from.

Limitations

The limitations of this study were dependent on the procedures and designs used to conduct the primary study. While there were other socio-demographic factors that impact VCT uptake not included in this study, the most significant and relevant to the South African population were included.

Cross-sectional studies are intrinsically flouted by certain limitations and biases like the social desirability and recall bias. In terms of the construct of this study it was possible to explain the behaviors of the respondent with other theoretical framework. However, the ITHBC is an encompassing theory that accepts the tenet of most other theories of change and brings them together as one; hence the ITHBC was used for this study.

External validity was limited as the situation of South Africa differs from many countries based on the history and prevalence of HIV. It is very unlikely that the findings can be applied to other countries with different histories, prevalence, and patterns of the epidemic; however, the result of this study was close to the truth in SA. Further, considering that the demographic information for non-responders characteristics were not available in this study, the level of bias this caused the results could not be determined.

It was also assumed that those not testing have access to testing but for socio-demographic reasons refuse to take up testing. The design of this study was commendable especially with the painstaking random sampling and KISH introduced to compensate for

sampling error; however whether this could entirely account for non-responders remains to be seen. Various steps were taken to achieve the best reliability and validity possible.

Significance

In this study, I determined the impact of socio-demographic factor on VCT uptake by identifying deterrent for VCT so that programs with these groups may consider such factors in the packaging of campaign messages. For example, a study among adolescents identified stigmatization by family, community, disclosure issue, and partner influence as predictors of uptake of VCT (Ndzombane, 2012). This study could improve insight on the relationship between factors affecting an individual and VCT uptake. At the end of the research, new ways of improving VCT uptake and more effective ways of providing contextualized VCT services were suggested.

VCT could impact and reduce HIV transmission. In 2011, the Desmond Tutu HIV Foundation indicated that one-third of young girls in South Africa had a forced first sexual encounter, and about 75% had at least a consensual sexual encounter. Infection of young girls is a primary driver of the South African epidemic. In addition to low rates of marriage, high rates of unstable relationships, high levels of population mobility, poverty and violence contributed. This study could help in identifying the population-at-risk and encourage VCT so that treatment and care could be accessed early.

This study could encourage behavior change necessary for HIV prevention. Behavior change is important in reducing HIV infection (Peltzer, 2012). The current study determined the impact of socio-demographic factors that impact VCT uptake in South Africa. With respect to risk-reduction in HIV infection, both variables (the socio-demographic factors and VCT uptake)

could impact each other and contribute to risk minimization. It is reasonable to think that behavior change brought about by identifying socio-demographic factors that improve VCT uptake will bring about harm-reduction and HIV prevention. On the other hand, it is also possible that VCT uptake could enhance behaviors that reduce the risk of HIV infection (HIV risk-reduction).

The result would bring about positive social change by improving community health and tolerance of HIV positive people. Improved understanding of the socio-demographic determinants of VCT uptake and HIV would also contextualize HIV prevention by first, improving community understanding, availability, and need for VCT. Second, reducing stigmatization, victimization, and discrimination of people and communities affected by HIV could further improve VCT uptake. Mall et al. (2012) demonstrated that uptake of VCT could decrease stigmatization in a peri-urban in South Africa. Better acceptance of positive persons will bring the entire community closer to PLWHIV; these would bring about change by improving equity and equality for PLWHIV, improve disclosure, and reduce denial. It is also possible that more infected persons could accept treatment and care leading to prevention of new infection and harm-minimization.

Finally, since this study was a population-based survey, its results could be generalizable to other geographic areas like other Sub-Saharan African countries since reasons and patterns of propagation of HIV are similar. Its application to other areas of HIV prevention like ART adherence and PMTCT in SA could also be explored as the basic epidemiology is similar. Other chronic diseases could also benefit by replicating the same study to determine their determinant and improve control. The result of this study would be disseminated through journals,

conferences and libraries to assist other researchers in this area of research.

Summary

In conclusion, the main focus of this study was to provide a model for the South African situation on the impact of socio-demographic determinants on VCT uptake through a quantitative study using secondary data generated in a population based study by the JHHESA. This study also provided a model on how these factors interact and how they vary by race and gender. In this chapter we identified the ITHBC as the main theoretical framework for this study and enumerated the significance and purpose of this study. Building on the research question and problem statement, the next chapter will bring to fore most literatures in the previous five years on the main determinants in this study and identify the gaps explored herein.

Chapter 2: Literature Review

Introduction

This study sets out to explore the socio-demographic determinants of VCT uptake through a quantitative study using secondary data generated in a population based study by the JHHESA. The purpose of this study is to determine the socio-demographic determinants of VCT uptake and how this knowledge could help in the formulation and directing of health messages in HIV prevention. In this chapter a comprehensive literature survey will be conducted on the various socio-demographic independent variables that act as determinant of VCT uptake in South Africa. This will include education, gender and age, socio-economic, and residential areas.

In South Africa, 7 out of 10 persons plan to undertake VCT but the actual numbers that take up testing is much lower. Men and persons at higher risk of HIV are less likely to take the HIV test (Mitchell, Cockcroft, Lamothe & Anderson, 2010).In addition, poor uptake is associated with poor condom use, primary education, younger age (18-23) and more than 2 sex partners in the past 6months (Mhlongo et al, 2013).The implication of this is that persons that did not take up VCT could be possibly positive and are in the undiagnosed prevalence pool making prevention difficult and far-fetched.

Studies in different socio-demographic areas showed that these factors impact on the uptake of VCT but to varying extend, depending on whether a factor is acting alone (which is very unlikely) or together with other socio-demographic factor. The results of the review of literatures are inconsistent and do not follow an arithmetic increase or decrease as the socio-demographic factors become available and accessible. It is also difficult to make clear statements on the impacts of one factor without considering the other. This informs one purpose of this study: To build a socio-demographic model on the pattern of VCT uptake for South Africa.

Literature Search Strategy

This study will use secondary data from the database and record of survey conducted by the John Hopkins health and education South Africa (JHHESA, 2012) at the 3rd South African National HIV communication survey published by UNAIDS and released at the XIX International AIDS Conference in United States. The literature review used the Walden library to sort for relevant literatures prioritizing peer-review journals on VCT and HIV/AIDS, and using Journals from search of databases like Cochrane, Pub med, Medline, and Google Scholar within the past 5years.

The method used to sort for the literatures is simple; the dependent and independent variables are sort for individually and one at a time. This method of search ensured that literature for each of the major independent variables were properly looked for and matched. For instance, the impacts of education on VCT uptake was sort for first and second the impact of gender and then age. Boolean phrases were used to modify the search to include, exclude, restrict or expand searches. It was also important to narrow the preferred years for the search, in this case 2009-2014. Literatures were included even when their time of publication exceeded the recommended 5years if they are found very relevant for a particular variable, or point of discussion, if the status quo has not changed, or when there is paucity of recent work on the area. However, effort was made to use the most recent of such work available. Another methods used to expand searches is to check the recent work citing a particular article. Key search terms were also varied or left general to include as much articles as possible.

Key Search terms

Socio-demographic factors in VCT uptake in South Africa, VCT uptake in South Africa, Socio-economic factors and VCT uptake in South Africa, Education and VCT uptake in South Africa, Residential areas and VCT uptake in South Africa, Gender and VCT uptake in South Africa, Marital status and VCT uptake in South Africa, Race and VCT uptake in south Africa, and Socio-demographic determinants and VCT uptake. HIV counseling and testing (HCT), HIV testing, VCT, and voluntary testing were used interchangeably.

Theoretical Framework

The Integrative Theory of Health Behavior Change (ITHBC)

In a bid to understand this abstract but important concept in the construction of a good study, the theoretical frameworks have been likened to many things: It can be seen as a string that joins all the separate concepts that a researcher wishes to use in answering the research questions, it has also be likened to a map by a researcher about his study at a point in time, and a map with boundaries and parts which can be subject to change as the study progresses. Ryan (2009) likens a study without a framework to a person shopping without a list not knowing what, where, when and how to buy.

Various questions need be answered by a researcher in his use of a framework including: "What led him to select the model or conceptual framework, what are the theoretical components of his framework, how did he decide upon the variables to include in his conceptual framework, how did the concept assist him visualize what he intended to investigate, and how did he use the conceptual framework to design his study and analyze his findings (Trafford & Leshem,

2002a)"? Put simply the main question one needs to answer is: How did you arrive at the preferred framework?

The essence of improving VCT uptake is to minimize risk (Risk-reduction) of acquiring or transmitting HIV and behavior change is important in reducing such risk (Peltzer, 2012). The current study set out to determine the socio-demographic factors that drive and impact VCT uptake behavior among South Africans. Risk-reduction involves minimizing the impact of diseases through people, policies, and programs that will prevent causes (protection), reduce consumption (risk), and consequences (outcome) of such diseases while entrenching public health (Newcombe, 2010). Peltzer (2012) found that HIV risk behavior was a significant risk factor in HIV infection and stated that since the socio-demographic factors associated with VCT uptake are not well characterized, it is necessary to investigate and identify socio-demographic factors that foster behavior change like VCT uptake. The ITHBC is well placed to steer behavior change that can lead to risk reduction through VCT uptake.

The ITHBC is the brainchild of Polly Ryan; it was formulated as a tool for change in health behavior after looking at the a priori theories of behavior change (Ryan, 2009). There is no one theory that singly encompass all the aspects of prevention as different theories come together at different level of the health system to make disease prevention possible. Theories of HIV prevention could include those change theories that affect us at the individual levels like: Health believe, Bandura theory of self-efficacy, trans-theoretical theories, and life course theory. At the interpersonal levels: the buffer theory and the social cognitive or social support theory. Community level theories include the empowerment education theory and diffusion of Innovation theory. Structural and policy level theories deal with structural barriers to prevention like: The social disorganization, gender and power. The harm reduction theory and the ITHBC

operate at all levels; in this study the ITHBC is the primary theory and it borrows from all the other theories.

The ITHBC is a tool for change in health behavior that encompass theories like Bandura theory of self-efficacy, health believe model, socio-ecological, life course theories, and harm-reduction or minimization theory. Ryan (2009) put forward an encompassing theory which can form the basis of health behavior uptake or risk behavior reduction in daily life nursing and medical practice. It is my opinions that only with an understanding and knowledge of the socio-demographics of South Africans will their patterns of VCT uptake be understood. For the purpose of this study the life course theory, health believe model, the Bandura theory of self-efficacy, and harm reduction or minimization theory were important contributors to the overarching integrative theory of health behavior change(ITHBC) and will be described briefly.

The life course theory attempts to understand the life history and behavior of persons and the groups they belong to by the twists, turns, transitions, and trajectories in their development (Laub & Sampson, 1993). It emphasizes the impact of historical changes, chronological developments, family, groups, and their interdependence. This theory sees humans as able to make choices considering constraints and opportunities. It recognizes diversity and choice that inevitable link between early life experiences, output in later life, and explains why different people react differently to stress and life events-VCT uptake in different socio-demographic situation.

In the life course perspective, a cohort is a group of persons who were born during similar time period, experienced similar social changes, belong within a given culture, and have similar sequence and age (Bjorklunde & Bee, 2008; Newman, 2008; Settersten, 2003a; Alwin & McCammon, 2003). It is often speculated that that this theory can explain the differences in VCT

uptake in the generation of South Africans before and after Apartheid; our life course is impacted by our educational achievements, income and residential area. Just as the race and educational status of parents today could impact children's life course tomorrow

Bandura describes the self-efficacy theory as that which determines the ability to initiate, carry on and complete a task. It describes the behavior of those who complete task, those who do not, and the determinants of their actions. Bandura proposed that people who complete activities often do so when their skills and capabilities are motivated by mastery experiences, social modeling, and persuasion of their capacities and abilities to do so (Bandura, 1997). This aspect of health behavior is vital for VCT uptake. Our response is also affected by the motivation of our emotional responses to situations, recognizing the internal locus of control, and reciprocal self-determinism. Self-determinism describes the motivation that our previous successes in activities bring to bear in our current endeavor. By learning how to deal with stress through elevating our moods, improve our perceived and real interpretation of physical, and emotional stress our self-efficacy can be encouraged (Bandura,1994, 1997).

The health belief model (HBM) is closely related to the self-efficacy theory. It is a model that explains health behavior or action by tapping into attitude, believe system, and perception. The health belief model suggests that for one to take action he needs to perceive the presence of his susceptibility or risk for the disease (in the case of VCT, HIV infection). Further to accepting the presence of a threat, an individual must then access the benefit to be derived from change. Perceived barrier are the possible impediment to change; it is probably the main determinant of whether change occurs or not and this is also determined by modifying variables like culture, socio-demographics, and cost of change. The health belief model has been used by previous authors to study the socio-demographic determinants of VCT (Mhlongo, 2013; Chagan, 2011;

Johnston et al., 2010; Peltzer, 2009). However, considering that this model deals mostly with the individual's perspective, the use the ITHBC theory in the present study will consider other aspects of behavior change not previously explored.

Cue to action are the events that encourage persons to complete their action for change; by testing for HIV publicly, President Jacob Zuma of South Africa was a cue to action for many South Africans just as the declarations of HIV status of well-known personalities influenced many to test and get past denial (Stretcher & Rosenstock, 1997). Self-efficacy was the last aspect of the HBM added; it was recognized that in the absence of belief by an individual in his ability to perform the action, it is difficult to take action even in the presence of the other elements (Rosenstock, Stretcher, & Becker, 1988). The Community participatory approach was one of the commoner theory cited by most studies that dealt with socio-demographic determinants and VCT in this study (Baisley et al., 2012; Mall et al, 2012; Venkatesh et al., 2011; De Kock et al., 2010). This approach demonstrates the role communities can play in the cue to action; this can be likened to cue to action in HBM albeit, at a community level.

The integrative theory of health behavior change (ITHBC) was put forward by Ryan (2009). The ITHBC is a culmination and combination of most of the change theories that form the basis of health behavior uptake or risk behavior reduction in medicine. This theory suggests that health behavior change can be improved by improving knowledge, self-regulation, believe, skills, and fostering social facilitation (Ryan, 2009). In the ITHBC model the proximal outcome is improved self-management of a health status including decision making while the distal outcome is improved health status for self and probably others. This theory pre-supposes that personal behaviors improve health and health can be improved by regularly seeking opportunities, and engaging in health promoting behaviors like VCT. The components of ITHBC

include the index patient, the health provider, social facilitation, and integration. The index individual's goal is to achieve self-management and ultimately improved health. It is generally accepted that knowledge in itself may not lead to change in health behavior but knowledge together with believe, positive reinforcement, past successes, motivation and cue to action may lead to change in behavior (Bandura, 1986). This component of ITHBC is related to VCT uptake, which is perhaps the most important as the beginning of the health management process. It is individuals that cue to action and undertake VCT that will have the opportunity to prevent infections, self-manage their conditions, and prevent complications; without seeking health promoting behavior the uptake of VCT will come to nothing.

The Health provider or the Lay Counselors for VCT are the second component of the ITHBC. The Health Providers have the responsibilities to sort out and continually access interventions that can promote individual, family, community, and the nation's health. Although, the values of health promotion is well understood and agreed upon by all, the ways and how they can be incorporated into our societies especially considering the large amount of information available is unclear. The Health Care Providers as a component of ITHBC have a vital role to play in understanding and encouraging health behavior change through improved uptake of health promoting behavior and continuous research to seek out new information, discoveries, and channels. This means that health providers must be equipped with the necessary skills and training required to perform VCT especially counseling and testing procedures. It is also necessary that there are adequate numbers of health providers to assist the individuals seeking help.

Social facilitation is a third component of ITHBC and a major determinant of health behavior change because it enhances self-regulation and engagement in self-management

behavior. In respect to VCT, social facilitation may come in the form of using socio-demographic determinants positively to enhance change or uptake of VCT. Ryan (2009) agrees that ITHBC is aimed at promoting health behavior change associated with chronic disease management and health promotion. She further suggests that the theory can facilitate at least a 25% change in health behavior with a variance of 45% when specific characteristics of individuals are considered, like sex, race and body mass index (Ryan, 2009). Social facilitation as an integral component of the ITHBC is a major theoretical framework of this research. It is my opinion that changes in the socio-demographic factors can act as social facilitators of VCT in the South African society; this is the main purpose of this research.

The final component of this theory is social integration. Over the years health behavior change theories and practices have evolved to become more integrative to examine the interplay and relationship between individual, interpersonal, social, cultural, and environmental factors (Curry & Mermelstein, 2013). The ITHBC is aimed at integrating all that is known on a health problem in developing solutions. It is this holistic approach that will clarify behavior, enhance better management, and treatment considering the circumstances of the persons concerned. It is also in considering the unique life course of South Africans, their health believes, self-efficacy, and socio-demographic factors that are at play in the country that a reasonable conclusion be drawn on the ways VCT uptake can be improved. The areas in which the ITHBC theory has been applied to reduce human and economic burdens of disease through prevention include studies in the areas of tobacco cessation, weight loss programs, and physical activity to control the onset or the progression of cardiovascular disease, hypertension cancers, osteoporosis, and diabetes (Curry &Mermelstein, 2013).

In conclusion, VCT services as major tool for HIV prevention can be streamlined to fit the people it is meant for, and not the reverse. The integrative theory of health behavior change was used to investigate the interplay of various socio-demographic factors and how they interact to explain VCT uptake in South Africa. Identifying positive facilitating socio-demographic factors in HIV prevention could help modulate self-regulation in health in the short term and lead to improved engagement in self-management behavior in the long term. This can lead to reduced HIV infection and incidence in South Africa, and ultimately reduced harm for self and others.

Literature Review

Introduction

In the previous chapters, a background for this study, the research problems, and how this study is important in HIV prevention were slowly developed. Why VCT is pivotal in South Africa in the strengthening of the HIV prevention programs was also identified and the need to develop it as a central tool that will act as an entry point for prevention. Further the need for using socio-demographic determinants as facilitators for the uptake of VCT was highlighted and the possible use of these differences in the socio-demographic factors in providing or directing the ways VCT uptake messages are focused was explored. This study would provide researchers, epidemiologists, and HIV clinicians an alternative explanation of the behavior of patients on the uptake of VCT as a preventive tool and possibly ways of providing better and more effective messages in the VCT campaign.

In this review, ideas of how different theoretical framework, design, and methodologies were explored in similar studies on this topic using different residential setting, sampling methods and sample size are provided. In this study data from a population-based survey was

used and is probably best as it provides a representative data for the country. It was also an ideal data in developing a model representative of South Africa. The primary study from which this data was obtained used random and multi-stage sampling to produce data that correctly and proportionately represent the provinces in South Africa.

The literatures in this review used various methodologies. Some studies reviewed in this study were qualitative studies (Leon, 2013; Chagan, 2011) and mixed method (Onoya et al., 2014; De Koker et al., 2010). Most studies were quantitative (Mhlongo et al., 2013; Baisley et al., 2012; Mall et al., 2012; Peltzer, 2011; Venkatesh et al., 2011; Johnston et al., 2010; Peltzer et al., 2009). Although, most studies reviewed used quantitative methods, they still differed from the present study as most considered samples from specific areas of the country or specific towns.

The design of many of the studies reviewed was cross-sectional (Anoya et al., 2014; Mhlongo et al., 2013; Venkatesh et al., 2011) as they examined a point in time and others longitudinal (Leon, 2013). Although the cross-sectional design is flout with intrinsic bias problems, it was the commonest method used to study present circumstance and determinants. The present study will also utilize the cross-sectional design but with detailed plan to reduce the bias associated with this type of study.

In this chapter, previous literature are explored with a view to developing and shedding more light on the previous work done on the impact of SES on VCT, my research question, hypothesis, and possible support for the findings in previous studies. I shall review various studies on the various aspects and the impacts of socio-demographic determinants on VCT uptake and ways our knowledge of socio-demographic differences in uptake can help in developing preventive interventions. I included previous, recent, and studies that may agree and

disagree with our focus in this study. The studies looked at will show how although, they closely explored the subject matter in this study, they failed to tackle the socio-demographic determinants of VCT in a holistic fashion, as it applies to different races, and different genders in South Africa; hence the need for a new study.

It also highlighted the gap in these studies when looked at through the theoretical framework of the integrated theory of behavior change which comprehensively examines the components of prevention and behavior change.

In this review, studies on the different socio-demographic factors were explored; beginning from education, gender, age, residential area, socio-economics, sex, and race. Finally, I looked at possible ways in which knowledge of these determinants have previously been used in developing the VCT uptake campaign. Although the literatures explored shed light to the research topic, problem statement and the research questions; it was guided by the theoretical framework of this study in order to comprehensively explore the factors in this study.

Education:

Education has been differentiated from health literacy. It is possible to have health education without health literacy; the reverse is less likely (Martin et al., 2009). Higher level education has been defined as education greater or equal to grade 12 educations and it involve a formal process of impacting knowledge. HIV health literacy involves the ability of individuals and communities to perform, facilitate, obtain, interpret and understand HIV/AIDS prevention. It also include testing, treatment information and the ability to use such in prevention of disease; discrimination, stigmatization, encourage behavior change and uptake of preventive strategies

(Schenker, 2005). This process may involve formal or informal education. Educations in all forms have been known to improve all forms of VCT (Schenker, 2005).

Education is known to increase the uptake of provider-initiated counseling and testing (PICT) among people attending STI clinics provided with education and information then offered PICT (Gray et al., 2010a). PICT is a novel way of increasing the uptake of HIV testing. PICT has been found to be more effective when compared with client-initiated onsite VCT in primary care facilities in South Africa (Gray et al., 2010a). PICT respondents reported better support and health education by providers, and encouraged patients' registration for HIV treatment (Dalal et al., 2011). VCT was also significantly improved by education among adolescents in a rural and school-based setting in South Africa (Montague et al., 2014).

An important consideration is the level of education; education does not improve testing in an arithmetic proportion if number of years spent in school is considered. People with secondary education had a higher odd of testing compared to those with less than 7 years education and tertiary education (Mhlongo et al., 2013). There was also a decrease in stigmatization and increase in HIV testing among persons with secondary education (Mall et al., 2012). Venkatesh et al. (2011) on the other hand, demonstrated that men with less than 12years of education had a higher odd of being tested while women with higher levels of education had a higher odd of having repeat testing.

It is important to highlight that the relationship between education and VCT uptake is not always as expected; as shown above respondent with secondary education had a better uptake than those with tertiary education. While reasons for these variations are not very clear, some factors can be suggested including; less health services use by those with tertiary education, less reporting of HIV in more educated persons due use of private health services, or due to fear of a

positive result with apparent better knowledge of consequences of a positive test by more educated individuals (Mallet al., 2012). Another possibility could be that education probably acts together with other factors to produce its effect on VCT uptake.

Knowledge is closely related to education, so is fear, communication, believe, skill and motivation. These factors have been variously described in various studies as reasons for the uptake of VCT or lack of it (De Koker et al., 2010). A lack of knowledge of the consequences of HIV infection will be expected to affect uptake. It has been demonstrated that the core motivation for the uptake of VCT are knowledge, fear of getting infected, and consequences of the infection (De Koker et al., 2010). However, this fear and knowledge do not necessarily lead to increased uptake of VCT since men who perceive themselves to be at increased risk do not necessary take up testing and self-perceived increased risk of being infected do not lead to increased testing (Johnston et al., 2010). The above suggests that while education is a factor that can improve uptake, higher and lower levels of education may have the opposite effect probably due to fear brought on by knowledge, ignorance, or lack of knowledge respectively.

In addition to understanding consequences of testing and increased uptake of VCT, knowledge can also affect factors that can militate against increased uptake of VCT like stigmatization (De Koker et al., 2010). It has been shown that the introduction of education and intervention channels in some communities can help reduce stigmatization and increase VCT uptake. Mall et al. (2012) demonstrated an increase in the uptake of VCT and decrease in stigmatization in a peri-urban South African community after a 4 years educational program and introduction of ART. The result of the above study demonstrated that people were more likely to be open about their status if there was knowledge of someone who was infected or had died from HIV in the community.

Education is also known to improve attitude and tolerance towards HIV positive persons. Kalichman & Simbayi (2003) demonstrated that in addition to better tolerance and attitude towards PLWHIV, education can reduce ascribing of guilt, shame, and social disapproval to PLWHIV. This study involved black participants from the Capetown area who identified that improved VCT uptake led to a reduced stigmatization and improved tolerance, and knowing results did not affect stigmatizing beliefs or endorsement (Kalichman & Simbayi, 2003). AIDS-related stigma endorsement is negatively associated with life time testing while positively associated with HIV transmission risk (Pitpitan et al., 2012).The inference from this study is that persons that accept stigmatization are less likely to uptake VCT, which may make HIV transmission easier because of less protection and worsen denial of the condition.

Discrimination is a major cause of fear of testing in many communities. It has been identified that there is still fear in some communities about testing for HIV because of fear of discrimination especially by persons with multiple sexual partners (De Koker, et al., 2010). Despite the above, it is important to note that fear of the consequences of positive results especially in persons with multiple sex partners (MSPs), problems of stigmatization, and discrimination still appears to be the core motivation for VCT uptake and non-uptake especially in peri-urban communities (De Koker, et al., 2010). On the other hand some studies have shown that VCT uptake is not related to factors like condom use, MSP, and stigmatization in urban areas (Venkatesh, et al., 2011). It is feasible to think that the location of the studies and the level of education may be determining factors for the impact of stigmatization on VCT uptake.

One advantage of VCT is that it reduces stigma and improves tolerance for those infected. People that had not undergone a VCT test and those who have, but did not know their status had more negative attitude towards testing. Non-participation in VCT was also associated

with increased guilt, disapproving behavior to infected persons, shame, and AIDS related stigma. It is therefore important to educate people about the importance of VCT and its role in reducing AIDS associated stigma (Kalichman & Simbayi, 2003). Another important area is self-perception of AIDS stigma versus community perception of stigma; the findings are that individuals are more worried about the community perception of their status than their self-perception, and this affects their use of VCT and their acceptance to use VCT in the presence of other people.

VCT can reduce anxieties about perceived community discrimination, disclosure and support structures. When individuals were certain about family and friends support they were still wary about possible discrimination from their community (MacPhail et al. 2008a, b). Although it has been demonstrated that real stigmatization was lower than perceived stigmatization (Pettifor, MacPhail, Suchindran & Delany-Moretlwe, 2010), it remains a main reason for non-uptake of VCT in many communities. Further, victimization on disclosure of a positive VCT results has been found to be more associated with partners of positive patients than with their families. This was qualitatively investigated among PLWHA; the findings suggested that disclosure issues were linked to stigmatization and violence against positive patients especially females. This study demonstrates that non-uptake and non-disclosure is often motivated by complicated relationship dynamics even among couples and friends.

VCT can also foster support between partners when proper education and counseling is offered. Maman, van Rooyen, and Groves (2013) determined that disclosure was associated with negative reactions or lack of support from partners but better support from family members. This study also showed that positive patients were more likely to disclose to family members who were more inclined to keep the news confidential, provide support, and encourage them to

disclose to others (Maman, et al., 2013). Contrary to the above, Mohlala, Boily and Gregson (2011) showed that when proper couple counseling was offered they showed a reduction in women and men having unprotected sex, and reduced intimate partner violence after HIV disclosure. This shows that exposing partners to VCT and their participation during antenatal could improve their perception and understanding while improving support. This study demonstrates the importance of couple VCT counseling, disclosure, and the role of a trained health provider cannot be underestimated in this process.

Proper counseling and education is an important determinant of VCT uptake. When the male partners are involved in the VCT and PMTCT process together with their spouses the adherence to medical treatment and PMTCT is improved. As Mohlala et al. (2011) showed, proper couple counseling led to reduction in women and men having unprotected sex in a study that offered VCT to male partners invited by the Health Provider by written invitation to antenatal. In addition to the above, couple VCT fostered support and education, and directly affected uptake, care, and treatment. Male participation, better communication, and disclosure are all situations that involve inclusion of the partners in the VCT programs; when these are effectively used lead to improved VCT uptake and adherence to PMTCT programs, partner protection and harm-reduction in cases of discordance (Peltzer, et al., 2010). It is understandable from the above that when the health provider and other support systems of the patients are lacking behavior change becomes difficult, unmotivated and unguided.

Disclosure of HIV status is an issue that concern men and women in relationship and goes to tell the kind of support structure the patient has or envisage. HIV-infected men and women with recent sexual contact attending ART clinics in Cape Town, South Africa, had disclosure among recent sex partners of less than 20% and were less likely to disclose their status

if the relationship was short, unstable, and were on ART or knew the HIV status of their partners. This research obviates the importance of couple testing, counseling, and disclosure of status to encourage VCT uptake (Andrinopoulos, Mathews, Chopra, Kendall, & Eisele, 2012). This study further emphasizes the importance of social support and trust for the uptake and disclosure of VCT results; it is reasonable that fear of lack of support or abandonment by spouse or partners may make uptake difficult for spouses of negative persons or partners of females on the PMTCT programs.

Education does not only apply to the patient or respondents, it also has a lot to do with the provider. The provider is a source of knowledge for the patients and when he lacks knowledge, skills and training the transfer of knowledge, advice and counseling for the patient become absent, lacking, or inadequate. While some studies generally report satisfactory levels of training in content and skills for lay counselor in South Africa (Malema, Malaka, &Mothiba, 2010) other literatures advocate a better leadership, monitoring of implementation of the PICT program, improved organizational context, nurse skills, and close compatibility of this skill with the PICT program to ensure sustainability and transferability of theory driven VCT implementation (Leon et al., 2013). From the above, it is discernable that when nursing skill is lacking the basic provider knowledge which drives PICT is absent and this can be a deterrent for VCT uptake.

The uptake of VCT among sexually active men is exemplified among recently traditionally circumcised men in Eastern Cape; it was shown that the VCT uptake among men was particularly low (35.1%) and the intention to test was positively associated with many factors among which were probability of getting an STI, attitudes towards gender-based violence, education on being responsible men, and highest grade passed (Nyembezi et al., 2014).

This study further emphasizes the impact of fear, violence, and gender on uptake of VCT. It also highlights the remarkable and encompassing effect education can have in changing this kind of mind set.

Finally, having looked at various aspects of education and how it affects VCT the inevitably conclusion is that VCT uptake is dependent on the level of education. However this effect is probably impacted by other socio-demographic factors at any level; interplay of other socio-demographic factors that act as facilitator or deterrent to uptake. It seems that as the level of education increases the VCT uptake increases until the secondary education level. At the tertiary level a more complex web of factors come into play including perception of the levels of victimization, stigmatization, and the interplay between health literacy and education.

Finally fear and trust of the health provider, partner, community, and other system factors are important players in this interaction and it seems that as the level of education increases the number of factors that determine uptake become more complex. The task in this study is to understand the ways education interacts with other factors like race, gender, health care provider, and facility to impact uptake in support of the ITHBC. It will also lead to an understanding of which factor has the most effect on VCT uptake in South Africa and what interaction or integration of factors produce the best effects.

Gender, Race and Age

Gender is a strong determinant of VCT uptake; factors that impact uptake of VCT in male and females vary. Various studies have demonstrated that the uptake of VCT in men and women are different (Venkatesh et al., 2011). This behavior is further modified by other factors like marriage and age. The uptake of VCT is demonstrated to be better in women and repeated

testing is even higher when women were married, had children under their care, older and educated (Mhlongo et al, 2013; Venkatesh et al., 2011). Further, Mhlongo et al. (2013) demonstrated that unemployed men, students, or those that belonged to low-income group had a lower VCT uptake than their female counterparts. The above demonstrate that the factors that impact VCT uptake in males and females vary and depended on factors like marital status, race, age, and level of education.

The ages in which men and women undergo testing differ among South Africans. A study in Mpumalanga among 282 public and non-governmental VCT site showed differences in the age at which males and females undergo HIV testing; the study showed that males underwent tests at older ages than females (median age of testing was 32 years in men, compared to 28 for females). Most men and females tested were between the ages of 20 to 39 years (peak age), however only 17.4% of females tested were older than age 40 (versus 30.4% of males), and only 5.7% of females were above age 50 versus 11.7% of males (Snowa et al., 2010). Different reasons can be responsible for this trend most importantly is the earlier and frequent contact between females and health systems like antenatal and child care.

The uptake of VCT is related to the risk factors to HIV infection among men. The low uptake of VCT among sexually active men is exemplified among a cross-section of screened men in Soweto men who recently underwent traditional circumcision in Eastern Cape. It was demonstrated that the VCT uptake among men was low (35.1%) and the intention to test was positively associated with factors like probability of getting an STI, attitudes towards gender-based violence, education on being responsible men, and highest grade passed among others. This study also demonstrated that 71% of screened men had not had VCT and 55% of them were young men between 18-23years (Nyembezi et al., 2014). This study demonstrated that an

interplay of factors impact men and women decision to undergo VCT (Venkatesh et al., 2011; Mhlongo et al., 2013). However, it is not clear whether the findings in this study apply to the entire country. This could be validated by the present study and the most significant interactions identified.

The effect of gender on the uptake of VCT extends to the attitude of mothers on the PMTCT program. Mothers generally are expected to avail themselves of the PMTCT program for the sake of their unborn children. Despite mothers believing in the positive impact of PMCT and the benefit their children could derive from this program, there is still a lot of missed opportunities and the incidence of positive children remain unacceptable in South Africa. In peri-urban Kwa-Zulu natal with high HIV prevalence there was no report of testing of pre-school children of HIV positive mothers even after pre- and post-pregnancy testing was missed among primary care givers (Chagan et al., 2011). The inference from this is that infected children go on to school age with attendant problems of failure to thrive, HIV morbidity, and mortality. There is also little inclusion of pre-school children after the period of pre- and post-natal care of their mothers.

PMCTC uptake in SA is not satisfactory. About 1 million babies are born in South Africa yearly and of this only 70% receive PMTC falling short of the less than 5% target set by the United Nation (Peltzer et al., 2011). Pregnancy is particularly an important stage in the life of a woman and if VCT uptake must be increased, PMTCT and male participation in the VCT process must be encouraged (Peltzer et al., 2011). In another study with similar results in some peri-urban communities the coverage of mothers who are care givers to pre-school children is high even when the coverage for these children remains low (Chagan et al., 2011). It is therefore important to increase the coverage of pregnant women, improve education during antenatal,

encourage early childhood testing, and reduces mortality of children (Chagan et al., 2011). VCT and dual ART is offered to pregnant women for free in South African public clinics although it is still a long way before the government meets its target for reducing peri-natal infection. Further education and counseling is necessary for foster mother to ensure early childhood health

Pregnancy has long been regarded as an opportunity for males to enter the VCT program. The impact of men on PMTCT was tested in a study conducted during antenatal in a Capetown study. This study involved the participation of men in the antenatal visits of pregnant mothers, with a view to encourage uptake of VCT by males. The randomized group of male sexual partner (MSP) in the VCT session and the Program information session (PIS) group were provided written letters through their spouses for participation. The result showed a significant difference in the number of men and women reporting unprotected sex during pregnancy with the MSP, VCT arm having about 26%, MSP, PIS arm having about 76%, and with no difference in intimate partner violence (Mohlala, Boily & Gregson, 2011). This difference means that VCT uptake was more successful in reducing vertical (MSP) and horizontal transmission (MSP) of HIV than PIS and that providing written letters increased male participation in antenatal and increased uptake of VCT by couples while probably reducing intimate partner violence (Mohlala et al., 2011).This showed that avenues of VCT uptake can be used for counseling on other health promoting behavior and health provider have a major part to play as suggested by the ITHBC theory.

The important role of Adolescents and young adult girls in prevention of HIV and VCT uptake are becoming obvious in many studies. The recent HRSC (2012) survey showed that Adolescent girls and young adult girls have the highest prevalence of HIV infection. Despite the effort of the United Nation to focus on this group towards reducing incidence to less than 20%

by 2015 the prevalence has been unsatisfactory (HRSC, 2012). HRSC (2012) study also suggested that the uptake of VCT among adolescents is probably low and HIV incidence high because of their lack of knowledge and vulnerability to the influence by older men. In epidemics of a heterosexual nature adolescents further present with more risk of HIV infection (USAID, 2009) because of early sexual debut, poverty and violence against women. Shisana et al. (2010) suggested that late sexual initiation is a factor that reduces exposure to the HIV virus hence reduces the risk of contracting the infection while early sexual debut, poverty, intergenerational sex, alcohol and recreational drug use which are often linked to impaired judgment lead to casual sex and incorrect or inconsistent condom use.

Contrary to the above, another study found that the VCT rate among adolescent girls in South Africa is incongruent to their knowledge of the advantages of VCT. In Kwa-Zulu natal it was found that despite 91% of the respondent in a study indicating that they would seek VCT, only 28% actually did (Francis, 2010). A focus group discussion cited the nature of the clinics as the reason given by adolescents for such poor uptake and suggested that adolescent friendly clinic with warm staff and waiting rooms are necessary if uptake of VCT must be improved (Jaspan et al., 2008). This illustrates that even when knowledge and intention to test are high; the real uptake of VCT could be much lower, emphasizing the need for leadership, policies and program to encourage a cue to action.

VCT uptake increases as age increases during youth and early adulthood. This age group seems to be vulnerable because of the quest for independence after leaving school; due to their pursuit for employment and identity which leads to high rates of pregnancy and STI including HIV. VCT acceptance is associated with older age, marriage, and living with partner (Johnston et al., 2010). However, in a study it was demonstrated that VCT uptake among male youth between

ages of 18-23 remained low (less than 29%) and those who tested were significantly older than those who did not (Mhlongo et al., 2013). In addition, Snowa et al. (2010) demonstrated that in Mpumalanga, the impact of gender on VCT uptake was so significant that even when testing done by female for PMTCT program (7.6%) were excluded, women were still more likely to test (64.1%) than men. This demonstrates that age and adolescence may not explain VCT uptake patterns, suggesting that combination of factors are more likely to explain VCT uptake patterns in adolescents.

VCT uptake in middle aged adult men and women differ from testing young adult. De Koker et al. (2010) showed that men were more likely to test for HIV at older ages and as a result of medical referral while youth were more likely to test in situation where they had discussion about HIV/AIDS and ART. Improved communication between partners, family, community, and friends improved uptake of VCT; this was demonstrated in a randomized study conducted in Kayalitha, Capetown where male partners of pregnant women were invited and provided with VCT. Up to 26% of men provided with VCT continued to have unprotected sex and 76% of the men provided with information session continued having unprotected sex (Mohlala et al., 2011).

VCT uptake is impacted by level of education and availability of HIV testing facilities. Peltzer et al. (2009) showed that female age group, being black between ages of 24-35years, living close to where HIV can be tested, and with higher educational status were associated with improved knowledge of HIV status. Mitchell, Cockcroft, Lamothe, and Andersson (2010) found that hearing about HIV/AIDS from a clinic, health center, and talking to someone about HIV/AIDS were associated with HIV testing. On the other hand, having primary education, a younger age (18-23), and having more than 2 sex partner in the past 6months were associated

with reduced uptake (Mhlongo et al., 2013). The above, illustrates that the determinants for improved uptake of VCT begin at a young age when race and gender-identity take root and culminates in young and middle adult life with other socio-demographic determinants like educational status and income playing a major role.

From the foregoing, it is reasonable to assume that the various studies reviewed in South Africa on the impact of gender and age provided varying outcome. Uptake was better in women and testing was likely at a lower age in women compared to men. It is un-doubtable that other socio-demographic factors interact with gender but it is not clear to what extent, when, how this happens, and the impact of settings on the uptake. The present study used a population based survey data to obtain the pattern of VCT uptake among gender and varying age groups. This study validated previous studies, determined interaction terms, evaluated various aspects of the ITHBC, and gender impact on uptake.

Marital Status

HIV prevalence and risk of infection was higher in unmarried persons and when socio-demographic factors like age, locality, and presence of STI were included in a multivariate logistic regression. The risk of HIV infection is still significantly higher in unmarried persons compared with married persons (Shishana, 2004). VCT acceptance is associated with older age, marriage and living with partner (Johnston, et al., 2010). However, having primary education, a younger age (18-23years), and having more than 2 sex partner in the past 6months were associated with reduced uptake of VCT (Mhlongo et al., 2013). Mohlala, Boily and Gregson (2011) on the other hand, demonstrated that men that presented to antenatal with partners had better VCT uptake than those who did not. This suggests that marital status has some relationship

with VCT uptake but did not clearly state what the relationship between various marital statuses and uptake of VCT were.

It is possible that t marital status is impacted by other socio-demographic factors. It is also possible that as the ITHBC suggests socio-demographic factors come together with the way VCT is packaged to influence its uptake.

Residential Area (Province & Settlement)

The areas of residence of a patient have an impact on the VCT uptake. There are several ways the residential area can affect uptake including distance from closest testing site, type of testing (free or fee for service), and the environment in which testing take place (warm and confidential or unkempt and confidentiality doubts). This was demonstrated in a focus group discussion among adolescents who cited the nature of clinics and health facilities as reasons for poor VCT uptake and suggested adolescent- friendly clinic with warm staff and waiting rooms in order to improve VCT uptake (Jaspan et al., 2008). Further, other studies have mentioned the problem of clinical practice standards and training especially nurse skills as deterrent for uptake in resource limited and residential settings where the VCT programs are nurse-driven (Leon, 2013).

Other factors include infrastructural and development of the area including urban, peri-urban, or rural. Residential areas are also generally associated with certain educational levels, socio-cultural believes, and socio-economic levels. For example it was found that conventional VCT may be unable to meet all the needs of South Africans as certain residential areas are left uncovered due to unavailability of services in these areas (Rohlender et al., 2009). Further, among women determinants of Multiple Sex Partners included economic vulnerability, younger

age at sexual debut, and living in formal urban rather than formal rural area (Onoya et al., 2014). On the other hand, Baisley et al. (2012) asserted that respondents that test for HIV were from variable background and religion without consistent variations from one type of residential area to the other.

Marginalized communities like informal settlements and squatter camps are less likely to have access to VCT services due to economic reasons, distance from service centers, and their possible preference for traditional doctors over modern medicine. Other factors are education, cultural, and language barriers. This likelihood of not using health services also make it difficult for them to seek testing, treatment, and care for their problems contributing to the propagation of HIV (Thiede, Palmer & Mbatsha, 2004). The differences in the VCT uptake in rural, peri-urban, and urban areas is exemplified in several studies on socio-demographic determinants and VCT in these areas.

Peri-urban communities have presented a mixed picture on the uptake of VCT and its determinants. Montague et al. (2014) demonstrated in a school based setting in Kwazulu-Natal that knowledge of VCT was high and uptake was determined by the level of education and self-perception of persons infected with HIV in peri-urban population in Kwazulu-Natal. Chagan et al. (2011) showed that even when knowledge was high, the uptake of VCT among mothers and primary care givers for their newborn babies, children, or those under their care was low. Another peri-urban study in Western Cape showed an increased uptake of VCT and stigma score when a community education, research, and ART program was introduced from 2004 to 2008. This study indicated that an education program and reduced stigma is important for improved uptake of VCT in these setting (Mall et al., 2012).

A similar finding was demonstrated by De Koker et al. (2010) in a peri-urban town in the Limpopo Province using a mixed focused group discussion. They showed that improved communication among focal groups, families, communities and between partners are factors that could improve uptake. They also showed that fear of result and discrimination is core motivators and deterrent to testing, and education must focus on these while considering contextual factors.

Several studies conducted in Soweto-a rapidly growing peri-urban area around Johannesburg in South Africa were used in this review. First, Ventakesh et al. (2011) demonstrated that persons who had discussions around HIV/AIDS and ART had a higher uptake while Mhlongo et al.(2013) showed that testing was commoner in the older age groups and in the low-income groups in Soweto. While most studies in the Soweto area and others mentioned in this review looked at specific provinces and location, this study will provide a holistic picture of the country; specific areas and comparisons would probably be possible from the findings.

Beside the direct impact of residential area on uptake of VCT, the human, infrastructural resources, and built environment can impact uptake. Mbengo (2013) demonstrated that the shortage of human and infrastructural resources, the inaccessibility to VCT services, and the long waiting period for test results are major causes of poor VCT services uptake. On the other hand, urban settlement and living close to HIV testing sites were associated with improved knowledge of HIV status (Peltzer, Matseke, Mzolo & Majaja, 2009). It is possible from the above, that the uptake of VCT is more dependent on the presence or absence of these resources than on the residential classification of the area.

Residential area as a socio-demographic determinant of VCT is not well studied and literatures are sparse. It is important to mention that communication and education are recurring common factor for improved uptake of VCT in most urban and peri-urban areas emphasizing

that the problem of lack of medium for continuing communication of health messages and VCT messages may be the main deterrent to uptake in these communities unlike in the urban areas with well-developed modes of communication. This forms the crust and gives basis for the work by the JHHESA (2012) National Communication Survey; this will further be explored in this study to determine and compare the trend of VCT uptake in different parts of the country. This review further suggests that these communication media could be more needed in the rural and peri-urban areas of the country.

Socio-economic factors, Income and Unemployment

Socio-economic, Poverty, Income, and Un-employment are closely related. Without exception the common denominator among these factors are unemployment rates and low income. The employment status of South Africa as a country is unique, beginning from the end of apartheid to today, the employment has continuously worsened year after year. Several measures to curb unemployment have been greatly ineffective and measures put in place to assist marginalized communities have had very little effect to address these problems (IMF, 2009). The implication of this problem is the perpetuation of factors that worsens propagation of HIV like poverty, early sexual debut, and domestic violence.

Unemployment affects all aspects of the South African society including health and the HIV epidemic. According to the CDC (2013) to reduce the prevalence of HIV in communities disproportionately affected by HIV; the social, economic, and environmental factors must be tackled first. It further suggests that poverty, immigration status, language barrier, discrimination, stigma, and homophobia increase unemployment and the prevalence of undiagnosed and untreated HIV and other STDs in these communities.

Socio-economic status has been measured in different ways, in the national communications survey (NCS). SES was measured by taking stock of household appliances present in the household of the respondent. NCS in SA classified 39% of households as 'high' socio-economic status, 32% of respondents as 'medium' socio-economic status, and 29% as 'low' Socio-economic status. In the NCS study there was a significant difference in socio-economic status across provinces; KwaZulu-Natal and Limpopo had the highest percentage of respondents classified as 'low' socio-economic status while the lowest were Northern Cape and Gauteng provinces (JHESSA, 2012). In a similar light, the HRSC (2012) identified KwaZulu-Natal, Gauteng and Limpopo as sub-provinces with highest prevalence of HIV. The above shows that provinces like Limpopo with low socio-economic status, low HIV prevalence, and also had low VCT uptake (HRSC, 2012). An analogy that can be drawn from these is that there could be a relationship between SES, VCT uptake, and HIV prevalence.

Researches in different parts of Africa (Burkina Faso, Kenya, Malawi, and Uganda) have consistently shown that VCT uptake is worse among the poor and marginalized. Researches in Kenya have shown that persons that belong to higher socio-economic group were more likely to present at VCT facilities than those of lower socio-economic status (Obermeyer et al., 2013). In South Africa individuals in the upper Socio-economic class reported higher frequency of HIV testing (59.3%) compared to the low Socio-economic class (47.7%). Obermeyer et al. (2013) also showed that the poor had a higher stigmatizing attitude to HIV, worse perception of their susceptibility to HIV infection, and poor accessibility to information on HIV. In addition, to the poor accessibility to services, disproportionate burden and fear of HIV among the poor.

Employment status has been known to affect the uptake of VCT. The role of this factor is seen on a multi-country VCT service organized by Heineken. In this study it was found that

VCT uptake was higher among employed persons who were females compared to males. In addition it was higher among female spouses compared to males. VCT uptake was 8% among employees in the first year compared to 3% in the second year. HIV infected employees were more likely to test earlier than non-infected ones, they were in more advanced stages of the disease, and their spouses were more difficult to reach (Van der Borght et al., 2010).

The impact of socio-economic status on VCT uptake is dependent on other factors like being care givers, gender, and level of education. Ventakesh et al. (2011) showed that even when socio-economic status of men and women were different even when they may still have similar uptake of VCT. They showed that men with less than 12 year education had higher uptake of VCT if they belonged to a higher socio-economic class and women of lower socio-economic class with children under their care had a better uptake than the normal expected for that socio-economic status. Although, Chagan et al. (2011) did not quite demonstrate the same when they showed that even when mothers had children under their care their uptake of VCT did not improve.

In summary, despite the little publication on the socio-economic factors in south Africa on the uptake of VCT, it is obvious that men of higher socio-economic class, educated up to grades 12, and employed had a higher uptake while in women socio-economic class played less role. However, the responsibility of caring for children, marriage, and education could be an additional factor leading to improved uptake in women. Although, the above could not account for why women had a better uptake than men; fear, sense of responsibility to children, family and higher contact with the health system in pregnancies (PMTCT) may have a role.

Summary and Conclusion

This study used the ITHBC theory to understand the impact of socio-demographic determinants on VCT. Various theories have been used in the past for similar studies but the ITHBC theory is new and has the advantage of looking at the index individual, the health provider, socio-demographic factors as social facilitators of health behavior or VCT uptake, and social integration. In the ITHBC theory the social integration of various factors and individuals is necessary to bring about short-term self-regulation and long-term control of chronic diseases like HIV.

This study used quantitative methods and a cross-sectional design to study how socio-demographic factors affect VCT uptake. Although done before, the present study differed in various ways: One aspect is that it used secondary data from a primary study which differed in the residential setting, sampling methods, and sample size used in other studies; the primary study was a population-based one, with sample taken from the 9 provinces of SA and it is painstakingly designed to reduce bias and ensure validity and reliability of result.

In this chapter, I discussed previous literatures on the areas of socio-demographic determinants of VCT uptake. From this review it can be concluded that women are more likely to undergo VCT than men and also more likely to present at a younger age than their male counterparts. While many studies showed the advantage of education in the uptake of VCT, there tend to be a decrease in uptake after secondary education. Few studies are available on the impact of residential area on the uptake of VCT however, there is evidence that the marginalized communities may have poorer uptake and the peri-urban areas may have a better uptake than the urban areas, a behavior akin to the impact of education.

In this review, it was identified that poor, unemployed people who belong to the low socio-economic class and are also likely to live in marginalized communities are more likely to have poorer VCT uptake and higher stigma levels to HIV positive persons. On the other hand, female gender, secondary education, and people living in peri-urban communities have higher VCT uptake. It is also important to mention that socio-demographic factors rarely act alone, but is more likely to act in consonance or otherwise with some factors than others depending on the prevailing circumstances and the factors that are at play.

In conclusion, it is interesting to see that most determinants of VCT uptake showed a bell shaped curve with uptake peaking in the moderately educated, middle income earners and people living in peri-urban communities. Whether this is so because of little studies in these area or the limitation of the sample used for most of these studies is not clear. What is important and clear is that new studies around these factors are needed; this probably lends support for the type, source and analysis of data in this study.

Chapter 3: Research Methods

Introduction

The purpose of this study was primarily to understand the impact of Socio-demographic determinants of VCT in South Africa. It also sought to understand the findings in the literature review by ascertaining the impact of these determinants through a population based survey. It was hoped that a model for South Africa could be developed through multivariate analysis and the results from the study used to suggest possible ways necessary to improve VCT uptake.

This chapter describes the research design and methodology; this study was a secondary study, and borrows from the design and methodology used in the primary study. The design and methodology of the primary study is described briefly in this chapter including any data manipulation made for the secondary study. Also included in this chapter are the procedures, operationalization, pilot study, ethical procedures, and the processes followed to obtain the data for this study. The ethical responsibilities of the researcher to the primary researcher, respondents, Walden University, and IRB would be discussed. At the end of this chapter, I would have briefly described the step by step procedure the primary researchers took, as well as, the steps and responsibilities I followed for the completion of the study.

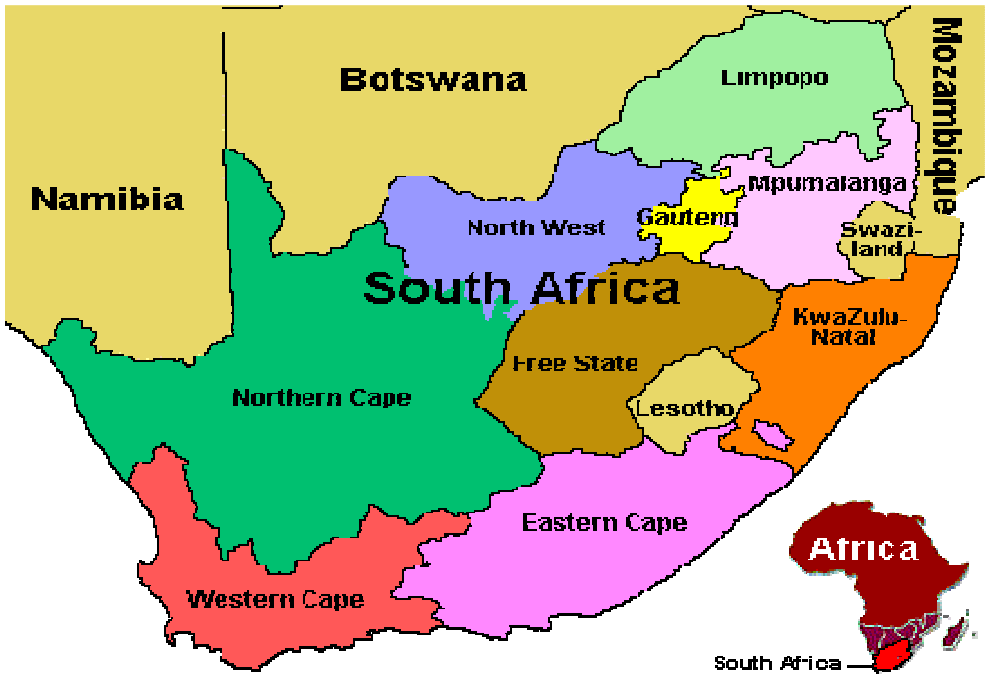
Research Design and Rationale

This study used a cross-sectional study design and the independent variables were studied to determine how they affected the dependent variable. This study demonstrated the VCT uptake of various race and age groups in SA. It developed a multivariate model by adding variables by a forward regression technique and ascertained which predictors had a significant effect on outcome. The limitations of the primary study were similar to the secondary study. For

instance, the respondents could not remember all the information required in this survey as some information needed to be recalled (recall bias) and socially desirable answers were possibly provided especially for embarrassing questions which were rife in this study (social desirability bias). Information and misclassification bias were also possible limitations. The design choice was appropriate since quantitative data was used. The methodologies described below applied to the primary study.

Methodology

In the primary study the target population were selected from sub-regions until a representative data was obtained with approximately 10, 000 respondents in the survey in all provinces of SA representing 16-55 year olds across all population groups in SA.



The Map of South Africa showing provinces and surrounding Southern African Countries

Population and setting:

The secondary study used the samples and data collected in the primary survey. The primary data was collected by Multi-stage cluster sampling which drew 400 primary sampling units (PSU) in 3 stages (JHESSA, 2012). Sub-places represent the smallest and Primary Sampling Unit (PSU) which were obtained by sampling each province proportionate to its size. The size represented the number of individual in each sub-place. The country was stratified into its nine provinces with contribution of each proportional to its size.

The Target or Source Population included South Africans between the ages of 16-55years. All sex, race, and residential area were included if they meet other inclusion criteria; like eligible persons must have spent at least 4 or more night per week for most part of the year in their household of inclusion.

The Survey Population was identified by first, random sampling of each sub-place and additional numbers added by systematically skipping through the sub-places to make up the required sample size for each province. Second, systematic random sampling was done using sampling intervals according to the total number of households in the sub-places included.

The third stage involved sampling each household to obtain one person from the eligible persons in the household. The Study Population was the number of identified individuals who responded or availed themselves of the interview, in this case 83% of identified persons.

Sampling and sampling Procedure

The design of the primary survey was carefully planned to systematically include the entire country; four hundred primary sampling units (PSUs) were draw by a multi-stage and cluster sampling approach. The multistage cluster involve a three stage procedure firstly the

determination of the primary sampling unit. Second, the calculation of number of household based on the population of each household and third stage; involve selecting eligible respondents in the household. This study also accepted and used the 33:66 group populations for age groups 16-24 and 25-55 respectively used in the primary study. In this respect the population size of provinces were considered during sampling. This means that in order to yield reliable results smaller provinces like Northern Cape had to be oversampled to improve reliability.

The first stage involved the PSU and used data obtained from statistics South Africa; sub-places were used as the PSU and were derived from the smallest classification of population aggregation data for census purpose in South Africa since 2001. In this sampling, the population of each province was used to determine the number of respondents from the PSU. Sampling was preceded by first selecting sample from the PSU according to the probability proportional to size and each PSU contained sub-places with specific number of individuals. After the initial random sampling of the PSU, the sub-places were randomly selected from each PSU.

Subsequent systematic selection of sub-places from each province was derived by dividing the province proportionately to meet the proportional number for the sample size for each province. To meet the sample size desired for the province; units contributed a number of individuals proportional to its size. The PSU was sampled on probability proportional to size in each province and the measure of size was the number of persons in each sub place. Sub-places were initially randomly selected from each province. Thereafter, sub-places were selected and added from each province by the use of the sub-places listed for each province by systematically skipping through this list. This was done in each province using sampling intervals that yielded the needed sample size. Four hundred PSUs were selected and used in all.

The second phase involved systematic sampling of households in the sub-places. The beginning point was ascertained by random sampling. The final stage involved the identification of respondents to be interviewed and the preferred respondents were between 16-55years and had spent not less than four nights for most of the year. The respondents were selected by random sampling of eligible respondents using the KISH grid method.

Pilot study

The pilot study was performed in the primary study to identify hurdles and problems in the understanding of the questionnaire by the respondents and the researcher so that such difference were corrected before the main study. Gauteng, KwaZulu-Natal, and Eastern Cape were used for the piloting of the questionnaire using a total of 100 respondents from 5 identified wards. At the end, the questionnaire were revised, rephrased and validated to make sure that respondents and researchers have similar understanding of the content. In matching the understanding of researchers and responders, field workers errors were addressed in training and eventually minimized. The post-pilot questionnaires were obtained by correcting for problems during the pilot study and finally the questionnaire was translated to the 10 official languages.

Procedure used for Recruitment, Participation and Data Collection

Source of Secondary Data

The Johns Hopkins Health and Education in SA (JHHESA) conducts national communications surveys in SA; this has been going on since 2008. This institution is an affiliate of the Johns Hopkins University Bloomberg School of Public Health.US. The data that gave rise to this study was presented at the HIV/AIDS conference in Atlanta, Georgia (2012). Further, the

JHHESA (2012) presented the National HIV Communication Survey (NCS) reports in other conferences with several peer reviews by colleagues and organizations. The data used in this study is part of the data collected in the process of investigating socio-economic, behavioral, and communication variable in the uptake of VCT for HIV prevention.

A letter addressed to the institute including the premise for this study was delivered to the research committee of the JHHESA and an initial positive response obtained. Data user agreement was signed with the organization. The consent from the JHHESA had a proviso that data would be used as represented, confidentiality preserved, and the outcome of the research made available to the institute (A copy of this consent will be attached to the appendix). The positive preliminary response obtained for consent to use the data for the purposes of the study provided access to the data to determine feasibility of study and the presence of data and variables needed for the study. After this, the data was obtained from the institute, it was sent to my drop box in STATA format since the original software used for analysis was STATA. The data was converted by software converter to SPSS which enabled it meet the requirement of the Walden University. The data use and analysis commence after the institutional review board of Walden (IRB) approved my dissertation.

Chi squared and Wald statistics were used for the estimation of the effect size. These are traditional measurements used in logistic regressions for the measurement of the effect size. This study uses a secondary data therefore no fresh calculation of the sample size will be made, instead all the sample used in the primary study will be included in the secondary study. This will insure maximum sample size, adequate power, and improve validity and reliability. However, this was limited by the problems of validity, bias, and reliability in the primary study. An alpha level of 0.05 was used.

Instrumentation and Operationalization of Construct

The primary study collected data that are necessary in this study and data collection was exhaustive and included all the variables that are necessary in the current study. In the secondary study the variables are

Dependent (outcome) Variable:

Have/have not undergone VCT in the past 1 year.

Independent (predictor) Variables:

Education: No schooling, up to grade 11, Matric, and tertiary.

Gender: Male and female.

Race: Black, Indians, Colored, and White.

Age group: 16-24, 25-49, and 50-55.

Marital status: Not married, not married but in a steady relationship, not married but live with partner, married and living with partner, married but not living with partner, and divorced or widowed.

Socio-economic status and poverty: In this study socio-economic status, poverty, and income class were measured and classified as low, medium, and high. In the primary study socio-economic class was measured using living standard measures. This is a measure of the household items the respondent have; presence of flushable toilet and other household facilities. The use of a flushable toilet is supported in SA as it means the presence of running water, municipal services, and possibly the presence of electricity. Kevany et al. (2012) measured SES by the presence of one of any three alternative measures: Flushable toilets, household goods, or presence of roof and type.

Data Analysis

The type of analysis I used with my data included methods of analysis for quantitative data. This methodology determined the frequencies of predictors and outcome (univariate analysis), compared single outcome and predictor variable (bivariate analysis), and impact of various confounding predictor variables on the outcome variable (multivariate or logistic regression). The independent variable included all the socio-demographic predictors of VCT uptake while the dependent or outcome variable was having had a VCT or not in the past year. The dependent variable was tested against all the independent variables to ascertain its characteristics as positive or negative predictors. IBM SPSS Statistics was used for the analysis of Data. Result was presented in graphs, tables, and figures. The manuscript structure, style, and display of results followed the sixth edition of the American Psychological Association (APA, 2010)

In this survey, information from respondents were obtained from data captured by the JHESSA from the questionnaires (attached). Multiple logistic regression methods were used to assess the impact of socio-demographic factors on VCT uptake behaviors in the SA population. In the primary study a continuous exposure and impact of programs on identified factors on HIV prevention behaviors were assessed while the secondary study mostly evaluated quantitative facts reported by respondents and assessed by the field workers. The statistical package used in the primary study for data analysis was STATA version 12 and the data were converted to SPSS in the secondary study.

Multiple logistic regression methods were used to ascertain the relationship between socio-demographic and uptake of VCT in the past 1 year. Factor analysis was conducted to confirm that the various socio-demographic factors could be combined to create a single model

that best describes the SA situation. Data was manipulated, merged, and cleaned when needed. Data and variables for this study were separated from the entire data before being used for the study. Cronbach alpha was used to measure the internal reliability of the model and the validity of the model was measured by its correlation to variables. The following questions were answered:

Research Question and Hypothesis

Research question 1:

What is the impact of socio-demographic determinants on VCT uptake?

Bivariate logistic regression analysis was performed between each independent variable and the dependent variable to show the significance of the relationship.

Research Question 2:

What socio-demographic determinants interact to impact VCT uptake?

Pearson chi-squared test is used to check the association between independent variables. Variables that were not highly associated with the dependent variable and/or are highly associated with other independent variables were excluded from the final logistic model (multiple logistic regressions). The assumption of normality was assumed due to large sample size.

Research Question 3:

Does racial group interact with gender to impact VCT uptake in South Africa?

There is no difference in the socio-demographic determinants of VCT uptake between different races and gender?

From analysis done in question 2, I extrapolated the role and differences between gender and racial groups to determine if the different groups have same impact on VCT uptake, and how socio-demographic factor interact with different racial and gender group.

Threat to Validity

Cross-sectional studies provide results of parameter estimates at a point in a population and give no estimates of ongoing observation or sequence of observations; hence the observation obtained can only be regarded as an associations or correlations, and not causal. Also, since this cross-sectional study is conducted at a population level, we can assume a time-order relationship where outcome measures are assumed to have occurred after or at the same time as the intervention.

Measurement of the key outcome behaviors (HIV testing) in this study was restricted to a time period. In this case, 12 months before the survey. It is possible then to make a causal relationship if other criteria are met; like confounding, exogeneity tests, and theoretical coherence. When all these statistical requirements are met it may be possible and justified to make a causal inference; reported between exposure to prevention and the hypothesized behavioral outcomes.

Self-reported and recalled information were used in this study and could have led to recall, misclassification, and social desirability bias. However, these factors are likely to have affected the tested and the untested (or exposed and non-exposure) to similar levels leading more to non-differential misclassification which will not affect the outcome and calculation significantly.

Validity of the information provided (recall bias) in the questionnaire would be tested: Various methods can be used to compare results of two dependent variables when one is the predictor variable; multivariate regressions analysis was used here to detect lack of validity that self-reporting in a survey may bring about, and the difference between direct and indirect variable. It could also solve confounding and selection bias problems.

The overall response rate in this study was 83%. Non-responders such as households that were ineligible, where nobody was at home, and where there was a refusal made up the remaining. Given that demographic information was not available on characteristics of the non-responders, this study could not determine if the non-responders biased the result of the study.

Ethical Issues

Procedures and Participations

I sought approval of this secondary study from the Walden university institutional review board (IRB) and they approved the study before I commenced. However, the Institutional Review Boards of the Johns Hopkins University Bloomberg School of Public Health and the University of the Witwatersrand's Human Research Ethics Committee (Non-medical) issued approval for the primary study. Ethical considerations were given to several issues in this study before commencement.

In the primary study the following were addressed: Autonomy involved making sure respondents were informed and understood that they could withdraw at any stage of the survey, and are not oblige to finish the survey. The field worker read the content and the consent form to the respondent before they signed the forms. The questionnaire was written in the home language of participant. Individual aged between 16-17 years needed to provide consent with additional

consent from their parents. The individuals were also given the choice of their preferred venue and their freedom to make a comment.

In considering participation as a field worker in the primary study a comprehensive consideration of several issues were undertaken; in the study design, survey training were offered to the field workers, and field workers were matched by age and gender to respondent to reduce the effect this may have on the result. However, female field workers were allowed to interview male respondents. Field workers helped to ensure confidentiality during the collection of information.

The ethical issue of Beneficence was an important one in this study; the benefits and requirements from participants were explained to the participant at the outset. Although, they could benefit from the materials and understanding of the disease through the questions, they were clearly made to understand that no financial benefit will be derived. How the society could benefit by the use of the information and the result of the survey were explained; potential social change implication, how results could help in planning for HIV prevention, communication, and help society in general.

Non-maleficence involved informing and ensuring that the respondent received confidentiality during the research, and that results linked to participants were de-identified before release to the public domain. Respondents were provided information on the nature of research, confidentiality issues, informed consent, anonymity, respect, and honesty in relation to the research processes.

In addition, the respondent were given contact number of who or organizations to contact in case they had questions, concerns, needed help on ambiguous issues, or need further help medically. All the consent forms bore unique identifier codes not traceable to the

participants, and the consent forms were kept in a safe place to be destroyed after 5years in accordance with requirement if need arises. All respondents were treated equally and committed to the agreed recommendations and procedure which was necessary to avoid risk and harm to the participants (Distributive Justice). At the end the study and data collections were completed without incidents or adverse effects.

Handling of Data

I reached a full agreement with the primary holders of the data for secondary use in this study. Although no direct contact with human participants were made, I exercised all caution necessary to avoid the misuse or mishandling of data I held. I treated all data as though I directly obtained it from the human subjects concerned. The institutional review board provided all the necessary approval of this proposal before I proceeded with full data use and analysis. There was an IRB approval number for the proposal (see appendix) before I proceeded with the collection, use, and disaggregation of data.

I also abided by the required ethical regulations guiding the discharge of scientific researches including the rule of autonomy, beneficence, confidentiality, and honesty as described elsewhere in this dissertation. I discharged this research with respect, followed all laid down procedures and processes for use of data obtained from primary sources as secondary data, including the protection of participants and subjects of the primary research study.

I upheld the rules by Walden University in the conduct of researches including the handling of data made available to me scientifically, and all manipulation of such data followed clear scientific methodologies. The result of data analysis was completely anonymous. The raw

data is safe from other external bodies to prevent the matching of data by readers. The data provided by the JHESSA is stored safely for 5 years before I will discard them if necessary.

Summary

In this chapter, I dealt with the methodology and design I followed in executing this study, and discussed the variable as it applied to the research question. The steps and procedures followed in the primary research were highlighted and explored, and additions that applied to this study made. The steps in the primary study are acknowledged as steps taken in obtaining the data that was used in this study and manipulation of data were done when the need arose. Ethical issues were very important in this study and were discussed and applied extensively. There was need to consider the conditions and rules that governed the primary study, Walden University IRB, and the JHHESA in the use of data in completing this study.

I also acknowledge and accept all ethical responsibilities in this study. Validity issues, steps needed to improve the study findings, and validity and reliability of this study have been implemented. In the nest chapter the step by step presentation of the results of the study will be done and finally discussions, conclusions, and summary of result.

Chapter 4: Result

Introduction

The purpose of this study was to determine the socio-demographic factors that impact VCT uptake in South Africa. Determine the impact of race and gender on VCT in South Africa, and understand how these factors interact. This study will enable policy makers, health professionals, and other bodies responsible for the planning and implementation of VCT programs to develop guidelines, policies, and programs that are contextualized, based on the socio-demographics that impact VCT in a particular group in SA to achieve a better uptake, improve HIV prevention, and risk reduction.

This study will also bring about equity, equality and social justice in the distribution of government programs in HIV prevention; this is to ensure those that need the interventions access it better. It will also bring about acceptability, reduced victimization, stigmatization, and discrimination against those that are infected due to better understanding of the disease.

In this study, the dependent variable is the uptake of VCT or the number of persons answering yes or no to a HIV test in the past one year before data collection. The independent variables are socio-demographic factors or variables like social (education and employment) and demographic (age, race, sex, and residential area) factors. The predictive study used a secondary data set from NCS data. Homogeneity at the sub- sites made pooling, quantitative analysis, and summary possible. The study population consisted of patients who answered questions relating to ART adherence and demographic determinants in 2012. The study involved analysis of data from the NCS electronic databases after Identifier information were remove.

Research Question and Hypothesis

Research question 1:

What is the impact of socio-demographic determinants on VCT uptake?

The null hypothesis:

Socio-demographic determinants do not have any impact on VCT uptake?

Alternative Hypothesis:

Socio-demographic determinants have impact on VCT uptake?

Research Question 2:

What socio-demographic determinants interact to impact VCT uptake?

The null hypothesis:

Socio-demographic determinants interact do not interact to impact VCT uptake?

Alternative Hypothesis:

Socio-demographic determinants do interact to improve VCT uptake?

Research Question 3:

Does racial group interact with gender to impact VCT uptake in South Africa?

The null hypothesis:

Racial groups do not interact with gender to impact VCT uptake in South Africa?

Alternative Hypothesis:

Racial groups interact with gender to impact VCT uptake in SA?

The 3 questions above are separate and not sub questions; hence each set of hypothesis will be tested separately.

The measurement of variables will use secondary data from the National Communication Survey data collected by the JHHESA (2012).The response rate in the primary study is 83% and this data contain all the variable of interest for this study. A pilot study was done in the primary study with 100 respondents from Gauteng and Kwa-Zulu Natal province.

This chapter will describe the process of obtaining data from the primary holder and describe any problems encountered including how the data was used for the various variables required in this study. I will also describe any problems encountered in this phase. I will proceed to report the findings of the study and data analysis and provide a summary of the key findings.

Data collection

The purpose, research questions, and hypotheses: In this study I did not recruit any respondents or use any instruments. The data was obtained from the NCS database; a primary study performed by the JHHESA. I applied for the use of the data and signed the data use agreements, and the use of data was granted by the steering committee of the NCS. When this was done and finalized the data was sent to me by e-main and I stored in my drop box. I had to convert data from STATA to SPSSS with as STATA was the initial software used for analysis. After converting to SPSS using a converter the data was uploaded in SPSS for further analysis. Before data analysis, a copy of the original and complete data was made; one was used for data manipulation and analysis while the other was stored for references and record purposes.

Data manipulation was done by deleting variables that are not necessary for this study. When the necessary data set has been obtained, data manipulation was done; in this study this involved the

manipulation of the dependent variable. In the questionnaire used for the predictive study, Question 11.4 reads: How many times did you test for HIV in the Past 12 months? The interviewee is given options to write how many times he/she participated in a HIV test for the year. In the secondary study this variable was coded as no or yes (0, 1). This meant that if the interviewee indicates 0 times it is categorized as no (0) while 1 or more times will be represented by yes(1). Coding as used here made it possible to consider the dependent variable as a binary or dichotomous variable making multiple logistic regressions the multivariate regression of choice.

Although the data acquisition process as described in chapter 3 went as planned, there are still limitations in the instruments and categories in which data was collected. For instance the employment category was merely divided into employed, unemployed and students. It failed to give a categorization of the employment status as to provide an idea on the real impact of employment or unemployment thereof: Are employment and income a variable in the uptake of VCT?

Representative Sample:

A multi-stage random sampling was used for this study. The sample can be said to be a representative sample of the population of the SA population. The population used in this study was selected from sub-regions until representative sample of approximately 10, 000 respondents were obtained for the survey in all nine provinces of SA across population groups in SA. Multi-stage cluster sampling was used to draw 400 primary sampling units (PSU) in 3 stages (JHESSA, 2012). Sub-places represent the smallest Primary Sampling Unit (PSU) which was obtained by sampling each province proportionate to its size. The number of persons from each PSU represented the number of individuals in each sub-place or province, and not the geographical

size. Sampling was preceded by first selecting samples from the PSU according to the probability proportional to size

The Target Population was South Africans who met the inclusion criteria. The Survey Population was identified by first, random sampling of sub-place and additional numbers added by systematically skipping through the sub-places to make up the required sample size for each province. Second, systematic random sampling was done using sampling intervals according to the total number of households needed from each sub-place. The third stage involved sampling each household to obtain one person from the eligible persons in the household.

The Study Population was the number of identified individuals who responded or availed themselves for the interview, in this case 83% of identified persons. The study also accepted and used the 33:66 group populations for age groups 16-24 and 25-55 respectively. Further, the Sub-places used well known PSUs which were the smallest classification of population aggregation data for census purpose in South Africa since 2001. The PSU contained sub-places with specific number of individual. This careful and painstaking sampling method ensured representativeness.

Table 1
Descriptive statistics of variables and response

		province	Local/settlement	sex respondent	race	age categories	marital status	employment	Education	had HIV test in last 12mt	socio-econ status scale
N	Valid	10034	10034	10034	10026	10034	10034	9739	10014	6444	10034
	Missing	0	0	0	8	0	0	295	20	3590	0

Baseline Characteristics and Demographics of Study Participants (N=10,034)

A total of 10,034 study participants took part in the study. All the participants were aged between 16 to 55 years and were from across the nine provinces of South Africa. The respondents are further classified according to their locale or settlements which included urban-formal or informal, rural, peri-urban, tribal, and farming. Male participants (40.5%) were lower than females (59.5%). Blacks made up a majority of the study population contributing 82% while Indians and whites contributed less than 2% each. The age category between 25-49 years made up 57%, followed by 16-24 year old at 33.9% , and 50-55year old contributed less than 10% of the study participants. Single persons were 44% of total study participants, while single, unmarried persons living alone in steady relationships and married persons living with spouse each contributed about 18% of respondents. Half of the participants in the study were unemployed, while a third was employed and a fifth were students. Persons in Matric and that had attained grade 11 made up 34% and 42% respectively. Persons in primary and tertiary contributed about 11% each. Socio-economic status was relatively evenly distributed with low at 27%, medium at 38% and high SES at 34% of study participants. Missing values were assumed to be completely missing at random.

Interpretation of Result

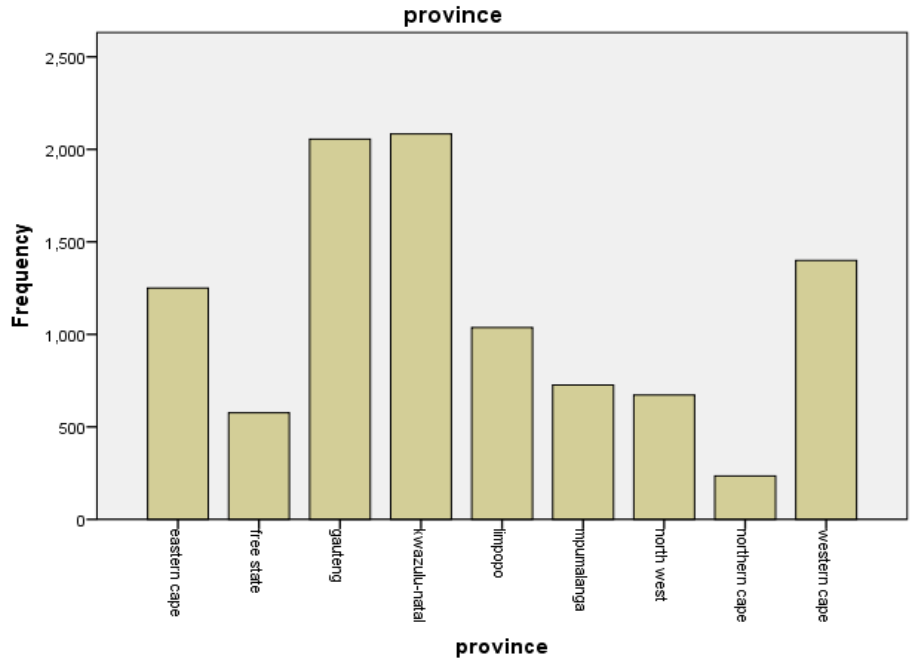
Univariate Analysis and Descriptive Data

Frequency tables

Table 2
Province

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	eastern cape	1250	12.5	12.5	12.5
	free state	576	5.7	5.7	18.2
	Gauteng	2055	20.5	20.5	38.7
	KwaZulu-nat	2083	20.8	20.8	59.4
	Limpopo	1037	10.3	10.3	69.8
	Mpumalanga	726	7.2	7.2	77.0
	north west	672	6.7	6.7	83.7
	northern cape	235	2.3	2.3	86.0
	western cape	1400	14.0	14.0	100.0
	Total	10034	100.0	100.0	

Figure 1
Respondents by province



There are nine provinces in SA. In this study Kwa-Zulu Natal and Gauteng, the economic capital, were most populated followed by western cape. Northern cape had the least population and over sampling was applied in such provinces to ensure proportionate representation.

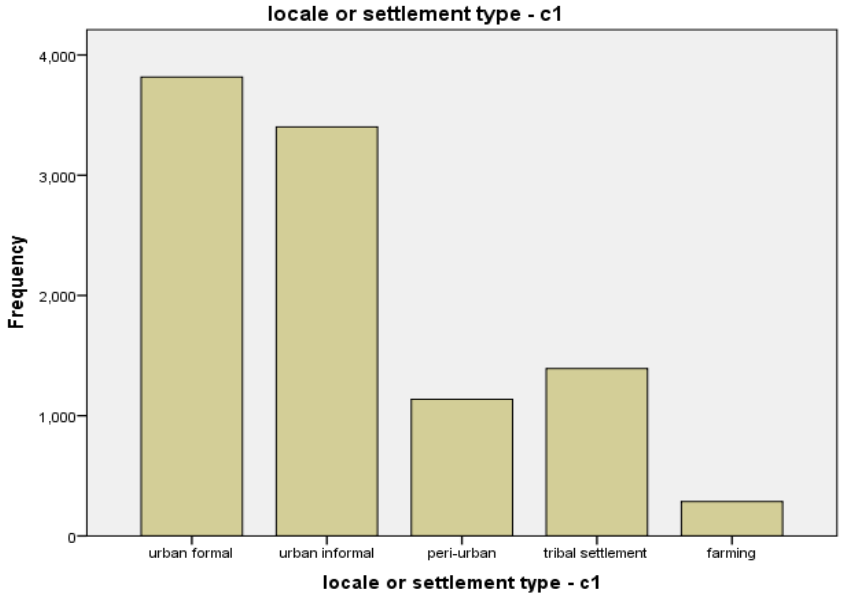
Table 3

Locale or Settlement type of Respondent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	urban formal	3817	38.0	38.0	38.0
	urban informal	3402	33.9	33.9	71.9
	peri-urban	1137	11.3	11.3	83.3
	tribal settlement	1392	13.9	13.9	97.1
	farming	286	2.9	2.9	100.0
	Total	10034	100.0	100.0	

Figure 2

Bar chart of Respondents by settlement



The above demonstrate that more than a third of South African population is urban. This rapid urbanization of the SA population is possibly due to better infrastructure, housing and more availability of employment in the urban areas. Farming population which is related to the food producing and agricultural sectors make up less than 3% of the population.

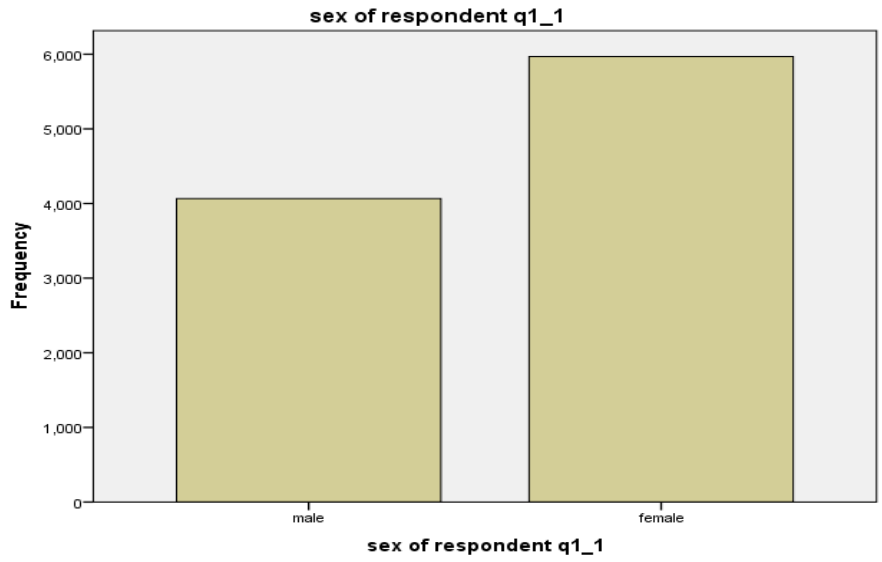
Table 4

Sex of Respondent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	4065	40.5	40.5	40.5
	female	5969	59.5	59.5	100.0
	Total	10034	100.0	100.0	

Figure 3

Bar chart of Respondents by Gender

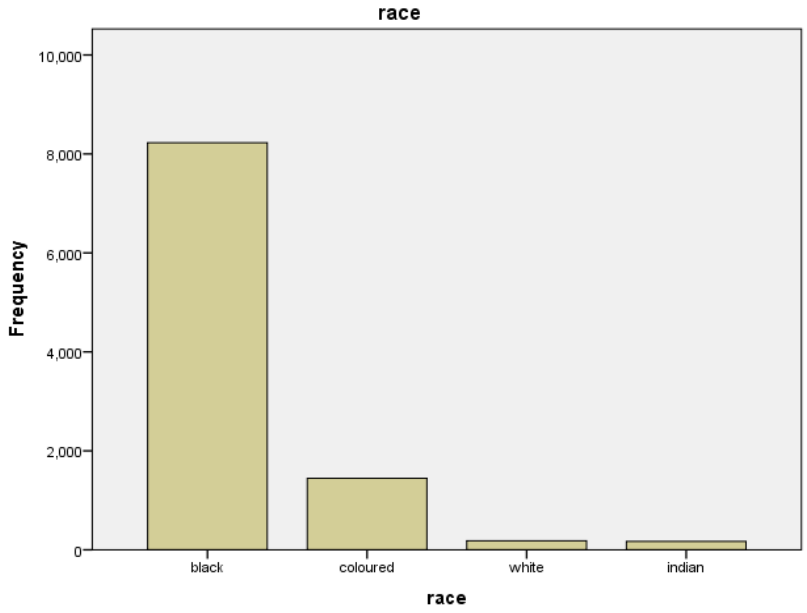


This statistics demonstrates that the respondents in this survey were mostly females making up 60% of the population compared to 40% of males.

Table 5
Race

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	black	8225	82.0	82.0	82.0
	Colored	1447	14.4	14.4	96.5
	white	183	1.8	1.8	98.3
	Indian	171	1.7	1.7	100.0
	Total	10026	99.9	100.0	
Missing	System	8	.1		
Total		10034	100.0		

Figure 4
Bar chart of Respondents by Race

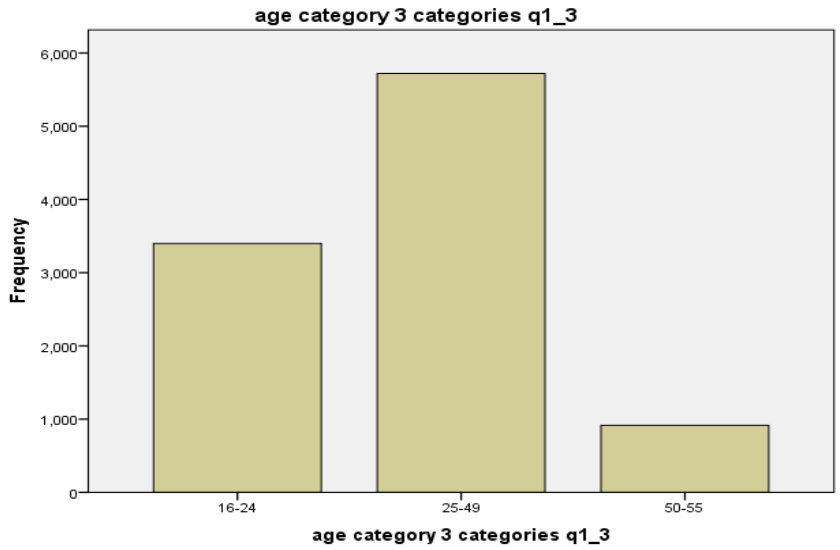


The respondent in this survey were mostly blacks, making up more than 80% of the total study population. Colored race made up about 15%. Whites and Indians made up less than 2% each. Whites had the highest percentage of Non-respondents in the study. The implication of the distribution of the race in this study is that apart from blacks the standard errors of the other races are likely to be wide and needs to be considered carefully.

Table 6
Age Categories

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	16-24	3399	33.9	33.9	33.9
	25-49	5720	57.0	57.0	90.9
	50-55	915	9.1	9.1	100.0
	Total	10034	100.0	100.0	

Figure 5
Bar chart of Respondents by Age categories

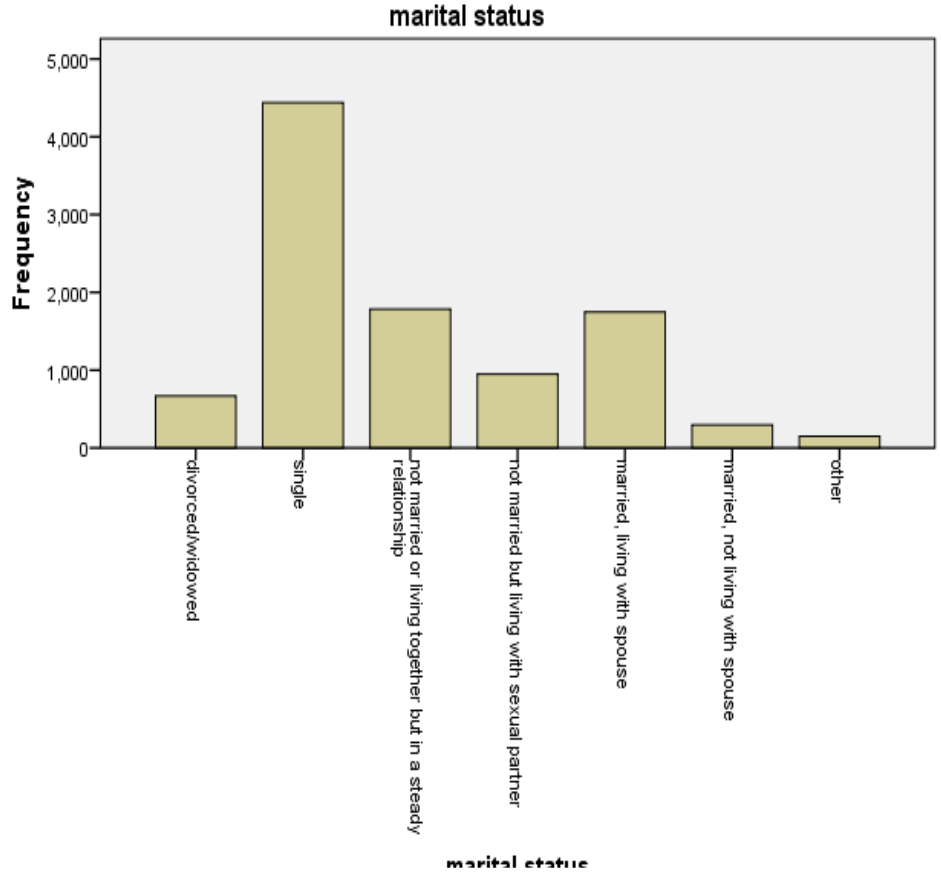


Respondents in this study are mostly age group of 25-49 years making up more than half of the population. Age group of 16-24years makes up about a third of the respondents. Respondents greater than 50years old made up less than 10%.

Table 7
Marital Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	divorced/widowed	668	6.7	6.7	6.7
	single	4439	44.2	44.2	50.9
	not married or living together but in a steady relationship	1784	17.8	17.8	68.7
	not married but living with sexual partner	948	9.4	9.4	78.1
	married, living with spouse	1748	17.4	17.4	95.5
	married, not living with spouse	297	3.0	3.0	98.5
	other	150	1.5	1.5	100.0
	Total	10034	100.0	100.0	

Figure 6
Bar chart of Respondents by Marital status

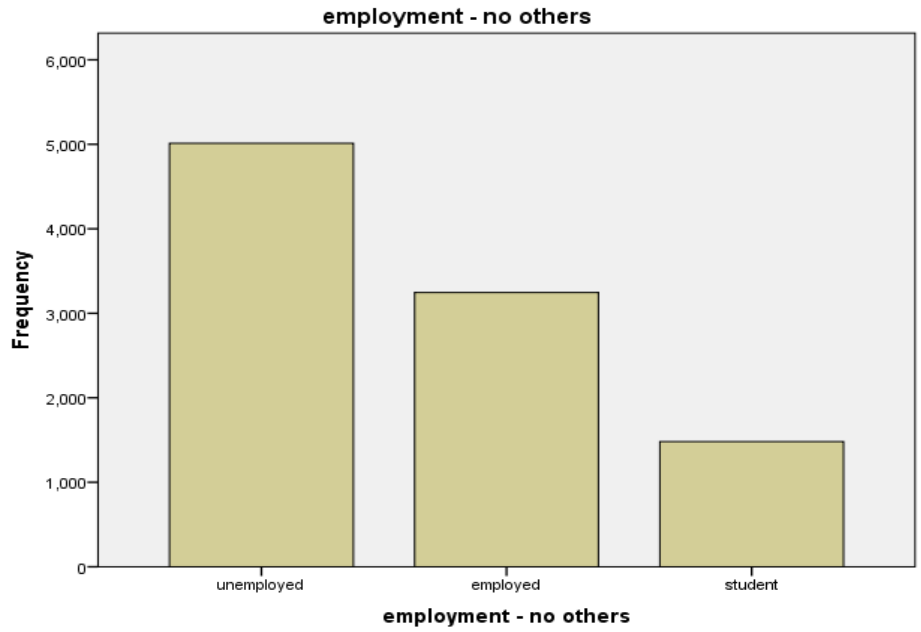


Unmarried persons(single,divorced/widowed,unmarried in steady relationships, living or not living with partners) made up most of the respondents used in this study making up just less than 80% of the respondents. Married persons made up about 20% of the respondents.

Table 8
Employment - no others

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	unemployed	5012	50.0	51.5	51.5
	employed	3246	32.4	33.3	84.8
	student	1481	14.8	15.2	100.0
	Total	9739	97.1	100.0	
Missing	System	295	2.9		
Total		10034	100.0		

Figure 7
Bar chart of Respondents by Employment categories



With the high rates of unemployment in SA, The employed population make-up about a third of the population with unemployed respondents making up the highest group.

Table 9

Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	up to primary school	1075	10.7	10.7	10.7
	up to grade 11	4253	42.4	42.5	53.2
	Matric	3385	33.7	33.8	87.0
	tertiary	1159	11.6	11.6	98.6
	no schooling	142	1.4	1.4	100.0
	Total	10014	99.8	100.0	
Missing	System	20	.2		
Total		10034	100.0		

Figure 8
Bar chart of Respondents by Educational status

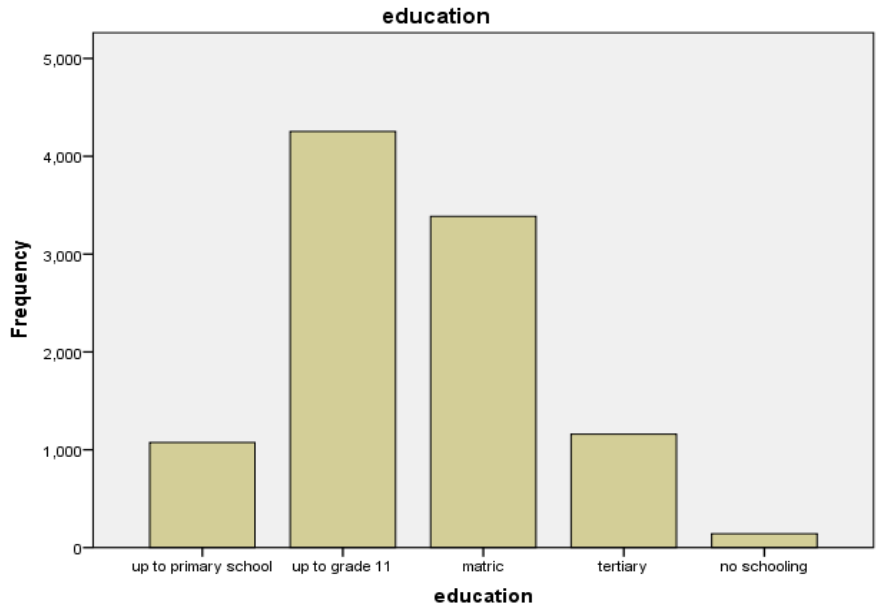


Table 10

Socio-economic Status scale

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	high	3477	34.7	34.7	34.7
	medium	3827	38.1	38.1	72.8
	low	2730	27.2	27.2	100.0
	Total	10034	100.0	100.0	

Figure 9

Bar chart of Respondents by socio-economic status

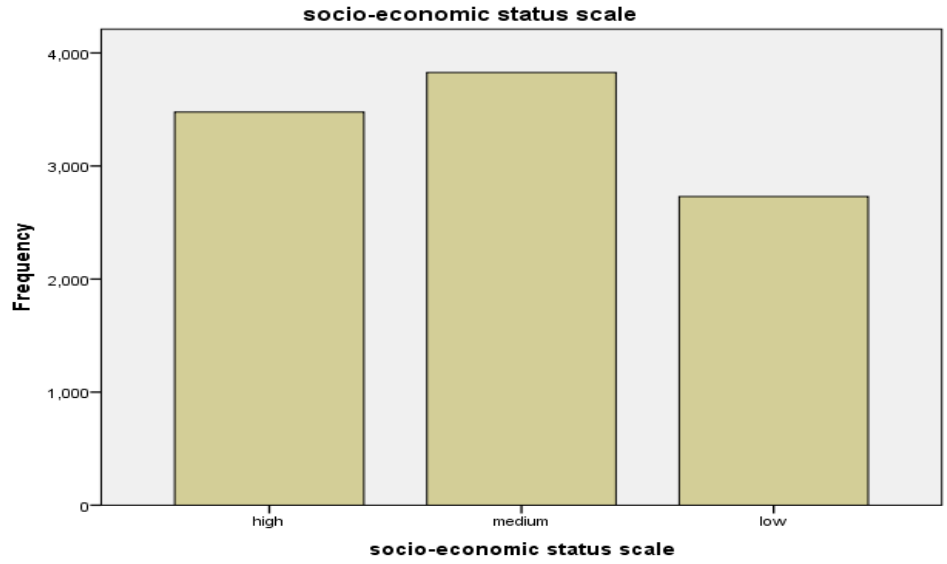


Table 11

Had test for HIV in the last 12 months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	2450	24.4	38.0	38.0
	yes	3994	39.8	62.0	100.0
	Total	6444	64.2	100.0	
Missing	System	3590	35.8		
Total		10034	100.0		

Figure 10
Bar chart of Respondents by uptake of HIV test in past 12months

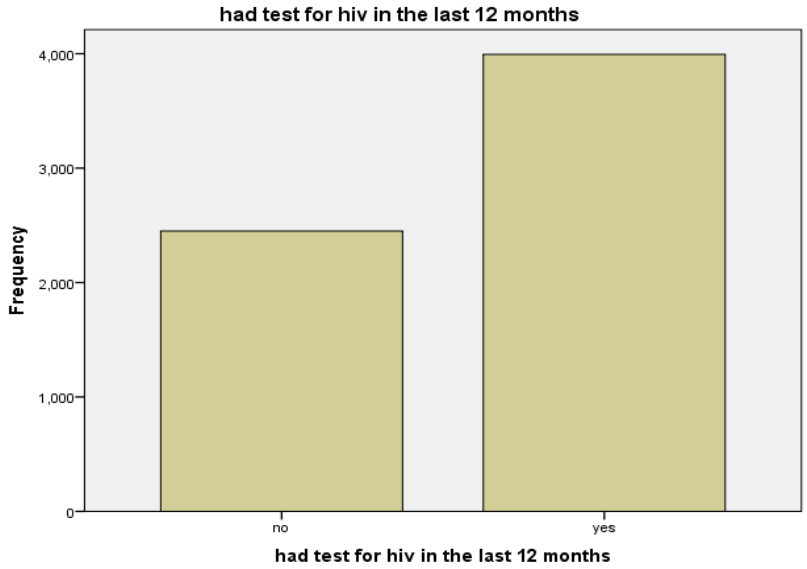
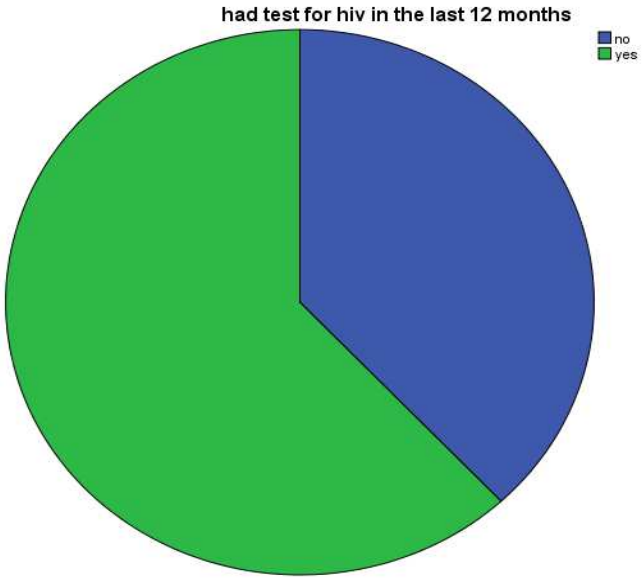


Figure 11
Pie chart of Respondents that had HIV test in past 12 months



A total of 10,034 study participants took part in the study. 2,450 (24.4%) of the participants answered No while 3,994(39.8%) answered Yes to VCT uptake.

Baseline Descriptive Characteristics of Study Participants (N=10,034)

A total of 10,034 study participants took part in the study, 2,450 (24.4%) of the participants answered no to VCT uptake and 3,994(39.8%) answered yes. All the participants were aged between 16 to 55 years and were from across the nine provinces of South Africa, with Gauteng province (20.5%) contributing the highest and northern cape, the lowest (2.3%). The Country was further divided into 5 developmental areas with urban area-formal and informal-contributing about 70% of the study population. Specifically the urban-formal area contributed the highest number of participants at 38% while farming areas contributed the lowest at 2.9%. Male participants (40.5%) were lower than females (59.5%) and Blacks made up a majority of the study population contributing 82% while Indians and whites contributed less than 2% each. The age category between 25-49years made up 57% followed by 16-24 year old at 33.9% while 50-55year old contributed less than 10% of the study participants. Single persons made up about 44% of total study participants, this was followed by single unmarried persons living alone in steady relationships, and married persons living with spouse (each contributed about 18% of the population). Half of the participants in the study were unemployed, employed persons made up 32% of participants, and student contributed 15.2%. In addition, Persons in Matric and persons that had attained grade 11 made up 34% and 42% respectively. Persons in primary and tertiary education contributed about 11% each. Socio-economic status was relatively evenly distributed with low at 27%, medium at 38% and high SES making up 34% of study participants

Evaluation Statistical and Post-hoc terms and Assumptions

Statistical analyses were conducted using SPSS version12 statistical software. The proportion of patients who answered yes/no to uptake of VCT and socio-demographic characteristics were noted. Proportions were used to report basic characteristics of the study population such as Gender, race, and marital status. To test for differences between those who answered yes and no, a chi-square test for categorical variables was used. A logistic regression model was used to estimate odd ratios (OR) and 95% confidence intervals (CI). In the logistic model, bivariate model was first run with each of the predictors as independent variables (age, gender, marital status, occupation, and education) and the uptake of VCT as the dependent variable to find out those predictive variables that were associated with VCT uptake. Multivariate analysis included all variables adjusting for all risk factors and including patient's socio-demographic characteristics.

Reporting baseline descriptive characteristics of the sample

Analysis was conducted with SPSS. Numbers of people responding to each of the independent variables were reported in frequency tables, proportions, and bar charts were used to describe independent variables and characteristics of the study population like gender and marital status. The differences between those who answer yes or no to uptake of VCT were tested as categorical variables with odd ratio. Logistic regression model was used to estimate odd ratios (OR) and 95% confidence intervals (CI). A univariate analysis was conducted first using the logistic model, and bivariate with VCT uptake at a $p\text{-}value \leq 0.05$. Further, a correlation analysis was conducted to ascertain the relationship between independent variables. Correlation analysis excluded collinearity between independent variables. Variables that are not highly associated (*p*-

value ≤ 0.05) with the dependent variable and/or are highly collinear in the correlation model may be excluded from the final logistic model (multiple logistic regressions). The assumptions of collinearity have to be tested for multiple logistic regression to be applied otherwise the non-parametric alternative may be used.

Definition of terms in Reporting Bivariate and Multivariate Analyses

The B-value: Tells us about the relationship between VCT uptake and the predictor variables. If the value is positive then it shows a positive correlation while a negative sign shows a negative correlation. The B-values also tell us to what extent the change predictor affect the logit of the outcome. These are the values for the logistic regression equation for predicting the dependent variable from the independent variable. They are in log-odds units. The standardized beta value provided by SPSS tells us the number of standardized deviation change in the predictor brought about by one standardized deviation change in the outcome.

Odd ratio (Exp B): The odds ratio is interpreted in terms of change in odds. If the value of Exp B is greater than 1, then it indicates that as the predictor increases, the odds of the outcome occurring increases. On the other hand, if the value is less than 1 then as the predictor increases, the odds of the outcome occurring decreases (Field, 2010). For instance, in employment category (1) the 95% CI does not cross 1; we can conclude that as unemployment increases, the odds of the uptake of VCT decreases. Meaning that those with unemployment has 0.75 Lower odd of uptake of VCT than students (95%CI=0.67, 0.927; *p=0.08*). In employment category (2) where the CI crosses 1; we can conclude that for employed persons the odd of VCT uptake is 0.86 less than the student category (CI=0.688, 1.083; *p=0.203*).

The df column: Lists the degrees of freedom for each variable. Each variable to be entered into

the model, e.g., Province and settlement have various degrees of freedom. The total degree of freedom for all variables is listed at the bottom of the column. The variable province is listed here only to show that if the dummy variables that represent province were tested simultaneously, the variable province would be statistically significant.

Effect size and Sample Size: Calculate the necessary sample size you need to determine values for three items; Statistical Power, Alpha, and Effect size. The rule of thumb is the bigger the sample size the better. The SPSS produces a value of r for each predictor based on the Wald statistics. This can be used as the effect size measure for the predictor. However, this will be dependent on the accuracy of the Wald statistics. The power of logistic regression is based not only on total sample size but also on the balance between outcomes. The more balanced the number of subject between intervention and non-intervention arm the better.

The Wald chi-square (listed in the column called "Sig."): This tests the null hypothesis that the constant equals 0. The hypothesis is rejected if the p-value (listed in the column called "Sig.") is smaller than the critical p-value of .05 in this instance. Hence, we conclude that the constant is not 0 or the coefficient (parameter) is not 0 (i.e., you can reject the null hypothesis and say that the coefficient is significantly different from 0). The Score and significance test is used to predict whether or not an independent variable would be significant in the model. Usually, this finding may not be of practical significance to researchers. Constant is the expected value of the log-odds of honcomp when all of the predictor variables equal zero.

Wald's statistics: This is used to tell the impact of the predictor variable on the outcome variable. For this analysis a Wald's statistics of 10 or more is generally regarded as significant. The significance level is set at 0.05. If the coefficient is significantly different from zero we can

assume that the predictor is making a significant contribution to the prediction of the outcome (Field, 2010).The analyses that justify inclusion of covariates in the model are provided below.

Report of Statistical Analysis Findings

Research question 1:

What is the impact of socio-demographic determinants on VCT uptake?

After Univariate logistic regression I found that apart from Gender, all the socio-demographic determinants had statistically significant impact on VCT uptake.

Logistic regression analysis is important to examine the strength of the relationships between single predictor independent variables and the dependent variables. Each of the variables in tables above was regressed with the uptake of VCT. Bivariate regression analysis will reveal the strength of relationship and association of each independent variable with uptake or not of VCT.

Tables 12 to 20 above give the significance level for the slope coefficient for each of the independent variables. The Wald's statistics has a chi squared distribution and indicates whether the b coefficients are significantly different from zero. If the coefficient is significantly different from zero we can assume that the predictors are making a significant contribution to the prediction of the outcome (Field, 2010). The Wald value will determine the effect size of having the intervention and its significance on the outcome.

Bivariate Analysis

In this analysis the ability of a single variable to predict the outcome is tested.

Basic Bivariate Analyses of Provinces

Table 12

Bivariate Analyses of Provinces

Step		B	S.E.	Wald	df	Sig.	Exp(B)
0	Constant	.489	.026	362.671	1	.000	1.630

Model Summary

Step	-2 Log likelihood	Cox &Snell R Square	Nagelkerke R Square
1			

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	6	1.000

	8453.556a	.016	.022

Variable in equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1a	province			102.124	8	.000	2.336		
	Eastern cape	.848	.133	40.697	1	.000		1.800	3.032
	Free state	.314	.092	11.667	1	.001	1.368	1.143	1.638
	Gauteng	.218	.091	5.768	1	.016	1.244	1.041	1.486
	Kwazulu-natal	.531	.113	21.958	1	.000	1.701	1.362	2.124
	Limpopo	.750	.119	39.785	1	.000	2.117	1.677	2.673
	Mpumalanga	-.106	.131	.651	1	.420	.900	.696	1.163
	North west	-.110	.205	.288	1	.591	.896	.599	1.339
	Northern cape	.070	.094	.567	1	.451	1.073	.893	1.289
	Constant	.221	.071	9.775	1	.002	1.248		

In the present statistics in table 12 above it seems that having the intervention is a significant prediction of the outcome with effect size of (Wald statistics) of 102.12 (*p =0.00*). All provinces except Northern Cape (OR=1.07; CI= 0.89-1.29; *p=0.45*), Mpumalanga (OR=0.90; CI= 0.70-1.16; *p> 0.42*), and North-West (OR=0.90; CI=0.60-1.34; *p =0.59*). Mpumalanga, North-west, and Northern Cape had statistically more significant impact than the Western Cape (the referent

category) on the uptake of VCT (outcome). Generally province had a statistically significant impact on the uptake of VCT. In addition a unit increase in the predictor variable (province) brought about the highest increase in VCT uptake in Eastern Cape (b=0.85; *p= 0.00*) and lowest in Gauteng (b=0.22; *p=0.02*) and a decrease in provinces Mpumalanga and North-West. Having the intervention will bring about the following changes in each province, Eastern Cape: (OR=2.34; 1.8, 3.03*; p=0.00*). Limpopo (OR=2.1; CI=1.68, 2.67; *p=0.00*). Kwa-Zulu Natal: (OR=1.7; CI= 1.36, 2.12; *p=0.00*). Free State: (OR=1.4; CI=1.14, 1.64; *p=0.00*) Gauteng: (OR=1.2; CI= 1.04, 1.49; *p=0.02*). Northern Cape (OR=1.07; CI= 0.89, 1.29; *p=0.45*). Mpumalanga (OR=0.90; CI= 0.70, 1.16; *p=0.42*). North-West (OR=0.90; CI=0.60, 1.34; *p=0.59*).

Basic Bivariate Analysis of Settlement

Table 13

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.489	.026	362.671	1	.000	1.630

Model Summary

Step 1	-2 Log likelihood	Cox &Snell R Square	Nagelkerke R Square
	8526.297a	.005	.007

Hosmer and Lemeshow Test

Step 1	Chi-square	df	Sig.
	.000	3	1.000

Variable in Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1a	settlement			33.083	4	.000			
	Urban-formal	.168	.060	7.942	1	.005	1.183	1.052	1.329
	Urban-informal	.391	.089	19.501	1	.000	1.479	1.243	1.760
	Peri-urban	.358	.085	17.701	1	.000	1.430	1.211	1.689
	Tribal	-.104	.169	.373	1	.541	.902	.647	1.257
	Constant	.345	.041	71.138	1	.000	1.412		

In table 13 the statistics shows that having the intervention (locale or settlement) is a significant prediction of the outcome with Wald of 33.08 (*p =0.00*). All Settlement except urban formal had statistically more significant impact on the outcome (uptake of VCT) than farming settlement (reference). A unit increase in the tribal settlement will bring about a decrease in outcome (OR=0.90; CI=0.65, 1.26; *p=0.00*) unlike all the other settlements that caused increase in outcome with urban-formal (OR=1.18; CI=1.05, 1.33;*p=0.01*) followed by peri-urban (OR=1.43; CI=1.21, 1.69; *p =0.00*) and finally the settlement with highest impact on uptake is urban-informal (OR=1.48; CI=1.24, 1.76; *p =0.00*).

Basic Bivariate analysis of Gender

Table 14

Gender

Variables in the Equation

Step 0	Constant	B	S.E.	Wald	df	Sig.	Exp(B)
		.488	.026	361.561	1	0.00	1.629

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	0	.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1a	Male	-.032	.055	.336	1	.562	.969	.870	1.078
	Constant	.499	.031	254.310	1	.000	1.647		

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In the present statistics as shown in table 14 above, having the intervention is not a significant prediction of the outcome. The male gender had a statistically less significant effect than the female gender. As the predictor (male gender) increases the uptake of VCT decreases. Since Gender had no statistically significant effect (OR=0.97; CI=0.87, 1.08; $p = 0.56$) on the outcome (uptake of VCT) it was therefore excluded from the logistic regression model.

Basic Bivariate Analyses of Race

Table 15
Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.488	.026	361.561	1	.000	1.629

Model Summary

Step	-2 Log likelihood	Cox &Snell R Square	Nagelkerke R Square
1	8522.900a	.005	.007

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	0	.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1a	race2			30.863	3	.000			
	black	-.230	.070	10.723	1	.001	.794	.692	.912
	coloured	-.856	.215	15.807	1	.000	.425	.279	.648
	white	-.766	.301	6.453	1	.011	.465	.258	.840
	Constant	.542	.028	363.467	1	.000	1.720		

In table 15 having the intervention of race had a significant impact on prediction of the outcome with Wald of 30.86 (*p = 0.00*). All racial groups including black (OR=0.79; CI=0.69, 0.91; *p= 0.01*), white (OR=0.43; CI=0.28, 0.65; *p =0.00*) and colored (OR=0.47; CI=0.29, 0.84; *p = 0.01*) are statistically more significant than the Indian race. Further, a unit increase in any racial group caused a decrease in outcome (VCT uptake). However, generally race was statistically significantly association with uptake of VCT. The above indicates that the least decrease in

uptake of VCT was caused by the black race, followed by the colored race then the white race or put differently, belonging to the black race brought about the highest increase in VCT uptake.

Basic Bivariate Analyses of Age

Table 16
Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.489	.026	362.671	1	.000	1.630

Model Summary

Step 1	-2 Log likelihood	Cox &Snell R Square	Nagelkerke R Square
	8433.622a	.019	.026

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	1	1.000

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1a	agecat3a			121.322	2	.000			
	16-24years	-.599	.060	97.919	1	.000	.550	.488	.619
	25-49years	-.883	.103	73.664	1	.000	.413	.338	.506
	Constant	.947	.051	338.976	1	.000	2.577		

In our present statistics as shown in table 16 above, having the intervention is a significant prediction of the outcome (Wald statistics=121.32; $p = 0.00$). All age groups have a statistically significant association with the outcome (uptake of VCT). Generally age groups 1& 2 had statistically significant association with uptake of VCT than age group 50-55years (referent). A unit increase in age group 16-24 years (OR=0.55; CI=0.49, 0.62; $p=0.00$) and 25-49 year

(OR=0.41; CI=0.34, 0.51; *p=0.00*) caused a reduction in the uptake of VCT respectively. This means that the 25-49 year age group caused the best increase in VCT uptake.

Basic Bivariate Analyses of Marital Status

Table 17
Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.489	.026	362.671	1	.000	1.630

Model Summary

Step	-2 Log likelihood	Cox &Snell R Square	Nagelkerke R Square
1	8527.944a	.005	.007

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	4	1.000

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1a	marstat			31.886	6	.000			
	divorce/widow	.469	.109	18.430	1	.000	1.598	1.290	1.980
	single	.601	.118	26.024	1	.000	1.823	1.448	2.297
	Not mar/in steady reltsp	.487	.129	14.313	1	.000	1.627	1.265	2.095
	Not mar. but in sexual reltsp	.316	.116	7.386	1	.007	1.372	1.092	1.723
	Mar. live with spouse	.505	.174	8.367	1	.004	1.656	1.177	2.332
	Mar/don't live with spouse	.517	.237	4.738	1	.029	1.676	1.053	2.670
	Constant	.051	.101	.256	1	.613	1.053		

In table 17 above, the statistics shows that having the intervention caused a significant prediction of the outcome (Wald statistics= 31.89; *p = 0.00*). All marital status had a statistically significant

impact on the outcome (uptake of VCT). An increase by a unit of any of the marital statuses will cause an increase in the outcome. Generally marital status had a statistically significant positive impact on the uptake of VCT with single status having the highest impact on uptake (OR=1.82; CI= 1.45, 2.30; *p =0.00*) followed by married but not living with spouse (OR=1.68; CI=1.05, 2.67; *p =0.023*) then married but living with spouse (OR=1.66; CI=1.18, 2.33; *p=0.00),* not married or in steady relationship(OR=1.63; CI=1.27, 2.10; *p=0.00*), not married but living with sexual partner had the smallest impact in uptake (1.4; CI=1.09-1.72; *p=0.01*)

Basic Bivariate Analyses of Employment status

Table 18
Employment status

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.493	.026	360.041	1	.000	1.637

Model Summary

Step 1	-2 Log likelihood	Cox &Snell R Square	Nagelkerke R Square
	8316.003a	.007	.009

Hosmer and Lemeshow Test

Step 1	Chi-square	df	Sig.
	.000	1	1.000

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1a	emplcat2			39.611	2	.000			
	unemployed	-.003	.056	.003	1	.960	.997	.894	1.113
	employed	.590	.096	37.507	1	.000	1.804	1.494	2.179
	Constant	.439	.035	160.219	1	.000	1.551		

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Table 18 shows that having the intervention caused a significant prediction of the outcome (Wald statistics = 39.61; *p=0.00*). Unemployed status had a statistically non-significant impact on the outcome (OR=0.99; CI= 0.89, 1.3; *p= 0.96*). Generally employed status had a statistically significant impact on the uptake of VCT (OR=1.80; CI=1.50, 2.18; *p = 0.00*). A unit increase in uptake led to a 0.003 decrease unemployment and 0.59 increase in employment respectively.

Basic Bivariate Analysis of Educational Status

Table 19
Educational Status
Variables in the Equation

Step		B	S.E.	Wald	df	Sig.	Exp(B)
0	Constant	.490	.026	363.536	1	.000	1.632

Model Summary

Step	-2 Log likelihood	Cox &Snell R Square	Nagelkerke R Square
1	8521.394a	.002	.003

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	2	1.000

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
Step 1a							Lower	Upper
educat2			15.321	4	.004			
primary	.296	.091	10.499	1	.001	1.344	1.124	1.607
Up to grade 11	.354	.093	14.385	1	.000	1.424	1.186	1.710
Matric	.247	.109	5.150	1	.023	1.280	1.034	1.585
Tertiary	.101	.254	.159	1	.690	1.107	.673	1.820
Constant	.211	.082	6.601	1	.010	1.235		

In our present statistics having the intervention is a significant prediction of the outcome (Wald statistics=15.32; *p= 0.00*). All educational status except tertiary level statistically impacted uptake. There was also a statistically significant increase in the outcome (uptake of VCT) except for tertiary level which did not cause a statistically significant increase. Generally educational status had a statistically significant association with uptake of VCT. Units increase in educational status cause a 0.35 increase in outcome in the up to grade 11, 0.30 increase outcome in the primary level, 0.25 increases in the outcome in the matric level and 0.10 for the tertiary levels. The greatest impact is observed in the up to grade 11(OR=1.42; CI=1.19, 1.71; *p= 0.00*), then primary (OR=1.34; CI=1.12, 1.60;*p= 0.00*), matric (OR=1.28; CI=1.03, 1.61; *p = 0.02*) and lastly tertiary (OR=1.10; CI=0.67, 1.82; *p=0.69*).

Basic Bivariate Analysis of Socio-economic Status

Table 20
Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.489	.026	362.671	1	.000	1.630

Model Summary

Step	-2 Log likelihood	Cox &Snell R Square	Nagelkerke R Square
1	8543.735a	.002	.003

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	1	1.000

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1a	sescat			15.963	2	.000			
	High ses	.157	.060	6.871	1	.009	1.169	1.040	1.315
	Medium ses	.263	.067	15.252	1	.000	1.301	1.140	1.485
	Constant	.357	.044	65.734	1	.000	1.429		

In table 20 above the intervention (Socio-economic status) significantly predicted the outcome (Wald statistics=15.96; *p = 0.00*). All Socio-economic categories caused a statistically significant increase in the outcome (uptake of VCT). Generally, socio-economic status has statistically significant association with uptake of VCT. A unit increase in the medium socio-economic class (sescat2) brought about a higher increase in uptake of VCT (0.23) than a unit increase in the high socio-economic class (0.16). The medium SES (OR=1.30; CI=1.04, 1.31; *p = 0.00)* had a greater impact on uptake than the high SES (OR=1.17; CI= 1.14, 1.49; *p = 0.01*).

Summary of Bivariate regression

Province

Table 21

Hypothesis	Dependent variables	Independent variable	Statistical test	Sig. of the Change	Hypothesis outcome
Province does not have any impact on VCT uptake.	Uptake of voluntary testing and counseling	Province general	Logistic regression	0.000	Null Rejected
		Eastern Cape	Logistic regression	0.000	Null Rejected
		Free State	Logistic regression	0.001	Null Rejected
		Gauteng	Logistic regression	0.016	Null Rejected
		Kwa-Zulu Natal	Logistic regression	0.000	Null Rejected
		Limpopo	Logistic regression	0.000	Null Rejected
		Mpumalanga	Logistic regression	0.420	Null Accepted
		North West	Logistic regression	0.591	Null Accepted
		Northern	Logistic regression	0.451	Null Accepted
Settlement does not have any impact on VCT uptake.	Uptake of Voluntary testing and counseling	Settlement general	Logistic regression	0.000	Null Rejected
		Urban-informal	Logistic regression	0.000	Null Rejected
		Urban-formal	Logistic regression	0.005	Null Rejected
		Peri-urban	Logistic regression	0.000	Null Rejected
		Tribal	Logistic regression	0.541	Null Accepted
Gender does not have any impact on VCT uptake.	Uptake of Voluntary testing and counseling	Gender	Logistic regression	0.564	Null Accepted
		Male	Logistic regression	0.564	Null Accepted
Racial groups does not have any impact on VCT uptake	Uptake of Voluntary testing and counseling	Racial group general	Logistic regression	0.000	Null Rejected
		black	Logistic regression	0.001	Null Rejected
		colored	Logistic regression	0.000	Null Rejected
		white	Logistic regression	0.011	Null Rejected
Age groups does not have any impact on VCT uptake	Uptake of Voluntary testing and counseling	16-24yrs	Logistic regression	0.562	Null accepted

Hypothesis	Dependent variables	Independent variable	Statistical test	Sig. of the Change	Hypothesis outcome
Marital status does not have any impact on VCT uptake.	Uptake of voluntary testing and counseling	Marital status general	Logistic regression	0.000	Null Rejected
		Divorced/widow	Logistic regression	0.000	Null Rejected
		single	Logistic regression	0.000	Null Rejected
		Not married or steady relatnship	Logistic regression	0.000	Null Rejected
		Not married in sexual relatnship	Logistic regression	0.007	Null Rejected
		Married live with spouse	Logistic regression	0.004	Null Rejected
		Married don't live With spouse	Logistic regression	0.029	Null Rejected
Employment does not have any impact on VCT uptake.	Uptake of Voluntary testing and counseling	Employment general	Logistic regression	0.000	Null Rejected
		Unemployed	Logistic regression	0.960	Null Accepted
		Employed	Logistic regression	0.000	Null Rejected
Educational status does not have any impact on VCT uptake.	Uptake of Voluntary testing and counseling	Educational status general	Logistic regression	0.004	Null Rejected
		primary	Logistic regression	0.001	Null Rejected
		Grade 11	Logistic regression	0.000 0.023	Null Rejected Null Rejected
		Matric	Logistic Regression	0.690	Null Accepted
		Tertiary	Logistic Regression	0.010	Null Rejected
Socio-economic status does not have any impact on VCT uptake	Uptake of Voluntary testing and counseling	Socioeconomic Status general	Logistic regression	0.000	Null Rejected
		Medium	Logistic regression	0.009	Null Rejected
		High	Logistic regression	0.000	Null Rejected

Summary

Province generally had a statistically significant impact on uptake of VCT. A unit increase in each province brought about the highest increase in VCT uptake in Eastern Cape and lowest increase in Northern Cape and a decrease in provinces like Mpumalanga and North-West. Mpumalanga, North-west and Northern Cape had statistically more significant impact on VCT

uptake than in the Western Cape. Generally, settlement had a statistically significant association with uptake of VCT. A unit increase in the tribal settlement caused a decrease in VCT uptake unlike all the other settlements that caused increase in uptake. Highest impact on uptake is urban-informal followed by Peri-urban and finally Urban-formal caused the lowest increase in uptake.

The male gender had a lower effect on VCT uptake than the female gender (referent variable) although its effect was statistically non-significant. Since Gender caused no statistically significant effect on the uptake of VCT, it was excluded from the model. Although, race generally had a statistically significant association with uptake of VCT, specific racial groups including blacks, white, and colored were statistically more significant than the Indian race, and a unit increase in black, white, and colored races caused a decrease in VCT. All age groups have a statistically significant association with uptake of VCT. However, the age group 25-49 years caused the most positive increase in uptake of VCT

Generally marital status had a statistically significant positive impact on the uptake of VCT with single status having the highest effect on uptake followed by married but not living with spouse then married but living with spouse, divorced/widowed, not married or living with sexual partner. Not married but living with sexual partner had the smallest impact in uptake.

Unemployment had a statistically non-significant impact on the uptake of VCT. Employed status had a statistically significant impact on the uptake of VCT. In summary, in the bivariate regression employment had a positive impact on VCT uptake. Educational status had a statistically significant association with uptake of VCT. The greatest impact on VCT uptake is observed in the up to grade 11, then primary, matric, and lastly tertiary. Hence, all levels of education in the bivariate model had a positive impact on VCT uptake. Socio-economic status had statistically significant association with uptake of VCT. A unit increase in the medium socio-

economic class brought about an increase in uptake of VCT than a unit increase in the high socio-economic.

In summary, of all the factors, Sex is the only factor that does not have a significant impact on the uptake of VCT. Hence does not need to be included in the correlation analysis.

Research Question 2:

What socio-demographic determinants interact to impact VCT uptake?

To answer this question, it was important to determine the variables that interact in the model to produce the best and significant uptake of VCT in the South African population. To do this firstly, individual variables that produce statistically significant impact on uptake were examined. Looking back at question 1 it is clear that the only variable that did not produce a significant impact on VCT uptake is gender. Therefore it is important to exclude gender from the fitted model from the outset. Second, the correlations of the predictors were examined; it is important to exclude predictors that correlate significantly to ensure stability and that the model is not compromise.

Evaluation of Statistical Assumptions:

Multi-collinearity: Prior to running a logistic regression analysis, few analyses are needed to understand the data better. Bivariate logistic regression analysis is important to examine the strength of association between single predictor variables and the outcome variables. Collinearity is critical in regression analysis and needs to be studied first to exclude any collinear predictor variables or predictor variables that are highly correlated before Variable selection, goodness of fit, prediction of the model, and diagnostic check of the fitted model.

Collinearity of the independent variables can make the model coefficient unstable and could affect the coefficient interpretation; however, this has no effect on the model prediction. A higher value of collinearity elevates the standard error of the estimated coefficients, decreasing the coefficient's level of significance. In other words, a coefficient may be significant but because of the presence of other correlated variables its significance may be diminished. Alternatively, a coefficient may be artificially significant and become insignificant when correlated variables are removed. Therefore, caution must be exercised when explaining coefficients when a high degree of collinearity is present.

The assumption of multi-collinearity can be tested by calculating correlations between variables and collinearity statistics (Tolerance and Variance Inflation Factor). It is important to ensure that correlation between outcome and predictor variables are not too low and correlations between predictor variables did not exceed the accepted levels. There were no correlation results violating this assumption; therefore, the presence of multi-collinearity was not assumed. Normality is usually not a strict assumption in logistic regression, especially with the use of large sample size like the one used in this study.

Correlation Analysis:

In order to answer this question I conducted a Correlation analysis first to exclude association between independent variables. Variables that are not highly associated with the dependent variable and/or are highly collinear may be excluded from the final logistic model. Variables that are not related in the first place to the dependent variable are not considered in the logistic regression analysis.

The assumptions of collinearity had to be tested for multiple logistic regression to be applied otherwise the non-parametric alternative would be used. For this I examined the Pearson chi-squared test for association between the independent variables. This is because all my independent variables were either categorical or nominal. In my variable manipulation in chapter 3 variables there were continuous like age which was made categorical. For example age was reclassified as 16-24years, 25-49 years, and 50-50years.When the null hypothesis is true, the chi squared test is a good estimation of association provided that all expected values are greater than 1 and no more than 20% of the cells had expected values less than 5.

Pearson chi square test of association or independence can also be used for tables of 2 categories and more. In addition, assumptions of this test were met: The categories must be independent or mutually exclusive, the sample size large, and the categories must be categorical or nominal variables. In this correlation analysis, I examined a Pearson chi squared for association between independent variables. According to the set requirement, 0.05 was set as the alpha value. According to the findings here there were no significant correlations or perfect correlation between independent variables at 0.05. Although there were correlations between few variables; the correlations were not high enough to warrant exclusion of these variables from the model. In fact the variables with the best correlation are sex and age of respondents (chi-square=1.24; $p= 0.54$).

Collinearity can make the model coefficient unstable (Allison, 1999) and adversely affect the Coefficient interpretation (Christensen, 1997), but it has no effect on the model prediction. A higher value of collinearity elevates the standard error of the estimated coefficient. Collinearity of the independent variables can make the model coefficient unstable and could affect the coefficient interpretation; however, this has no effect on the model prediction.

One key point to note is that some biological variables are important in explaining or predicting a biological phenomenon, yet their significance level may be more than 0.05 in the final model. A decision has to be made between a sound biological (or physical) model and a statistical model; therefore, this may necessitate increasing the significance level to more than 0.05 in some instances to avoid exclusion of variables that may have practical implications and ensure that the model is robust enough to include most risk factors.

In the present model, the chi-square test showed that although there were correlations between various variables, the correlations were not high enough to warrant exclusion of these variables from the regression model. My conclusion is that based on the correlations of variables, all variables will be included in the model. No variable will be excluded in the multiple logistic models.

The results of the correlation analysis are shown in table 21 below. The table shows the Pearson correlation(r) value, the number of observation in each variable and the significance level of the correlation of two variables.

Table 22: Chi-Square for Independent Variable

Chi-Square Tests: Province * Socio-economic status scale * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	239.747[b]	16	.000
	Likelihood Ratio	238.185	16	.000
	Linear-by-Linear Association	5.430	1	.020
	N of Valid Cases	2450		
yes	Pearson Chi-Square	471.340[c]	16	.000
	Likelihood Ratio	489.947	16	.000
	Linear-by-Linear Association	38.671	1	.000
	N of Valid Cases	3994		
Total	Pearson Chi-Square	684.105[a]	16	.000
	Likelihood Ratio	699.028	16	.000
	Linear-by-Linear Association	40.304	1	.000
	N of Valid Cases	6444		

Chi-Square Tests: Locale or Settlement type * Socio-economic status * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	559.841[b]	8	.000
	Likelihood Ratio	573.380	8	.000
	Linear-by-Linear Association	450.661	1	.000
	N of Valid Cases	2450		
yes	Pearson Chi-Square	815.872[c]	8	.000
	Likelihood Ratio	839.281	8	.000
	Linear-by-Linear Association	705.538	1	.000
	N of Valid Cases	3994		
Total	Pearson Chi-Square	1379.834[a]	8	.000
	Likelihood Ratio	1418.075	8	.000
	Linear-by-Linear Association	1164.288	1	.000
	N of Valid Cases	6444		

Chi-Square Tests: Sex of respondent* Socio-economic status scale * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	14.832[b]	2	.001
	Likelihood Ratio	14.830	2	.001
	Linear-by-Linear Association	14.529	1	.000
	N of Valid Cases	2450		
yes	Pearson Chi-Square	4.952[c]	2	.084
	Likelihood Ratio	4.921	2	.085
	Linear-by-Linear Association	4.042	1	.044
	N of Valid Cases	3994		
Total	Pearson Chi-Square	17.034[a]	2	.000
	Likelihood Ratio	16.942	2	.000
	Linear-by-Linear Association	15.686	1	.000
	N of Valid Cases	6444		

Chi-Square Tests: race * Socio-economic status scale * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	405.686[b]	6	.000
	Likelihood Ratio	446.386	6	.000
	Linear-by-Linear Association	325.119	1	.000
	N of Valid Cases	2449		
yes	Pearson Chi-Square	360.082[c]	6	.000
	Likelihood Ratio	381.910	6	.000
	Linear-by-Linear Association	307.906	1	.000
	N of Valid Cases	3990		
Total	Pearson Chi-Square	770.010[a]	6	.000
	Likelihood Ratio	823.429	6	.000
	Linear-by-Linear Association	641.095	1	.000
	N of Valid Cases	6439		

Chi-Square Tests: Age categories * Socio-economic status * had test for HIV in the last 12 months

Chi-Square Tests

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	22.928[b]	4	.000
	Likelihood Ratio	22.142	4	.000
	Linear-by-Linear Association	15.229	1	.000
	N of Valid Cases	2450		
yes	Pearson Chi-Square	13.156[c]	4	.011
	Likelihood Ratio	13.253	4	.010
	Linear-by-Linear Association	11.433	1	.001
	N of Valid Cases	3994		
Total	Pearson Chi-Square	34.043[a]	4	.000
	Likelihood Ratio	33.318	4	.000
	Linear-by-Linear Association	30.438	1	.000
	N of Valid Cases	6444		

Chi-Square Tests: Marital status * Socio-economic status * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	147.765[b]	12	.000
	Likelihood Ratio	145.779	12	.000
	Linear-by-Linear Association	3.924	1	.048
	N of Valid Cases	2450		
yes	Pearson Chi-Square	119.393[c]	12	.000
	Likelihood Ratio	118.468	12	.000
	Linear-by-Linear Association	.118	1	.731
	N of Valid Cases	3994		
Total	Pearson Chi-Square	251.885[a]	12	.000
	Likelihood Ratio	248.832	12	.000
	Linear-by-Linear Association	2.207	1	.137
	N of Valid Cases	6444		

Chi-Square Tests: Employment * Socio-economic status * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	98.306[b]	4	.000
	Likelihood Ratio	98.005	4	.000
	Linear-by-Linear Association	57.724	1	.000
	N of Valid Cases	2388		
yes	Pearson Chi-Square	181.626[c]	4	.000
	Likelihood Ratio	183.266	4	.000
	Linear-by-Linear Association	97.350	1	.000
	N of Valid Cases	3909		
Total	Pearson Chi-Square	273.040[a]	4	.000
	Likelihood Ratio	273.698	4	.000
	Linear-by-Linear Association	148.309	1	.000
	N of Valid Cases	6297		

Chi-Square Tests: Education *Socio-economic status * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	209.418[b]	8	.000
	Likelihood Ratio	207.006	8	.000
	Linear-by-Linear Association	95.203	1	.000
	N of Valid Cases	2442		
yes	Pearson Chi-Square	383.981[c]	8	.000
	Likelihood Ratio	383.706	8	.000
	Linear-by-Linear Association	208.266	1	.000
	N of Valid Cases	3986		
Total	Pearson Chi-Square	578.105[a]	8	.000
	Likelihood Ratio	572.089	8	.000
	Linear-by-Linear Association	294.217	1	.000
	N of Valid Cases	6428		

Chi-Square Tests: Province * education * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	113.743[b]	32	.000
	Likelihood Ratio	113.601	32	.000
	Linear-by-Linear Association	7.249	1	.007
	N of Valid Cases	2442		
yes	Pearson Chi-Square	158.624[c]	32	.000
	Likelihood Ratio	160.295	32	.000
	Linear-by-Linear Association	3.648	1	.056
	N of Valid Cases	3986		
Total	Pearson Chi-Square	216.656[a]	32	.000
	Likelihood Ratio	221.297	32	.000
	Linear-by-Linear Association	10.882	1	.001
	N of Valid Cases	6428		

Chi-Square Tests: Locale or settlement type * education * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	121.599[b]	16	.000
	Likelihood Ratio	120.976	16	.000
	Linear-by-Linear Association	37.245	1	.000
	N of Valid Cases	2442		
yes	Pearson Chi-Square	162.760[c]	16	.000
	Likelihood Ratio	159.447	16	.000
	Linear-by-Linear Association	82.401	1	.000
	N of Valid Cases	3986		
Total	Pearson Chi-Square	237.270[a]	16	.000
	Likelihood Ratio	231.702	16	.000
	Linear-by-Linear Association	114.610	1	.000
	N of Valid Cases	6428		

Chi-Square Tests: Sex of respondent* education * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	18.751[b]	4	.001
	Likelihood Ratio	18.522	4	.001
	Linear-by-Linear Association	8.578	1	.003
	N of Valid Cases	2442		
yes	Pearson Chi-Square	22.801[c]	4	.000
	Likelihood Ratio	22.546	4	.000
	Linear-by-Linear Association	13.226	1	.000
	N of Valid Cases	3986		
Total	Pearson Chi-Square	41.130[a]	4	.000
	Likelihood Ratio	40.626	4	.000
	Linear-by-Linear Association	21.573	1	.000
	N of Valid Cases	6428		

Chi-Square Tests: Race * education * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	119.601[b]	12	.000
	Likelihood Ratio	106.557	12	.000
	Linear-by-Linear Association	1.043	1	.307
	N of Valid Cases	2441		
yes	Pearson Chi-Square	115.233[c]	12	.000
	Likelihood Ratio	104.715	12	.000
	Linear-by-Linear Association	17.658	1	.000
	N of Valid Cases	3982		
Total	Pearson Chi-Square	232.124[a]	12	.000
	Likelihood Ratio	205.008	12	.000
	Linear-by-Linear Association	14.948	1	.000
	N of Valid Cases	6423		

Chi-Square Tests: Age categories * education * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	162.697[b]	8	.000
	Likelihood Ratio	142.589	8	.000
	Linear-by-Linear Association	76.221	1	.000
	N of Valid Cases	2442		
yes	Pearson Chi-Square	484.493[c]	8	.000
	Likelihood Ratio	382.887	8	.000
	Linear-by-Linear Association	151.126	1	.000
	N of Valid Cases	3986		
Total	Pearson Chi-Square	619.983[a]	8	.000
	Likelihood Ratio	514.901	8	.000
	Linear-by-Linear Association	231.414	1	.000
	N of Valid Cases	6428		

Chi-Square Tests: Marital status * education * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	89.800[b]	24	.000
	Likelihood Ratio	80.282	24	.000
	Linear-by-Linear Association	.106	1	.745
	N of Valid Cases	2442		
yes	Pearson Chi-Square	166.664[c]	24	.000
	Likelihood Ratio	162.954	24	.000
	Linear-by-Linear Association	.000	1	.983
	N of Valid Cases	3986		
Total	Pearson Chi-Square	226.543[a]	24	.000
	Likelihood Ratio	211.662	24	.000
	Linear-by-Linear Association	.056	1	.813
	N of Valid Cases	6428		

Chi-Square Tests: Employment * Education * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	145.573[b]	8	.000
	Likelihood Ratio	158.539	8	.000
	Linear-by-Linear Association	59.814	1	.000
	N of Valid Cases	2380		
yes	Pearson Chi-Square	250.123[c]	8	.000
	Likelihood Ratio	266.952	8	.000
	Linear-by-Linear Association	76.708	1	.000
	N of Valid Cases	3901		
Total	Pearson Chi-Square	388.949[a]	8	.000
	Likelihood Ratio	419.998	8	.000
	Linear-by-Linear Association	137.187	1	.000
	N of Valid Cases	6281		

Chi-Square Tests: Province * employment - no others * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	20.363[b]	16	.204
	Likelihood Ratio	20.635	16	.193
	Linear-by-Linear Association	1.881	1	.170
	N of Valid Cases	2388		
yes	Pearson Chi-Square	79.563[c]	16	.000
	Likelihood Ratio	78.407	16	.000
	Linear-by-Linear Association	.000	1	.984
	N of Valid Cases	3909		
Total	Pearson Chi-Square	77.575[a]	16	.000
	Likelihood Ratio	77.435	16	.000
	Linear-by-Linear Association	.900	1	.343
	N of Valid Cases	6297		

Chi-Square Tests: Locale or Settlement type * Employment - no others * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	67.487[b]	8	.000
	Likelihood Ratio	68.692	8	.000
	Linear-by-Linear Association	20.487	1	.000
	N of Valid Cases	2388		
yes	Pearson Chi-Square	71.490[c]	8	.000
	Likelihood Ratio	72.816	8	.000
	Linear-by-Linear Association	8.207	1	.004
	N of Valid Cases	3909		
Total	Pearson Chi-Square	122.835[a]	8	.000
	Likelihood Ratio	124.411	8	.000
	Linear-by-Linear Association	21.952	1	.000
	N of Valid Cases	6297		

Chi-Square Tests: Sex of respondent * Employment - no others * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	75.039[b]	2	.000
	Likelihood Ratio	74.703	2	.000
	Linear-by-Linear Association	61.560	1	.000
	N of Valid Cases	2388		
yes	Pearson Chi-Square	128.902[c]	2	.000
	Likelihood Ratio	127.525	2	.000
	Linear-by-Linear Association	60.484	1	.000
	N of Valid Cases	3909		
Total	Pearson Chi-Square	199.944[a]	2	.000
	Likelihood Ratio	198.452	2	.000
	Linear-by-Linear Association	117.002	1	.000
	N of Valid Cases	6297		

Chi-Square Tests: Race * Employment - no others * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	41.388[b]	6	.000
	Likelihood Ratio	43.340	6	.000
	Linear-by-Linear Association	2.749	1	.097
	N of Valid Cases	2387		
yes	Pearson Chi-Square	37.277[c]	6	.000
	Likelihood Ratio	37.092	6	.000
	Linear-by-Linear Association	.277	1	.598
	N of Valid Cases	3905		
Total	Pearson Chi-Square	80.055[a]	6	.000
	Likelihood Ratio	80.154	6	.000
	Linear-by-Linear Association	.127	1	.722
	N of Valid Cases	6292		

Chi-Square Tests: Age categories * Employment - no others * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	464.596[b]	4	.000
	Likelihood Ratio	391.222	4	.000
	Linear-by-Linear Association	38.193	1	.000
	N of Valid Cases	2388		
yes	Pearson Chi-Square	897.983[c]	4	.000
	Likelihood Ratio	929.433	4	.000
	Linear-by-Linear Association	81.879	1	.000
	N of Valid Cases	3909		
Total	Pearson Chi-Square	1391.578[a]	4	.000
	Likelihood Ratio	1353.129	4	.000
	Linear-by-Linear Association	128.143	1	.000
	N of Valid Cases	6297		

Chi-Square Tests: Marital status * employment - no others * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	145.130[b]	12	.000
	Likelihood Ratio	170.528	12	.000
	Linear-by-Linear Association	1.823	1	.177
	N of Valid Cases	2388		
yes	Pearson Chi-Square	354.848[c]	12	.000
	Likelihood Ratio	414.557	12	.000
	Linear-by-Linear Association	.027	1	.869
	N of Valid Cases	3909		
Total	Pearson Chi-Square	482.892[a]	12	.000
	Likelihood Ratio	568.764	12	.000
	Linear-by-Linear Association	.347	1	.556
	N of Valid Cases	6297		

Chi-Square Tests: Locale or settlement type * Province * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	1225.446[b]	32	.000
	Likelihood Ratio	986.213	32	.000
	Linear-by-Linear Association	1.029	1	.310
	N of Valid Cases	2450		
yes	Pearson Chi-Square	1695.252[c]	32	.000
	Likelihood Ratio	1542.160	32	.000
	Linear-by-Linear Association	3.888	1	.049
	N of Valid Cases	3994		
Total	Pearson Chi-Square	2816.455[a]	32	.000
	Likelihood Ratio	2458.496	32	.000
	Linear-by-Linear Association	4.231	1	.040
	N of Valid Cases	6444		

Chi-Square Tests: Sex of respondent*Province * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	62.513[b]	8	.000
	Likelihood Ratio	63.383	8	.000
	Linear-by-Linear Association	44.990	1	.000
	N of Valid Cases	2450		
ye	Pearson Chi-Square	51.007[c]	8	.000
	Likelihood Ratio	51.469	8	.000
	Linear-by-Linear Association	31.893	1	.000
	N of Valid Cases	3994		
Total	Pearson Chi-Square	93.454[a]	8	.000
	Likelihood Ratio	95.155	8	.000
	Linear-by-Linear Association	74.456	1	.000
	N of Valid Cases	6444		

Chi-Square Tests: Race * Province * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	690.946[b]	24	.000
	Likelihood Ratio	680.197	24	.000
	Linear-by-Linear Association	53.388	1	.000
	N of Valid Cases	2449		
yes	Pearson Chi-Square	1439.119[c]	24	.000
	Likelihood Ratio	1266.441	24	.000
	Linear-by-Linear Association	257.384	1	.000
	N of Valid Cases	3990		
Total	Pearson Chi-Square	2100.504[a]	24	.000
	Likelihood Ratio	1933.054	24	.000
	Linear-by-Linear Association	277.055	1	.000
	N of Valid Cases	6439		

Chi-Square Tests: Age categories * Province * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	13.697[b]	16	.621
	Likelihood Ratio	14.164	16	.586
	Linear-by-Linear Association	2.468	1	.116
	N of Valid Cases	2450		
yes	Pearson Chi-Square	64.831[c]	16	.000
	Likelihood Ratio	62.577	16	.000
	Linear-by-Linear Association	.010	1	.921
	N of Valid Cases	3994		
Total	Pearson Chi-Square	51.492[a]	16	.000
	Likelihood Ratio	50.643	16	.000
	Linear-by-Linear Association	1.468	1	.226
	N of Valid Cases	6444		

Chi-Square Tests: Marital status * Province * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	198.089[b]	48	.000
	Likelihood Ratio	196.768	48	.000
	Linear-by-Linear Association	7.805	1	.005
	N of Valid Cases	2450		
yes	Pearson Chi-Square	459.274[c]	48	.000
	Likelihood Ratio	424.614	48	.000
	Linear-by-Linear Association	11.164	1	.001
	N of Valid Cases	3994		
Total	Pearson Chi-Square	604.715[a]	48	.000
	Likelihood Ratio	564.417	48	.000
	Linear-by-Linear Association	18.996	1	.000
	N of Valid Cases	6444		

Chi-Square Tests: Sex of respondent * Locale or settlement type * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	24.085[b]	4	.000
	Likelihood Ratio	24.806	4	.000
	Linear-by-Linear Association	3.143	1	.076
	N of Valid Cases	2450		
yes	Pearson Chi-Square	5.914[c]	4	.206
	Likelihood Ratio	5.863	4	.210
	Linear-by-Linear Association	1.368	1	.242
	N of Valid Cases	3994		
Total	Pearson Chi-Square	17.346[a]	4	.002
	Likelihood Ratio	17.412	4	.002
	Linear-by-Linear Association	4.168	1	.041
	N of Valid Cases	6444		

Chi-Square Tests: Race * Locale or settlement type * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	163.301[b]	12	.000
	Likelihood Ratio	226.073	12	.000
	Linear-by-Linear Association	87.967	1	.000
	N of Valid Cases	2449		
yes	Pearson Chi-Square	193.345[c]	12	.000
	Likelihood Ratio	259.986	12	.000
	Linear-by-Linear Association	136.354	1	.000
	N of Valid Cases	3990		
Total	Pearson Chi-Square	356.340[a]	12	.000
	Likelihood Ratio	480.682	12	.000
	Linear-by-Linear Association	229.403	1	.000
	N of Valid Cases	6439		

Chi-Square Tests: Age categories * Locale or settlement type * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	13.237[b]	8	.104
	Likelihood Ratio	14.186	8	.077
	Linear-by-Linear Association	.126	1	.723
	N of Valid Cases	2450		
yes	Pearson Chi-Square	18.438[c]	8	.018
	Likelihood Ratio	18.831	8	.016
	Linear-by-Linear Association	14.005	1	.000
	N of Valid Cases	3994		
Total	Pearson Chi-Square	26.030[a]	8	.001
	Likelihood Ratio	25.781	8	.001
	Linear-by-Linear Association	12.441	1	.000
	N of Valid Cases	6444		

Chi-Square Tests: Marital status * Locale or settlement type * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	102.613[b]	24	.000
	Likelihood Ratio	95.537	24	.000
	Linear-by-Linear Association	.747	1	.388
	N of Valid Cases	2450		
yes	Pearson Chi-Square	176.214[c]	24	.000
	Likelihood Ratio	157.476	24	.000
	Linear-by-Linear Association	6.081	1	.014
	N of Valid Cases	3994		
Total	Pearson Chi-Square	241.259[a]	24	.000
	Likelihood Ratio	215.466	24	.000
	Linear-by-Linear Association	2.042	1	.153
	N of Valid Cases	6444		

Chi-Square Tests: Race * sex of respondent * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	4.602[b]	3	.203
	Likelihood Ratio	4.400	3	.221
	Linear-by-Linear Association	.233	1	.629
	N of Valid Cases	2449		
yes	Pearson Chi-Square	8.786[c]	3	.032
	Likelihood Ratio	8.973	3	.030
	Linear-by-Linear Association	2.692	1	.101
	N of Valid Cases	3990		
Total	Pearson Chi-Square	10.582[a]	3	.014
	Likelihood Ratio	10.545	3	.014
	Linear-by-Linear Association	.658	1	.417
	N of Valid Cases	6439		

Chi-Square Tests: Age categories * Sex of respondent * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	3.081[b]	2	.214
	Likelihood Ratio	3.049	2	.218
	Linear-by-Linear Association	1.329	1	.249
	N of Valid Cases	2450		
yes	Pearson Chi-Square	2.292[c]	2	.318
	Likelihood Ratio	2.311	2	.315
	Linear-by-Linear Association	.170	1	.680
	N of Valid Cases	3994		
Total	Pearson Chi-Square	1.240[a]	2	.538
	Likelihood Ratio	1.254	2	.534
	Linear-by-Linear Association	.985	1	.321
	N of Valid Cases	6444		

Chi-Square Tests: Marital Status * Sex of respondent * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	15.265[b]	6	.018
	Likelihood Ratio	15.983	6	.014
	Linear-by-Linear Association	.398	1	.528
	N of Valid Cases	2450		
yes	Pearson Chi-Square	27.154[c]	6	.000
	Likelihood Ratio	28.105	6	.000
	Linear-by-Linear Association	1.198	1	.274
	N of Valid Cases	3994		
Total	Pearson Chi-Square	34.617[a]	6	.000
	Likelihood Ratio	36.196	6	.000
	Linear-by-Linear Association	.242	1	.623
	N of Valid Cases	6444		

Chi-Square Tests: Age categories * race * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	37.828[b]	6	.000
	Likelihood Ratio	39.674	6	.000
	Linear-by-Linear Association	36.527	1	.000
	N of Valid Cases	2449		
yes	Pearson Chi-Square	43.065[c]	6	.000
	Likelihood Ratio	40.982	6	.000
	Linear-by-Linear Association	31.682	1	.000
	N of Valid Cases	3990		
Total	Pearson Chi-Square	86.373[a]	6	.000
	Likelihood Ratio	83.889	6	.000
	Linear-by-Linear Association	78.750	1	.000
	N of Valid Cases	6439		

Chi-Square Tests: Marital Status * Race * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	180.428[b]	18	.000
	Likelihood Ratio	178.906	18	.000
	Linear-by-Linear Association	1.082	1	.298
	N of Valid Cases	2449		
yes	Pearson Chi-Square	124.405[c]	18	.000
	Likelihood Ratio	116.751	18	.000
	Linear-by-Linear Association	2.170	1	.141
	N of Valid Cases	3990		
Total	Pearson Chi-Square	298.002[a]	18	.000
	Likelihood Ratio	279.036	18	.000
	Linear-by-Linear Association	3.259	1	.071
	N of Valid Cases	6439		

Chi-Square Tests: Marital status * Age categories * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	492.751[b]	12	.000
	Likelihood Ratio	511.886	12	.000
	Linear-by-Linear Association	.240	1	.624
	N of Valid Cases	2450		
yes	Pearson Chi-Square	855.565[c]	12	.000
	Likelihood Ratio	926.907	12	.000
	Linear-by-Linear Association	1.970	1	.160
	N of Valid Cases	3994		
Total	Pearson Chi-Square	1362.528[a]	12	.000
	Likelihood Ratio	1448.308	12	.000
	Linear-by-Linear Association	.514	1	.474
	N of Valid Cases	6444		

Pearson chi-squared test of Association of independent Variables

To understand how collinear the independent variables are, a chi-squared test was done and the relationship between 2 independent variable looked at one at a time as shown in the tables above. As the results show, the total relationships between the most 2 independent variables were mostly non-significant. Although, the relationship between those who tested (yes) and those who did not(no) varied among variables, however, the total for the association between all set of variables were non-significant except between sex and age. Considering the above, no independent variables were excluded on the basis of collinearity from the regression equation.

Multiple Logistic Regressions

Factors that were associated with VCT uptake at a *p-value* ≤ 0.05 in bivariate models were further examined in multivariate models. It is important to note that the only variable not included in this model had a *p-value* of > 0.5 (gender) while the variables included had a p-value of < 0.05. From the above, there is a very good justification for the exclusion of gender from the model, as it was very unlikely to be included even if we considered variables with p < 0.1.

In most regression models, predictive variables with a p-value of less than or equal to 0.20in the bivariate analyses are potentially eligible for logistic regression analysis in most instances or the rule of thumb is that if the odds ratio changes by 10% or more then, it is considered a confounder and left in the model. In this case, a forward logistic procedure was used to examine the parameters that significantly predicted VCT uptake.

Interpretation of table

From table 22, we see the change in -2LL statistics change as variables are added from the first step to the addition of the last variables which produced a statistically significant change. The -2LL statistics decreased progressively from 119.22 to 75.38. Since lower levels of -2LL indicate that the variable predict the model more accurately it indicates that the model is correct. The variables that were excluded did not provide this trend. When variables like gender, education, socio-economic status and marital status were added the change observed were not statistically significant; hence these variables were automatically excluded from the model by forward regression and other variables added. Step 5 shows the five variables retained in the forward regression model.

Table 23

Model if Term Removed

Variable		Model Log Likelihood	Change in -2 Log Likelihood	df	Sig. of the Change
Step 1	agecat3a	-4164.776	119.224	2	.000
Step 2	province	-4105.164	95.287	8	.000
	agecat3a	-4114.274	113.506	2	.000
Step 3	province	-4091.389	85.897	8	.000
	settlement	-4057.521	18.161	4	.001
	agecat3a	-4103.554	110.226	2	.000
Step 4	province	-4086.401	84.712	8	.000
	settlement	-4054.279	20.468	4	.000
	agecat3a	-4082.817	77.544	2	.000
	emplcat2	-4048.440	8.790	2	.012
Step 5	province	-4079.237	79.327	8	.000
	settlement	-4048.868	18.589	4	.001
	race2	-4044.045	8.944	3	.030
	agecat3a	-4077.261	75.375	2	.000
	emplcat2	-4044.515	9.884	2	.007

Table 24

Block 1: Method = Forward Stepwise (Likelihood Ratio)
Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	119.224	2	.000
	Block	119.224	2	.000
	Model	119.224	2	.000
Step 2	Step	95.287	8	.000
	Block	214.511	10	.000
	Model	214.511	10	.000
Step 3	Step	18.161	4	.001
	Block	232.672	14	.000
	Model	232.672	14	.000
Step 4	Step	8.790	2	.012
	Block	241.462	16	.000
	Model	241.462	16	.000
Step 5	Step	8.944	3	.030
	Block	250.406	19	.000
	Mode1	250.406	19	.000

In table 25, the cox and snell, and naglekerk R squared are all a measure of the effect size of the model and when all variable were added, there was still statistically significant effect size on the model. In the classification table, table 24 when only the constant was included the value was 62.1 while when the interventions were included it became 62.4%

Table 25
Classification Table

	Observed		Predicted		
			had test for hiv in the last 12 months		Percentage Correct
			no	yes	
Step 1	had test for hiv in the last 12 months	no	0	2379	.0
		yes	0	3897	100.0
	Overall Percentage		102	2277	62.1
Step 2	had test for hiv in the last 12 months	no			4.3
		yes	109	3788	97.2
	Overall Percentage				62.0
Step 3	had test for hiv in the last 12 months	no	260	2119	10.9
		yes	270	3627	93.1
	Overall Percentage				61.9
Step 4	had test for hiv in the last 12 months	no	288	2091	12.1
		yes	281	3616	92.8
	Overall Percentage				62.2
Step 5	had test for hiv in the last 12 months	no	259	2120	10.9
		yes	239	3658	93.9
	Overall Percentage				62.4

The model summary in table 25 shows the various steps of the forward regression showing significant change up to the last variable added in the fifth level. Overall statistics tells us about the 13 variable not in equation and tells us that variable not in equation was 15.23($p=0.29$). A p-value >0.05 tells us that these variables are not statistically significant. Therefore, including these predictors will not make any significant impact on the outcome of the model. On the other hand the variable in the equation are statistically significant.

Table 26A
Model Summary

Step	-2 Log likelihood	Cox &Snell R Square	Nagelkerke R Square
1	8210.328a	.019	.026
2	8115.041b	.034	.046
3	8096.881b	.036	.050
4	8088.090b	.038	.051
5	8079.146b	.039	.053

Table 26B
Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	1	1.000
2	8.795	7	.268
3	15.362	8	.052
4	6.988	8	.538
5	5.625	8	.689

The Hosmer and Lemeshow show the goodness of fit of the model. In this model the model showed that the null hypothesis is rejected(meaning that there was a significant association between the various variables) as the significance at all levels from the first to last was greater than 0.05

Table 26C
Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.494	.026	359.802	1	.000	1.638

Regression Model

Factors that were associated with VCT uptake at a p-value ≤ 0.05 in bivariate models were further examined in multivariate models. Predictive variables with a p-value of less than 0.20 in the bivariate analyses are potentially eligible and can be used in the logistic regression analysis, although all predictive variables included had p-values of < 0.05 making the model a very strong predictive one. A forward stepwise procedure was used to add variables to the original model and those parameters that did not significantly predict VCT uptake removed.

When analyzing data using logistic regression, a rule of thumb is if the odds ratio changes by 10% or more, then the potential confounder should be included in model. This means that if a variable changes the effect by 10% or more, then it is considered a cofounder and left in the

model. In the analysis the various categories of the variable is compared to another category to determine the level of significance. In this case the categories are compared to the last level as the referent level.

Final models included all potential confounders that changed the effect estimate by ≥ 10% in either direction, as well established risk factors for VCT uptake. In this analysis, a forward regression is used, beginning with a constant and adding one predictor at a time. The variable with the highest score statistics are added to the model until there was no more to add. As shown in table 26A, in the end only 5 variables (province, settlement, employment status, age, and race) were retained with other 4 variables removed from the regression models including education, gender, marital status and socio-economic status.

Table 27A:

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95%C.I.for EXPB	
								Lower	Upper
Step 1a	agecat3a			114.888	2	.000			
	Age 16-24yrs	.878	.107	66.910	1	.000	2.407	1.950	2.970
	Age 25-49yrs	.290	.099	8.486	1	.004	1.336	1.099	1.624
	Constant	.062	.094	.433	1	.510	1.064		
Step 2b	province			91.826	8	.000			
	Eastern cape	-.048	.096	.246	1	.620	.953	.790	1.151
	Free state	.749	.130	33.197	1	.000	2.114	1.639	2.727
	Gauteng	.262	.087	9.159	1	.002	1.300	1.097	1.540
	Kwazulu-natal	.127	.086	2.200	1	.138	1.136	.960	1.343
	Limpopo	.456	.110	17.276	1	.000	1.578	1.273	1.957
	Mpumalanga	.695	.116	35.591	1	.000	2.003	1.594	2.517
	North-west	-.120	.130	.853	1	.356	.887	.687	1.144
	Northern cape	-.130	.206	.400	1	.527	.878	.586	1.315
	agecat3a			109.414	2	.000			
	Age 16-24yrs	.833	.108	59.076	1	.000	2.299	1.860	2.843
	Age 25-49yrs	.243	.100	5.831	1	.016	1.274	1.047	1.552
	Constant	-.098	.109	.812	1	.368	.907		
Step 3c	province			83.099	8	.000			
	Eastern cape	-.063	.097	.426	1	.514	.938	.775	1.136
	Free state	.743	.130	32.653	1	.000	2.103	1.629	2.713
	Gauteng	.303	.087	12.011	1	.001	1.354	1.141	1.608
	Kwazulu Natal	.126	.087	2.085	1	.149	1.134	.956	1.346
	Limpopo	.381	.132	8.362	1	.004	1.464	1.131	1.895
	Mpumalanga	.638	.118	29.328	1	.000	1.892	1.502	2.384
	North-west	-.114	.133	.741	1	.389	.892	.687	1.157
	Northern cape	-.084	.207	.163	1	.686	.920	.613	1.379
	settlement			18.105	4	.001			
	Urban formal	.090	.186	.236	1	.627	1.095	.760	1.576
	Urban informal	.254	.186	1.858	1	.173	1.289	.895	1.857
	Peri urban	.408	.197	4.315	1	.038	1.504	1.023	2.211
	tribal	.345	.188	3.385	1	.066	1.412	.978	2.040
	agecat3a			106.333	2	.000			
	Age 16-24yrs	.818	.109	56.751	1	.000	2.265	1.831	2.802
	Age 25-49yrs	.234	.101	5.382	1	.020	1.263	1.037	1.538
	Constant	-.296	.212	1.941	1	.164	.744		
Step 4d	province			81.911	8	.000			
	Eastern cape	-.067	.097	.477	1	.490	.935	.772	1.132
	Free state	.742	.130	32.509	1	.000	2.100	1.627	2.711
	Gauteng	.296	.088	11.404	1	.001	1.344	1.132	1.596
	Kwazulu-natal	.125	.087	2.059	1	.151	1.134	.955	1.346
	Limpopo	.361	.132	7.471	1	.006	1.435	1.108	1.859
	Mpumalanga	.633	.118	28.871	1	.000	1.884	1.495	2.374
	North-west	-.121	.133	.826	1	.363	.886	.683	1.150
	Northern cape	-.082	.207	.157	1	.692	.921	.614	1.382
	settlement			20.394	4	.000			
	Urban formal	.088	.186	.224	1	.636	1.092	.758	1.573
	Urban informal	.264	.187	1.994	1	.158	1.302	.903	1.877
	Peri urban	.425	.197	4.647	1	.031	1.529	1.039	2.250
	tribal	.370	.189	3.841	1	.050	1.447	1.000	2.094
	agecat3a			75.158	2	.000			
	Age 16-24yrs	.774	.113	46.893	1	.000	2.169	1.738	2.708
	Age 25-49yrs	.230	.101	5.203	1	.023	1.258	1.033	1.533

	emplcat2			8.725	2	.013			
	unemployed	-.256	.107	5.746	1	.017	.774	.628	.954
	employed	-.137	.114	1.425	1	.233	.872	.697	1.092
	Constant	-.094	.241	.151	1	.697	.911		
Step 5e	province			76.938	8	.000			
	Eastern cape	-.023	.100	.051	1	.822	.978	.804	1.189
	Free state	.795	.138	33.372	1	.000	2.214	1.691	2.899
	Gauteng	.346	.099	12.195	1	.000	1.413	1.164	1.715
	Kwazulu-natal	.182	.097	3.525	1	.060	1.199	.992	1.449
	Limpopo	.414	.138	8.992	1	.003	1.513	1.154	1.984
	Mpumalanga	.694	.126	30.535	1	.000	2.001	1.565	2.559
	North-west	-.056	.139	.161	1	.688	.946	.719	1.243
	Northern cape	-.060	.207	.085	1	.771	.941	.627	1.413
	settlement			18.521	4	.001			
	Urban formal	.098	.187	.273	1	.602	1.102	.764	1.590
	Urban informal	.260	.187	1.942	1	.163	1.297	.900	1.871
	Peri urban	.423	.197	4.603	1	.032	1.527	1.037	2.247
	tribal	.368	.189	3.805	1	.051	1.445	.998	2.092
	race2			8.860	3	.031			
	black	.427	.310	1.898	1	.168	1.532	.835	2.812
	colored	.526	.319	2.732	1	.098	1.693	.907	3.161
	white	-.081	.379	.045	1	.831	.922	.439	1.939
	agecat3a			73.088	2	.000			
	Age 16-24yrs	.765	.114	45.346	1	.000	2.149	1.720	2.685
	Age 25-49yrs	.226	.101	5.005	1	.025	1.254	1.028	1.529
	empcat2			9.812	2	.007			
	emplcat2	-.265	.107	6.174	1	.013	.767	.622	.945
	unemployed	-.134	.115	1.373	1	.241	.874	.699	1.094
	employed	-.562	.395	2.027	1	.155	.570		

Socio-economic status, marital status and Educational status:

When analyzing data using logistic regression, issues of practical significance make it necessary to examine all the factors even when they did not necessarily satisfy the 10% criteria. It is for this reason that all the variables are entered in the analysis procedure shown in 26B to consider the issue of statistical significance, practical significance, known risk factors and biological variability in one population.

Since Socio-economic status, marital status, and Educational status were excluded from the forward regression as the impacts of these variables to the uptake of VCT were not statistically significant, to determine their practical significance and to what extent they acted as confounders, another method of regression was used with all variables entered in

the regression equation at the same time. Table 26B demonstrates the effect of these variables on the uptake of VCT if they are included in the model all at the same time.

Table 27B

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1a	province			75.7	8	.00			
	Eastern cape	-.04	.100	.165	1	.684	.960	.788	1.17
	Free state	.784	.138	32.3	1	.000	2.19	1.67	2.87
	Gauteng	.348	.100	12.1	1	.001	1.41	1.16	1.72
	Kwazulu-natal	.166	.098	2.88	1	.089	1.18	.975	1.43
	Limpopo	.391	.140	7.79	1	.005	1.48	1.12	1.95
	Mpumalanga	.686	.127	29.0	1	.000	1.99	1.55	2.55
	North-west	-.07	.141	.219	1	.640	.936	.711	1.23
	Northern cape	-.04	.21	.04	1	.841	.96	.64	1.44
	settlement			14.0	4	.007			
	Urban formal	.126	.192	.435	1	.510	1.14	.779	1.65
	Urban informal	.262	.190	1.92	1	.166	1.30	.90	1.89
	Peri urban	.422	.199	4.50	1	.034	1.53	1.03	2.25
	tribal	.356	.190	3.50	1	.061	1.43	.983	2.07
	race2			9.27	3	.026			
	black	.409	.313	1.71	1	.191	1.51	.815	2.78
	colored	.552	.320	2.98	1	.084	1.74	.928	3.25
	white	-.06	.380	.023	1	.881	.944	.448	1.99
	agecat3			60.7	2	.000			
	Age 16-24yrs	.701	.126	30.9	1	.000	2.02	1.57	2.58
	Age 25-49yrs	.160	.108	2.17	1	.141	1.17	.949	1.45
	Marital stat			8.76	6	.187			
	Divorced/widowed	-.26	.252	1.07	1	.301	.770	.470	1.26
	singled	-.07	.229	.103	1	.749	.929	.593	1.46
	Not mar/living tog. but in steady relatnsp	-.02	.234	.005	1	.946	.984	.623	1.56
	Not mar but living with sex partner	-.05	.241	.042	1	.837	.952	.594	1.53
	Mar, living with spouse	.024	.235	.011	1	.918	1.02	.646	1.62
	Mar, not living with spouse	.201	.270	.553	1	.457	1.22	.720	2.08
	emplcat2			10.8	2	.004			
	unemployed	-.29	.108	7.11	1	.01	.75	.61	.93
	employed	-.15	.12	1.62	1	.20	.86	.69	1.1
	educat2			1.66	4	.80			
	Up to primary school	.03	.27	.01	1	.92	1.03	.61	1.74
	Up to grade 11	.15	.26	.31	1	.58	1.16	.69	1.93
	matric	.14	.26	.30	1	.59	1.16	.69	1.93
	tertiary	.15	.27	.29	1	.59	1.16	.68	1.97
	SEScat			4.20	2	.12			
	High SES	-.16	.090	3.46	1	.06	.85	.72	1.01
	Medium SES	-.04	.07	.28	1	.60	.96	.83	1.11
	Constant	-.50	.52	.91	1	.34	.61		

Variables contributing to Model

Province

The variable province has a p-value of 0.00, so the null hypothesis that the coefficient equals 0 would be rejected. Because the test of the overall variable is statistically significant, you can look at the one degree of freedom tests for the dummies provinces. The uptake of VCT in all provinces together is statistically significant (*p= 0.00*). Specifically the Eastern Cape was statistically non-significant (OR=0.98; CI=0.80, 1.19; *p= 0.82*) when compared to the Western Cape Province (which is the omitted, or reference category).The Free State Province was statistically significant (OR= 2.21; 1.70, 2.90; *p=0.00*) than the Western Cape Province just as Gauteng(OR=141; CI= 1.16, 1.71; *p=0.00*) and Limpopo Province (OR=1.51; 1.15-1.98; p=0.03)was statistically significant than the Western Cape Province, in the same vein as Mpumalanga Province(OR= 2.0; CI=1.57, 2.56; *p=0.00*). Finally, KwaZulu-Natal Province (OR=1.20; CI=0.0.99, 1.45; *p= 0.06*), North West Province (OR=0.95; CI=0.72, 1.24; *p=0.69*) and Northern Cape Province (OR=0.94; CI=0.63, 1.41; *p=0.77*) were non-statistically significant than Western Cape Province respectively.

In summary, living in certain Provinces significantly impacted VCT uptake in a multivariate logistic regression with a Walt statistics of 76.94. Looking closely Free State, Gauteng, Limpopo and Mpumalanga Provinces impacted VCT uptake significantly hence the CI did not include 1 and the Walt value is statistically significant at 0.05. In addition, Eastern Cape and Kwazulu-Natal provinces did not impact uptake significantly. On the hand, Northern and North West provinces are negatively associated with VCT uptake. It is clear that the multivariate model revealed a higher uptake in the Provinces with the higher prevalence of HIV clear this was not so with the bivariate model.

Settlement

The impact of settlement on VCT uptake was statistically significant (*p=0.00*) with a Walt value of 18.52. Looking closely only Peri-urban settlement was statistically significant than the farming settlement (OR=1.53; CI=1.04, 2.25; *p=0.032*). The other settlements are positively and non-statistically associated with the uptake of VCT; urban-formal (OR=1.10; CI=0.76, 1.60; *p=0.60*), urban informal (OR=1.30; CI=0.90, 1.90; *p=0.16*) and the other settlements were significantly associated with VCT uptake; peri-urban and Tribal (OR= 1.45; CI=1.00, 2.09; *p=0.05*). In the multivariate model, with age, race, employment status, educational status and province a unit rise in the urban-formal, urban-informal, peri-urban and tribal settlement produced a 0.10, 0.26, 0.42 and 0.37 increase in uptake of VCT respectively. This also revealed that peri-urban and tribal settlements were statistically significant. In summary, it seems that peri-urban settlement is the province with the highest uptake of VCT despite the method of analysis. The peri-urban settlement had the highest impact on VCT followed by tribal then urban-informal and lastly urban-formal.

Race

Impacted uptake of VCT significantly in the model (*p-value= 0.03*) and Walt value was less than 10 (8.86). On looking closely, the bivariate analysis of race groups were less significant statistically than the Indian race on their impacted on the uptake of VCT (which is the referent race). With the colored race (OR=1.70; 0.90, 3.16; *p= 0.10*) more significant than the black (OR=1.53; CI=0.84, 2.81; *p= 0.17*) and then the white race (OR=0.92; CI=0.84, 2.81; *p= 0.83*). Race was statistically non-significant and was negatively associated with VCT uptake. A unit rise in the black, colored and white race produced a 0.43, 0.53 increase and 0.08 unit decrease in

uptake of VCT respectively. Summarily, colored race had the highest impact on VCT uptake followed by black and then white.

Age

In the multivariate analysis age significantly contributed to the model, with Walt value of 73.09. However the age group 16-24years was more statistically significant (OR=2.15; CI=1.72, 2.69; *p= 0.00*) than the age group 50-55 year (the referent group) and the age group 25-49 is also more statistically significant(OR=1.25; 1.03,1.53; *p= 0.03*) than the age group 50-55 years. A unit increase in age category 16-24years and 25-49 years produced a 0.77 and 0.23 unit increase in uptake of VCT respectively. In all, age increased the uptake of VCT with the 16-24years impacting uptake most.

Employment Status

This also contributed significantly to the multivariate model with Walt value of 9.81 (*p= 0.01*). The unemployed category is statistically more significant (OR=0.77; CI=0.62, 0.95; *p=0.01*) than the student category (the referent category) and the employed category less statistically significant (OR=0.87; CI= 0.70, 1.09; *p= 0.24*) than the student category. A unit rise in unemployment and employment status produced a reduced VCT uptake of 0.27 unit and 0.13 units respectively. Summarily, unemployment is least associated with VCT uptake.

Marital status:

This did not have a statistically significant impact on VCT uptake. The Wald value when it was included in the model is 8.76*(p= 0.19)* hence the effect size is not significant statistically. In the same vein, all marital status were not significant statistically with divorced/widowed (OR=0.77; CI=0.47, 1.26; *p = 0.30*), single(OR=0.93; CI=0.59, 1.46; *p= 0.75*), not married or living together but in a steady relationship (OR=0.98;CI=0.62, 1.56; *p= 0.95*) Not married but living with sexual partners (OR=0.95; CI=0.53, 1.59; *p= 0.84*) married and living with spouse (OR=1.02; CI=0.65,1.62; *p= 0.92*) and married but not living with spouse(OR=1.22; CI=0.72, 2.08; *p= 0.46*)less statistically significant than the others group(the referent group). Increase in a unit of groups 1-4 caused a decrease in VCT uptake. Married, living with spouse caused the highest increase in uptake of VCT followed by married, not living with spouse. The divorced/widowed group caused the greatest decrease in uptake followed by the single group.

Educational status:

Educational status did not have a statistically significant effect on VCT uptake with Wald value of 1.66*(p= 0.80).* The different educational levels like up to primary school (OR=1.03; CI= 0.61, 1.74; *p= 0.92*), up to grade 11 with a (OR=1.16; CI= 0.69,1.93; *p= 0.58*), matric with a (OR=1.16; CI=0.69,1.93; *p= 0.59*) and tertiary level with (OR=1.16; CI=0.68, 1.97; *p= 0.59*) are all statistically less significant to the no schooling category (the referent category). Unit increase in educational level caused a similar increase in VCT uptake in the grade 11, matric and tertiary levels of education with the least increase in the primary level.

Gender

Gender was not significantly associated with Uptake of VCT in a bivariate model and hence was not included in the model.

Socio-economic status (SES)

SES did not have statistically significant effect on uptake of VCT. The Wald value was 4.20 (p= 0.12). However SES high (OR=0.85; CI=0.72, 1.01; *p= 0.06*) and SES medium (OR=0.96; CI=0.83, 1.11; *p= 0.60*) are less statistically than the SES (low) levels the uptake of VCT. A unit increase in SES brought about a 0.16 unit decrease in VCT uptake in the high SES and 0.04 in the medium SES category. In summary the medium SES causes a higher increase in uptake compared to the high SES.

In summary, living in Free State, Gauteng, Limpopo and Mpumalanga provinces impacted uptake positively while living in Eastern Cape, North-west and Northern Province impacted uptake negatively just as living in Peri-urban settlement increased uptake of VCT. Belonging to the colored or black race will increase the uptake of VCT (although not statistically significant) and belonging to age group 16-24years or 25-49 years will also positively impact VCT uptake. In addition, being unemployed will statistically reduce VCT uptake than being employed (not statistically significant) in a multivariate model. Finally, in the multivariate model province contributed the most followed by Age, employment category, race, marital status, socio-economic status and lastly educational status.

Research Question 3:

Does racial group interact with gender to impact VCT uptake in South Africa?

From question 2 one can extrapolate the impact of gender and race on VCT uptake while the chi-Squared test tells us the associations between these two variables in the past 12months among South Africans.

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Table 28
Gender

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.488	.026	361.561	1	.000	1.629

Model Summary

Step	-2 Log likelihood	Cox &Snell R Square	Nagelkerke R Square
1	8559.375a	.000	.000

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	0	.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1a	gender(1)	-.032	.055	.336	1	.562	.969	.870	1.078
	Constant	.499	.031	254.310	1	.000	1.647		

In our present statistics it seems that having the socio-demographic interventions of gender made a significant prediction of the outcome with Wald statistics of 0.336. However, the male gender (1) did not statistically differ from the female gender (2) in the uptake of VCT (CI=0.87, 1.08; *p= 0.56*). In fact males were 0.97 times less likely to uptake VCT than their female counterparts and the effect size of the male gender was 0.336(very small). As male gender increases the uptake decreases. Considering the small effect size of gender and its association with VCT uptake it was not included in the multivariate model.

Table 29
Race
Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.488	.026	361.561	1	.000	1.629

Model Summary

Step	-2 Log likelihood	Cox &Snell R Square	Nagelkerke R Square
1	8522.900a	.005	.007

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	0	.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1a	race2			30.863	3	.000			
	black	-.230	.070	10.723	1	.001	.794	.692	.912
	colored	-.856	.215	15.807	1	.000	.425	.279	.648
	white	-.766	.301	6.453	1	.011	.465	.258	.840
	Constant	.542	.028	363.467	1	.000	1.720		

In our present statistics it seems that having the intervention of race, made a significant prediction of the outcome. Wald statistics of 30.86 (*p=0.00*). Racial groups including blacks, Whites and colored had a statistically significant lower outcome (uptake of VCT) than the Indian race. Generally race had a statistically significant impact on uptake of VCT with Wald value of 30.863 (*p= 0.00*). However, increase in a unit of the each of the racial group caused a reduced uptake of VCT. In a multivariate analysis when province, settlement, age and employment status were considered as cofounders, increase in a unit of the black and colored and white race caused an increase in uptake of VCT by 0.43 black and 0.53 units increase in colored and 0.08 decrease in white race respectively. So although there were subtle differences between the age groups, it was not statistically different.

Table 30

Chi-Square Tests: Race * sex of respondent * had test for HIV in the last 12 months

had test for hiv in the last 12 months		Value	df	Asymp. Sig. (2-sided)
no	Pearson Chi-Square	4.602[b]	3	.203
	Likelihood Ratio	4.400	3	.221
	Linear-by-Linear Association	.233	1	.629
	N of Valid Cases	2449		
yes	Pearson Chi-Square	8.786[c]	3	.032
	Likelihood Ratio	8.973	3	.030
	Linear-by-Linear Association	2.692	1	.101
	N of Valid Cases	3990		
Total	Pearson Chi-Square	10.582[a]	3	.014
	Likelihood Ratio	10.545	3	.014
	Linear-by-Linear Association	.658	1	.417
	N of Valid Cases	6439		

Second, from the chi-square table one can extrapolate that the association between Race and sex of respondent among those that did not do HIV testing in SA was statistically non-significant while among those that did HIV testing was statistically significant. In all, the association between race and gender was statistically significant.

In summary, one can suggest that since there was a significant interaction between race and gender among those that took VCT and considering the result of the logistic regression-it is possible that among blacks and colored females a unit increase caused an increase in uptake of VCT while among white females there was a decrease uptake of VCT among males the relationship was not significantly different statistically for males a although females had practically better VCT uptake than males.

Summary

Summarize answers to research questions.

Table 31

	Hypothesis	Dependent variables	Independent variable	Statistical test	Sig. of the Change	Hypothesis outcome
1	Socio-Demographic determinants do not have any impact on VCT uptake.	Uptake of voluntary testing and counseling	Province	Logistic regression	0.000	Null rejected
			settlement	Logistic regression	0.000	Null rejected
			Gender	Logistic regression	0.562	Null accepted
			race	Logistic regression	0.000	Null rejected
			age	Logistic regression	0.000	Null rejected
			Marital status	Logistic regression	0.000	Null rejected
			Employment status	Logistic regression	0.000	Null rejected
			Educational status	Logistic regression	0.004	Null rejected
			Socio-economic status	Logistic regression	0.000	Null rejected
	Do socio-emographic determinants interact to improve VCT uptake?	Uptake of Voluntary testing and counseling	Province	Logistic regression	0.000	Null rejected
			Settlement	Logistic regression	0.007	Null rejected
			Race	Logistic regression	0.026	Null rejected
			Age	Logistic regression	0.000	Null rejected
			Employment status	Logistic regression	0.004	Null rejected
			Marital status	Logistic regression	0.187	Null accepted
			Socio-economic status	Logistic regression	0.120	Null accepted
			Educational status	Logistic regression	0.800	Null accepted
	There is no difference in the socio-demographic determinants of VCT uptake between races and gender?	Determinants of VCT uptake for race group	black	Logistic regression	0.191	Null accepted
			colored	Logistic regression	0.084	Null accepted
			white	Logistic regression	0.884	Null accepted
		Determinants of VCT uptake for gender	male	Bivariate regression	0.562	Null accepted

Transition

The result above clearly demonstrate the various factors that impact VCT uptake and to what extent. It also demonstrates that socio-demographic factors can act alone but as this is often unlikely in practice then the various predictors can confound the relationship between a specific variable and the uptake of VCT. It is also noteworthy that when these confounders act together the nature of the relationships between uptake of VCT and the various categories of predictors change.

In the nest chapter I will describe and interpret in details the findings of this study and the relationship with the literature review and the theoretical framework as prescribed in chapter 3. I shall also discuss some realities and limitations of the methodology used in this study, and how it differs from the methodology described in Chapter 3.The strengths, implications of study for practice, social change and future studies, and its recommendations.

Chapter 5: **Introduction**

Purpose and Nature of the Study

The purpose of this study is to determine the socio-demographic factors that impact VCT uptake in South Africa, determine the impact of race and gender, and understand how these factors interact. This study will enable policy makers, health professionals, and other bodies responsible for the planning and implementation of VCT programs to formulate contextualized guidelines, policies, and programs. Based on the socio-demographics that better impact VCT in a particular group an increased uptake can be achieved and hence, improved HIV prevention and risk reduction. It will also bring about equity, equality, and social justice in the distribution of government programs in HIV prevention; this will ensure that those that need these services access it better. It will also bring about acceptability, reduced victimization, stigmatization and discrimination against those affected by HIV.

Key Findings

Question 1

In the bivariate analysis one independent variable and the outcome variables are analyzed and the direct results reported based on this the 95% confidence intervals (CIs) and Odds ratios (ORs). The OR is used for interpreting the strengths of association between the predictor and outcome variable (Shisana et al., 2004). In question one it was shown that all socio-demographic factors except gender had a statistically significant impact on the uptake of VCT. If the value of Exp B is greater than 1, then it indicates that as the predictor increases, the odds of the outcome occurring increases, on the other hand, if the value is less than 1 then as the predictor increases, the odds of the outcome occurring decreases (Field, 2010).

In the bivariate analysis, province was found to have a statistically significant association with uptake of VCT. Settlement had a statistically significant association with uptake of VCT. Gender had no statistically significant association with the outcome (uptake of VCT) and there was no statistically significant difference between males and females. Generally there was a statistically significant association between race and uptake of VCT. Age was also statistically associated with uptake of VCT, with the age group 16-24years most significant. Marital status had a statistically significant association with uptake of VCT with single groups having the lowest uptake of VCT. Generally settlement had a statistically significant association with uptake of VCT with the odds of uptake highest in the peri-urban areas. Educational status had a statistically significant association with uptake of VCT with primary education demonstrating the highest increase in VCT uptake and tertiary lowest with a unit increase in education. Socio-economic status also had a statistically significant association with uptake of VCT.

Question 2:

In question two we intend to determine what happens when socio-demographic factors interact to determine uptake. The logistic regression findings in this study are that socio-demographic factors act as determinants of VCT uptake in South Africa. In a multivariate analysis, living in Free State, Gauteng, Limpopo, and Mpumalanga provinces impacted uptake positively while living in Eastern Cape, North-west, and Northern Province impacted uptake negatively. Living in peri-urban settlement increased uptake of VCT. Belonging to the colored or black race will increase the uptake of VCT (although not statistically significant), and belonging to age group 16-24years or 25-49 years will also positively impact VCT uptake, and were statistically more significant than 50-55 year old. In addition, being employed will increase VCT

uptake than being unemployed (not statistically significant) in a multivariate model. Finally, in the multivariate model province contributed the most followed by Age, employment category, race, marital status, socio-economic status, and lastly educational status.

Question 3

In question 3 we want to determine how racial group interact with gender to impact VCT uptake. The present statistics showed that having the intervention made a significant prediction of the outcome (VCT uptake). However, the male gender did not statistically differ from the female gender in the uptake of VCT (CI=0.87, 1.08; *p= 0.56*). In addition, race group showed a statistically significant impact on VCT uptake; racial groups including blacks, whites, and colored had a statistically significant negative and lower outcome (uptake of VCT) than the Indian race. Second, from the chi-square table one can extrapolate that the association between Race and sex of respondent among those that did HIV testing was statistically significant. Also in total (both those that did and did not do VCT), the association between race and gender was statistically significant.

This means that females of colored, black, and white race will impact uptake negatively. Colored race have the most impact followed by black race, and then white race. Race will also impact gender significantly. Consequently, we can extrapolate that race will statistically impact on gender, and VCT uptake with the colored race having the most impact followed by black and then white race. It also means that the effect of race would be more significant on females than on males.

As has been demonstrated in this study that racial group including blacks, whites and colored had a statistically significant lower outcome (uptake of VCT) than the Indian race. The

colored race has the greatest impact on uptake followed by blacks, and then white race. However this impact was a negative one. As shown in previous studies females are generally more likely to uptake VCT than men; more females than males underwent testing (HRSC, 2012); Ventakesh et al. (2011) showed that females with Children under their care had higher odds of reporting repeated testing. In addition, the low VCT uptake by whites and males is supported by literature as demonstrated by van Dyk & Alta (2013) in a population-based study that White male had a low self-perception of their HIV risk, are unlikely to test for HIV in public facilities, did not know their status, and preferred self-testing ($p< 0.05$).

In conclusion, of all the factors, Gender is the only factor that did not have a statistically significant impact on the uptake of VCT in a bivariate analysis. Hence was excluded from the multivariate analysis. However, race was statistically but negatively significant in a bivariate analysis but non-significant in a multivariate analysis. In all, race significantly affected gender and the uptake of VCT.

Analysis and Interpretation

Province

When province was examined in the bivariate regression analysis, the findings indicated that province significantly predicted the outcome (uptake of VCT) and had a Wald statistics of 102.12 ($p <0.05$).Eastern Cape had a statistically significant impact on VCT uptake (OR=2.34; 1.8, 3.03*; p=0.00*); Limpopo (OR=2.1; CI=1.68, 2.67; *p=0.00*); Kwa-Zulu Natal: (OR=1.7; CI= 1.36, 2.12; *p=0.00*); Free State: (OR=1.4; CI=1.14, 1.64; *p=0.00*); Gauteng: (OR=1.2; CI= 1.04, 1.49; *p=0.02*); Northern Cape (OR=1.07; CI= 0.89, 1.29; *p=0.45*); Mpumalanga (OR=0.90; CI= 0.70, 1.16; *p=0.42*); North-West (OR=0.90; CI=0.60, 1.34; *p=0.59*). All provinces except

Northern Cape, Mpumalanga, and North-West had statistically more significant impact than Western Cape Province (the referent category) on the uptake of VCT (outcome). Generally province impacted uptake of VCT in a statistically significant way. In addition, a unit increase in the predictor variable (province) brought about the highest increase in VCT uptake in Eastern Cape and lowest in Gauteng, and a decrease in VCT uptake in Mpumalanga and North-West province.

When province was examined in a multivariate model together with settlement, gender, race, age, and employment status, the uptake of VCT in Free State Province was statistically significant just as Gauteng, Mpumalanga, and Limpopo Provinces were. Finally, KwaZulu-Natal Province, North West Province, Northern Cape Province, and Eastern Cape were statistically less significant than Western Cape Province respectively. Specifically the Eastern Cape was statistically non-significant (OR=0.98; CI=0.80, 1.19; *p= 0.82*) when compared to the Western Cape Province (which is the omitted, or reference category).The Free State Province was statistically significant (OR= 2.21; 1.70, 2.90; *p=0.00*) than the Western Cape Province just as Gauteng (OR=141; CI= 1.16, 1.71; *p=0.00*), Limpopo Province (OR=1.51; 1.15, 1.98; p=0.03), and Mpumalanga Province (OR= 2.0; CI=1.57, 2.56; *p=0.00*) were. Finally, KwaZulu-Natal Province (OR=1.20; CI=0.0.99, 1.45; *p= 0.06*), North West Province (OR=0.95; CI=0.72, 1.24; *p=0.69*), and Northern Cape Province (OR=0.94; CI=0.63, 1.41; *p=0.77*) were less statistically significant than Western Cape Province respectively.

In summary, living in certain Provinces significantly impacted VCT uptake in the bivariate and multivariate logistic regression model- Free State, Gauteng and Limpopo Provinces impacted VCT uptake significantly. On the other hand, Eastern Cape and Kwazulu-Natal did not impact uptake significantly. In addition, Northern Cape and North West provinces were

negatively and non-statistically significant associated to VCT uptake in bivariate model and multivariate analysis.

Many studies have demonstrated that socio-demographic factors do interact to produce their effects (Montague et al., 2014; HRSC, 2012; JHESSA, 2012). Uptake was positive for those living in the Free State, Gauteng, and Limpopo and Mpumalanga provinces while living in Eastern Cape, North-west and Northern Province decrease uptake. In addition, Montague et al. (2014) stated that HIV prevalence, self-perception, and educational level are determinants in Kwa-Zulu Natal. In this study Kwa-Zulu natal was the third province with highest uptake and Limpopo had a high prevalence of HIV and high uptake VCT. HIV prevalence by province in the age group 15- 49 years was highest in KwaZulu-Natal 27.6% and closely followed by Mpumalanga with 26.0% (HRSC, 2012). Mhlongo et al. (2013) also demonstrated low VCT uptake in Gauteng among youths due to low use of condom. The findings in these studies support the findings of the multivariate analysis although; there are few studies on similar variables in a multivariate analysis.

Gender

Gender did not have a statistically significant association with Uptake of VCT in a bivariate model (OR=0.97; CI=0.87, 1.08; $p > 0.05$). The odds of males' uptake of VCT were 0.97 less than females in the bivariate analysis; meaning that females had a higher odd of VCT uptake than men. This is in keeping with results obtained in other studies. More females than males underwent testing (HRSC, 2012). Ventakesh et al. (2011) showed that females with Children under their care had higher odds of reporting repeated testing. In conclusion, of all the

factors, Gender is the only factor that did not have a statistically significant impact on the uptake of VCT in a bivariate analysis. Hence was excluded from the logistic regression model.

Settlement or locale

Settlement or locale in a bivariate analysis among South Africans had a statistically significant impact in the bivariate logistic regression with the odds of uptake highest in urban-informal, peri-urban region followed by urban-formal settlement. A unit increase in the tribal settlement will bring about a decrease in outcome (OR=0.90; CI=0.65, 1.26; *p=0.54*) unlike all the other settlements that caused increase in outcome with urban-formal (OR=1.18; CI=1.05, 1.33; *p=0.00*) the lowest impact on uptake, followed by peri-urban (OR=1.43; CI=1.21, 1.69; *p = 0.00*) and finally the settlement with highest impact on uptake is urban-informal (OR=1.48; CI=1.24, 1.76; *p = 0.00*). There was negative impact with the tribal settlement. All of the changes were statistically significant except for the tribal settlement.

When settlement was included in a multivariate analysis model together with province, gender, race, age and employment status the impact of settlement as a whole on VCT uptake was still statistically significant with a Wald size of 18.52 (*p=0.001*). Looking closely only peri-urban and tribal settlement were statistically significant than the farming settlement. The urban-formal, urban informal were positively but non-statistically associated with the uptake of VCT. The odds of uptake of VCT is highest in Peri-urban regions (OR=1.5; CI=1.03, 2.25; *p=0.03*) followed by tribal settlement (OR=1.45; CI= 0.98, 2.07; *p=0.05*), then urban informal (OR=1.3; CI= 0.90, 1.9; *p=0.16*) and least was urban formal (OR=1.1; CI= 0.78, 1.65; *p=0.60*) compared to the farming settlements.

The above findings are supported by the literature reviewed; the peri-urban based population was found to have a higher odd of VCT uptake (Chagan et al., 2011; De Koker et al., 2010). Ventakesh et al. (2011) in his study indicated that knowledge alone was not responsible for high uptake but improved communication among focal groups, families, communities, and partners was as important for improved VCT uptake. This probably supports the higher uptake in peri-urban and tribal settlements seen in this study where communal life, family, and focal group communication (inter-personal) is probably better and contextualized.

In the present study it seems that the more urbanized the settings the higher the odds of people refusing HIV testing, a finding that does not support previous literatures. This could also be due to the higher electronic rather inter-personal communication, knowledge, fear, distrust, and knowledge of the consequences of testing in these settings (Van Dyk & Alta, 2013). It could also point to the distrust of the public health system, uptake of more private services, or non-uptake of VCT (Van Dyk & Alta, 2013).

Thiede, Palmar, and Mbatsha (2004) stated that marginalized informal communities like squatter camps are less likely to have good uptake due to economic reasons, believe, and distance from clinics. This study differs from the above findings as it showed that urban-informal and peri-urban are among communities with higher uptake of VCT. In addition, tribal communities with even worse economic and cultural issues had even better uptake than urban communities in a multivariate logistic regression in this study. It is also noteworthy that urban-informal settlement had a better impact on VCT uptake than urban-formal, and peri-urban better than urban-formal. These demonstrate that better VCT uptake did not depend only on infrastructural development and distance from HIV testing clinic (Peltzer, Matseke, Mzolo& majaja, 2009), infrastructural or human resource (Mbengo, 2013), or economic and cultural

factors (Thiede, Palmar, and Mbatsha, 2004). The above findings suggest further research and exploration of the relationship between knowledge, reduced VCT uptake, and urbanization needs to be explored.

In different studies, peri-urban communities presented a mixed pictured, causing an increase or decrease in VCT uptake depending on confounders in a multivariate analysis; Mall et al. (2013) demonstrated that education program improved uptake, De Koker et al. (2010) showed that improved communication was important, while Mhlongo et al. (2013) demonstrated that old age was important. On the other hand, Ventakesh et al. (2011) demonstrated that discussion around HIV was most important. What is clear is that the communication is a positive determinant of uptake and differences in communication patterns in different settlements may account for difference in VCT uptake in these settlements.

Leon et al. (2013) alluded to rural settings as likely to have poor uptake due to nurse-driven health systems and poor facility. On the contrary, in this study Eastern Cape, Limpopo, and Gauteng province had the highest rural population, uptake of VCT, and low socio-economic class. In addition, Montague et al. (2014) stated that HIV prevalence, self-perception, and educational level are determinants in Kwa-Zulu Natal; in this study Kwa-Zulu natal and Limpopo are among provinces with highest uptake and they also have high prevalence of HIV (HRSC, 2012). In addition, HIV prevalence by province in the age group 15- 49 years was highest in KwaZulu-Natal 27.6% closely followed by Mpumalanga with 26.0% (HRSC, 2012).These findings show a relationship between uptakes, SES, HIV prevalence, unemployment and HIV uptake and this require further exploration.

Race

In the bivariate model, a unit rise in VCT uptake produced the highest increase in uptake in colored (0.53), then blacks (0.43) and lastly whites. All racial groups including black (OR=0.79; CI=0.69, 0.91; *p = 0.00*), white (OR=0.43; CI=0.28, 0.65; *p = 0.00*), and colored (OR=0.47; CI=0.29, 0.84; *p = 0.01*) are statistically more significant than the Indian race. Race contributed significantly to the model with a Wald value 30.86 *(p=0.00*). On looking closely, each of the racial group was statistically significant than the Indian race (the referent race). The black race had the highest odds of uptake of VCT, followed by colored, then whites.

In the multivariate model the impact of race remained significant and the Wald value was less than 8.86 (*p=0.03*). On looking closely all other race groups were less significant statistically than the Indian race however, the colored race was more significant than the black race, and the blacks more than the white race. The colored race (OR=1.70; 0.90, 3.16; *p= 0.10*) was more significant than the black (OR=1.53; CI=0.84, 2.81; *p= 0.17*), and black more significant than the white race (OR=0.92; CI=0.84, 2.81; *p= 0.83*). The VCT uptake for White race was also negative and non-significant statistically.

Age

In a bivariate model, A unit increase in age group 16-24 years (OR=0.55; CI=0.49, 0.62; *p =0.00*) and 25-49 year (OR=0.41; CI=0.34, 0.51; *p =0.00*) caused a reduction in the uptake of VCT respectively. Age significantly contributed to the model, with Wald value of 121.32. However the age group 16-24 was statistically significant and brought about the most increase or lower decrease in VCT uptake. The age group 25-49 was less statistically significant than the age

group 50-55 years. Age group 16-24 had the highest odds of VCT uptake followed by the age group 25-49 age grade.

In the multivariate analysis when other variables like province, settlement, gender, race, and employment status were included age still significantly contributed to the model, with an effect size of 73.09. However the age group 16-24years was more statistically significant (OR=2.15; CI=1.72, 2.69; *p= 0.00*) than the age group 50-55 year (the referent group), and the age group 25-49 also more statistically significant (OR=1.25; 1.03, 1.53; *p= 0.03*) than the age group 50-55 years. However, the age group 16-24 years was more statistically significant than the age group 25-49 year, and also more statistically significant than the age group 50-55 years. A unit rise in age category 16-24years and 25-49years produced a 0.77 and 0.23 unit increase in uptake of VCT respectively. In summary, the age group 16-24year old had the most effect on VCT uptake followed by 25-49year old age group in both bivariate and multivariate analysis.

In previous studies, the uptake of VCT is highest among adolescents and decreases as age increases during youth and adulthood (Johnston et al, 2010).This finding is in keeping with this study which also showed highest uptake in age group between 16-24years and decreases as we approach 25-49years in both bivariate and multivariate analysis. On the other hand, Mhlongo et al. (2013) demonstrated that VCT uptake in the age group between 18-23yrs was low. The difference between these studies could be differences in setting and populations studied.

Employment Status:

In a bivariate model, Unemployed status had a statistically significant impact on the outcome (OR=0.99; CI= 0.89, 1.3; *p= 0.96*). Generally employed status had a statistically significant impact on the uptake of VCT (OR=1.80; CI=1.50, 2.18; *p= 0.00*). Employment Status

contributed significantly to the model with Wald value of 39.61(p=0.00). A unit increase in unemployment and employment led to a decrease and increase in uptake of VCT respectively. The VCT uptake of the unemployed category was statistically less significant than students while the employed was statistically more significant than students' category. In decreasing order, the odds of uptake of VCT was employed, student then least, unemployed.

While in a multivariate model the Wald value was9.81 (*p= 0.01*).When variables like province, age, settlement, gender, and race and employment status were added, the unemployed category was statistically more significant than the student category (the referent category) and the employed category statistically less significant than the student category. The unemployed category is more statistically significant (OR=0.77; CI=0.62, 0.95; *p=0.02*) than the student category (the referent category) and the employed category less statistically significant (OR=0.87; CI= 0.70, 1.09; *p= 0.24*) than the student category. A unit rise in unemployment and employment status produced a reduced VCT uptake of 0.26 unit and 0.14 units respectively.

In summary, in the two models employment seems to have more positive impact on uptake of VCT when compared to the unemployed category however this impact in the multivariate model was not statistically significant for employed category.

Marital status

In the bivariate model the Wald statistics was 31.89 (*p = 0.00*). All marital status had a statistically significant impact on the outcome (uptake of VCT). An increase by a unit of any of the marital statuses will cause an increase in the outcome. Generally marital status had a statistically significant positive impact on the uptake of VCT with single status having the highest impact on uptake (OR=1.82; CI= 1.45, 2.30; *p = 0.00*), followed by married but not

living with spouse (OR=1.68; CI=1.05, 2.67; *p =0.029*), then married but living with spouse, single not married or living with sexual partner, not married but living with sexual partner had the smallest impact in uptake (OR= 1.37; CI=1.09, 1.72*; p= 0.01*).

When a multivariate analysis was done with other variables (province, age, settlement, gender, race and employment status) as cofounders the marital status was statistically non-significant. However, the divorced/widowed, married not living with spouse, single still had the highest impact on uptake 8.76*(p= 0.19)* hence the effect size is not significant statistically. In the same vein, all marital status were not significant statistically with divorced/widowed (OR=0.77; CI=0.47, 1.26; *p= 0.30*), single(OR=0.93; CI=0.59, 1.46; *p= 0.75*), not married or living together but in a steady relationship (OR=0.98;CI=0.62, 1.56;*p= 0.95*), Not married but living with sexual partners (OR=0.95; CI=0.53, 1.59;*p= 0.84*), married and living with spouse (OR=1.02; CI=0.65-1.62;*p= 0.92*), and married but not living with spouse(OR=1.22; CI=0.72, 2.08;*p= 0.46*) less statistically significant than the others group(the referent group).

In general, it seems that in a bivariate model the divorced/widowed status is a more important determinant and when multivariate analysis is done the impact of marriage become more significant. Infact, in multivariate analysis the single statuses had a negative relationship with VCT uptake and marital status had a non-significant effect.

Shishane et al, 2004 examined the relationship between marital status and risk of HIV infection in South Africa. They further demonstrated that HIV infections is higher in unmarried persons than married in a bivariate analysis, the findings were also the same in a logistic regression testing with variables like locality, demographics, employment status, and STI present. In addition, the prevalence of HIV infections remained higher in unmarried persons compared to married persons. The HRSC, 2012 also found that females were substantially more

aware of their HIV status than males due to the additional effect of the Prevention of Mother to Child Transmission (PMTCT) program. They also found that HIV prevalence among unmarried persons is twice that of married persons, 19.2% compared with 9.8%.

VCT acceptance is associated with older age, marriage, and living with partner (Johnston, et al., 2010). However, having primary education, a younger age (18-23), and having more than 2 sex partner in the past 6months were associated with reduced uptake of VCT (Mhlongo et al., 2013). Mohlala, Boily, and Gregson (2011) demonstrated that men that presented to antenatal with partners had better VCT uptake than others who did not. The above suggests that marital status has a positive relationship with VCT uptake as shown in this study and past literature. However, this effect can be enhances or impacted negatively by confounders especially if the partner in the marriage is males or females, educational status, and HIV prevalence.

Socio-economic status

In a bivariate analysis socio-economic status had a statistically significant association with uptake of VCT. A unit increase in the medium socio-economic class brought about a higher increase in uptake of VCT than a unit increase in the high socio-economic class. Wald statistics was 15.96 ($p = 0.00$). All Socio-economic categories caused a statistically significant increase in the outcome (uptake of VCT). Generally socio-economic status has statistically significant association with uptake of VCT. A unit increase in the medium socio-economic class brought about a higher increase in uptake of VCT (0.23) than a unit increase in the high socio-economic class (0.16). The medium SES (OR=1.30; CI=1.04, 1.31; $p = 0.00$) had a greater impact on uptake than the high SES (OR=1.17; CI= 1.14, 1.49; $p = 0.01$). The medium SES had a greater impact on uptake than the high SES, although these impacts were statistically non-significant.

In a multivariate model the Wald value was 4.20 (*p= 0.12*). When province, age, settlement, gender, race, marital status and employment status are analyzed with Socio-economic status; SES had a negative impact and did not have a statistically significant impact on uptake of VCT. SES high (OR=0.85; CI=0.72, 1.01; *p= 0.06*) and SES medium (OR=0.96; CI=0.83, 1.11; *p= 0.60*).An increase in high SES led to a decrease odd of VCT uptake. High and medium SES were also less statistically significant than the low SES however, medium SES brought about a higher increase in uptake than high SES. In summary, in the bivariate and multivariate models the medium SES brought about the highest increase in VCT uptake than the other SES classes.

Literatures within and outside SA has consistently identified low SES, Unemployment, and poverty as main determinants of VCT uptake (IMF, 2009; CDC, 2013) as being associated with high HIV prevalence and low uptake. While Ventakesh et al. (2011) demonstrated that the situation will be dependent on who is the care giver. However, Chagan et al. (2011) demonstrated that in spite of maternity and paternity the uptake in low SES situation is poor. HRSC (2012) identified provinces with low SES as being the ones with lower uptake. Also the JHHESA (2012) study identified Northern Cape and Gauteng provinces as low SES and as the provinces with the lowest VCT uptake, although, SES is found to be dependent on factors like education and race.

In conclusion, this study is supported by previous literatures; as SES increases the uptake of VCT increases, however, in the present study it seems that VCT uptake increases up to the medium SES level and decreases thereafter.

Educational level:

In the bivariate analysis finding the greatest impact of education is observed in the up to grade 11(OR=1.42; CI=1.19, 1.71; *p=0.00*), followed by primary (OR=1.34; CI=1.12, 1.60; *p=0.01*), then matric (OR=1.28; CI=1.03, 1.61; P=*0.023*) and lastly tertiary (OR=1.10; CI=0.67-1.82; *p=0.69*). These effects were statistically significant except for tertiary level. In the bivariate models the intervention was a significant prediction of the outcome. All educational status except for tertiary level statistically impacted uptake. A units increase in educational status caused the greatest impact in the up to grade 11, then primary, matric, and lastly tertiary.

In the multivariate model when educational status is analyzed with province, age, settlement, gender, race, marital status, employment status, and socio-economic status as cofounders. The effect was not statistically significant on VCT uptake. However, tertiary education caused the highest increase in the uptake of VCT followed by Up to grade 11 education, matric, and lastly primary school education. A Unit increase in educational level caused a similar increase in VCT uptake in the grade 11, matric, and tertiary levels of education with the least increase in the primary level. This was of some practical significance even though there was no statistical significance.

The different educational levels like up to primary school (OR=1.03; CI= 0.61-1.74; *p= 0.92*), up to grade 11 (OR=1.16; CI= 0.69-1.93; *p= 0.58*), matric (OR=1.16; CI=0.69-1.93; *p= 0.59*) and tertiary level (OR=1.16; CI=0.68-1.97; *p= 0.59*) were all less statistically significant than the no schooling category (the referent category). A unit increase in educational level caused a similar increase in VCT uptake in the grade 11, matric and tertiary levels of education with the least increase in the primary level.

In our review we saw that education increases the uptake of PICT among people attending STI clinics (Gray et al., 2010a). VCT is significantly improved by education among adolescents in a rural and school-based setting in South Africa (Montague et al., 2014).It was also demonstrated that educational level increased uptake till the secondary level but there was a decrease in uptake at the tertiary level (Mhlongo et al., 2013). This is seen in the present study in a bivariate analysis and in a multivariate analysis the differences between the grades 11 level, matric, and tertiary levels in uptake do not seems remarkably high. This study shows that education when acting alone seems to impact VCT in a different way than when other confounders are included. Including confounding made the impact of education less significant but increased the impact of tertiary education.

Educational status is dependent on the sex of the persons. In certain areas the responsibility of being a woman, care givers, and even mothers make uptake higher in women. Gray et al. (2010a) demonstrated that education increased the uptake of PICT while Montague et al, 2010 showed improved VCT among adolescents in a rural setting; he also demonstrated that people with secondary education had more uptake than people with less than 7 years and tertiary education. While some of the findings in the literatures are confirmed by this study, the impact of tertiary education seems to be higher in the present study. It is possible that the impact of other factors as confounders may be responsible for the variation evident in this study. However, what is agreed is that primary education had a lower impact than secondary in all the studies.

Ventakesh (2010) also demonstrated an increase testing among men and women, and even repeat testing among women when they had secondary education. De Koker et al. (2012) demonstrated that knowledge and fear (lack of education) are the core motivators of uptake of VCT while Kalichman and Simbayi (2003) demonstrated improved tolerance to infected persons

with education. These studies provide similar findings with the present study which also indicated improved uptake with better education in a multivariate logistic analysis. It is also possible that the presence of various confounders may account for the differences in the present study and the literatures.

In this study what is evident is that education does not follow an incremental pattern as number of years spent increases. The very educated seem to have lowest uptake than any other group in the reviewed literatures and the uptake did not increase remarkably after secondary education. The results above clearly demonstrate the various factors that impact VCT uptake and to what extent. It also demonstrates that when socio-demographic factors act together their impact on the outcome can increased, decrease or become non-significant statistically.

The findings in this study show that, in a multivariate model socio-demographic factors act as determinants of VCT uptake in South Africa. In this model province contributed the most followed by Age, employment category, race, marital status, socio-economic status, and lastly educational status. However, the Free State, Gauteng, Limpopo, and Mpumalanga provinces are positively associated with the uptake of VCT. All forms of settlements are negatively associated with uptake of VCT except in the tribal settlements. Gender, educational status, and socio-economic status did not significantly determine VCT uptake. Colored race, 24-49years age group, employed group had a better uptake than other group.

Question 3

In question 3 we want to determine how racial group interact with gender to impact VCT uptake. The present statistics showed that having the intervention made a significant prediction of the outcome (VCT uptake). However, the male gender did not statistically differ from the

female gender in the uptake of VCT (CI=0.87, 1.08; $p= 0.56$). In addition, race group showed a statistically significant impact on VCT uptake; racial groups including blacks, whites, and colored had a statistically significant negative and lower outcome (uptake of VCT) than the Indian race. In addition, from the chi-square table one can extrapolate that the association between Race and sex of respondent among those that did HIV testing was statistically significant. Also in total (both those that did and did not do VCT), the association between race and gender was statistically significant.

This means that females of colored, black, and white race will impact uptake negatively, with colored having the most impact followed by blacks and then white race. Race will also impact gender significantly. Consequently, we can extrapolate that race will statistically impact on gender and VCT uptake with the colored race having the most impact, followed by black, and then white race. It also means that the effect of race would be more significant on females than on males.

As has been demonstrated in this study, racial group including blacks, whites, and colored had a statistically significant lower outcome (uptake of VCT) than the Indian race. The colored race has the greatest impact on uptake followed by blacks and then white race. However this impact was a negative one. As shown in previous studies females are generally more likely to uptake VCT than men; more females than males underwent testing (HRSC, 2012). Ventakesh et al. (2011) showed that females with Children under their care had higher odds of reporting for repeated testing. In addition, the low VCT uptake by whites and males is supported by literature as demonstrated by van Dyk & Alta (2013) in a population-based study that White male had a low self-perception of their HIV risk, are unlikely to test for HIV in public facilities, did not know their status, and preferred self-testing ($p< 0.05$).

In conclusion, of all the factors, Gender is the only factor that did not have a statistically significant impact on the uptake of VCT in a bivariate analysis. Hence was excluded from the multivariate analysis. However, race was statistically but negatively significant in a bivariate analysis, but non-significant in a multivariate analysis. In all, race significantly affected uptake of VCT among gender groups.

Summary of Findings

In summary, the findings in this study showed consistently that socio-demographic factors are determinants of VCT uptake in South Africa. Socio-demographic factors acted as determinant when they acted alone but the impacts were more robust when these factors acted together in a multivariate analysis. This supported by many studies which demonstrated that socio-demographic factors do interact to produce their effects (Montague et al., 2014; HRSC, 2012; JHESSA, 2012).

Uptake was positive for those living in the Free State, Gauteng, Limpopo, and Mpumalanga provinces while those living in Eastern Cape, North-west, and Northern Province had a decrease uptake with each unit increase. All settlement types were positively associated with VCT uptake except in the tribal settlements. In addition, the colored race, 16-24years age group, employed group had a better uptake than other groups. Married persons living or not living with partner had highest uptake of VCT with divorced/widowed having the lowest uptake followed by single status. Gender, educational status and socio-economic status did not significantly impact VCT uptake in a forward regression analysis and were excluded from the logistic regression model.

It is important to mention that although some variable did not have a significant impact on uptake, they had a practical and theoretical impact on the uptake of VCT. To this end, the impact of Gender, educational status and socio-economic status cannot be discounted as they are known to have theoretical and practical significance on uptake in other studies as discussed elsewhere in this study. Considering the above bivariate and the multivariate analysis, it is important to consider our target from these combination and consideration of these. Therefore, the VCT campaign need include all races but especially blacks, unemployed, in the age of 16-24 and 25-49 years in all provinces but especially living in the Eastern Cape, North-west and, Northern Province. While this group are known to have a low uptake of VCT, it is still important consider every South African in the VCT campaign.

Limitation of Study

This study was generalizable to the whole of South Africa since the sample used was representative of the entire country. Although generalizability beyond SA was questionable and limited as the situation of South Africa differed from many countries. It is very unlikely that the findings could be applied to other countries with different histories, prevalence, and patterns of HIV epidemic; however, the external validity of the study could be extended to other Southern African countries as the population characteristics, culture, prevalence, and health systems are similar (Maltzahn&Durrheim,2008). It is important to remember that as a cross-sectional study using secondary data, the data used are aggregated and applicability at individual level is difficult. This application of aggregated data at the individual levels leads to ecological fallacy, a problem that needs to be guarded against in cross-sectional studies.

The result is also applicable to the age group included in this study. However, its applicability below 16years and beyond 55years is unlikely as the prevalence of HIV and the use of VCT could remarkably differ from persons in the 16-55year-age group. Response rate of this study was 83%, so the impact of non-response, opt-outs and missing not completely at random could notbe completely accounted for; this is especially so as SPSS conducts an automatic list-wise deletion of missing value during analysis. Possible bias created by missing data especially if of particular characteristics cannot be discounted. For instance in this study Whites had the highest rate of non-response as well as, the lowest participation rate.

The varying socio-economic circumstances of the participants in different parts of the country could impact VCT uptake differently. For instance, if data were collected during the day in a city with mainly unavailable employed persons; this could lead to selection bias. In addition, there is a possibility that respondents with positive status are not available on clinic days in their home; this could lead to selection bias and high non-response rate. In addition, considering that the demographic information for non-responders was not available in this study, the level of bias could not be determined.

Variability introduced by socio-demographic factors and confounders not tested are major source of bias- like support systems and chronic health conditions. Variability in the uptake of VCT brought about by structural problems and circumstances of patients like disability were not assessed. For instance, in certain areas structural factors like distance to closest clinics, overcrowding, and HCP to patient ratio are major deterrent to testing. In these areas respondent's uptake of VCT could be less. Further, Health Care and structural problems in some areas of the country and provinces are generally better or population lower. This is because inequity in the quality of care and health services could impact VCT uptake. This difference could make uptake

of VCT in some areas of the country better than others, despite the socio-demographic circumstances of the respondent.

Other limitations include those arising from the design of the study: As a Cross-sectional study there were problems of social desirability and recall bias; although, the problem of self-report and recalls bias ware reduced to a minimum by using only tests done in the preceding one year. However, the same could not be said of the impact of social desirability bias which would affect the response elicited from participants for sensitive topics like HIV where respondents could provide desirable answers to negative or sensitive questions. Misclassification bias was also reduced to a minimum by inclusion of all forms of testing that met the VCT definition by WHO. In addition, exposed and unexposed groups to HIV, VCT, and sexual intercourse were used in this study.

One assumption made in this study was that those not testing had access to testing but for socio-demographic reasons were unable to take up testing. This assumption was not necessarily the case as some areas had better access than others. Further, the design of this study included random sampling and KISH to compensate for sampling error; however, whether this entirely accounted for sampling errors and non-responders is not clear. However, various steps were taken to achieve the best reliability and validity possible.

In this study the methods of HIV testing were not a determinant of VCT uptake and all forms of VCT was considered as long as it included a voluntary, counseling , testing, and result process. This study was not specifically on a particular type of testing; it assumed that the predictive values of all testing methods were similar, but we know that this is unlikely. Further, considering the socio-demographics of responders, it is assumed that testing was performed in health facilities following a similar protocol. This was also unlikely given that the impact of

socio-demographic determinants was not the same for respondents in all settings and health provider training and knowledge would often not be the same. Also, self-tested and patients testing in private or public clinics were unlikely to have followed same protocol.

Strengths

The strengths of this study lie in being a population-based study which includes the entire South Africa in a probabilistic sampling method. This is important as the variability in service delivery, the availability of services for persons involved in the studies could be said to approximate each other. The principles, quality, and public health policies are generally the same as dispensed by the national government, although variations in different provinces could not be excluded. This study also used random sampling of the population to obtain the study population, matching of field workers to the study population and stratification to reduce bias. This methods improved reliability and validity of the study results.

The other strength of this study was its ability to explore the various aspects of the ITHBC model. The components of ITHBC include the index patient willingness to uptake VCT, the health provider availability, knowledge to provide the care, social facilitation using the knowledge of socio-demographic factors, and integration into larger society. This theory meant that various aspects had to be explored for behavior change including processes, group dynamics, health providers, various methods of testing, and facilities.

Another aspect of this study that sets it apart is that its population-based findings and conclusions are applicable to all settings of the SA society. The use of random sampling; multi-stage cluster sampling and KISH methods increased the validity and representativeness of this study as compared to an arbitrary selection of volunteer. The presences of non-responders still

constituted a source of worry as this could not guarantee true generalization of the result to the entire population. In addition, it was possible to study the multiple socio-demographic variables simultaneously in this study.

This study measured outcome at a point in time and did not have any reference points. This reduced ethical issues of with-holding or administering treatments or observations that could be beneficial or harmful to the subjects for research purposes. Simply put, the criticism with ethical issues of beneficence and non-maleficence were reduced in this study as no treatment was administered or withheld to the detriment of the participants.

Structural equation modeling (SEM) and path analysis were used in this study to improve the satisfaction of, and requirement for statistical causal inference. The use of forward regression ensured that cofounders that had statistical significance were retained in the study, while the entering or inclusion of all variables made it possible to assess issues of practical significance. Further, the control of cofounders, test of exclusion, exogeneity, and Hosmer-Lemeshow goodness of fit test were used to test how good the model was (JHESSA, 2012).Validity and Reliability were also improved by the high response rates for most races.

The sample used in the primary study was weighted so as to improve representative of the SA population with respect to sex, age, population group, urban/rural residence, and province. The sample was further corroborated with the Community Survey done by Statistics South Africa and the results obtained from SEM analysis compared to dose-response results to improve the validity of results (JHESSA, 2012).

Recommendation

The ITHBC theory highlights the important role of the index individual (or group), driven by health providers that provide evidence for change through research dissemination, social facilitation, and integration. In addition, the need to identify specific socio-demographic factors to facilitate effective prevention campaigns is validated by three principles for improved communication; first, messages transmitted by selective exposure and perception through groups. Second, impact, experience, and interpretation of messages are group-based, and finally communication as a dynamic group-process making group evaluation important in message formulation (WHO, 2009). Therefore, socio-demographic characteristics must direct behavior change methods through the fundamental cause theory, so that social facilitation and integration at all levels of the society becomes a reality.

VCT minimizes risk (Risk-reduction) of acquiring or transmitting HIV infection (Peltzer, 2012) and is the route for entry into HIV treatment, care, and support programs. Risk-reduction involves minimizing the impact of diseases through people, policies, and programs that prevent transmission and outcome of HIV infections (Newcombe, 2010). In order to enhance behavior change, innovative programs and policies that normalize VCT uptake in the community are needed (Kilembe et al., 2015); the current study highlighted socio-demographic factors that can drive and impact VCT uptake among South Africans. This study demonstrated that VCT uptake is higher in the urban-formal location, among young adults' females, between 16-24years of high SES, with matric education. Programs and policies to encourage VCT can be formulated to reach females above grade 9 in schools in urban-formal areas.

In addition, Married persons living or not living with spouse had highest uptake of VCT with unmarried persons (single persons/divorced/widowed) having the lowest uptake, and employed groups had a better uptake than the unemployed or student groups. This study

recommends targeting unemployed men in their youth, as it was demonstrated that in the age group15-49 years an estimated 16.6% of people are infected with HIV (National Planning Commission Report, 2011) including 19% of men in same age group (UNAIDS, 2013). With these statistics, the results of this study, group-based theories, and communication theory this study recommend that VCT programs be intensified among single, unemployed men of low SES in the age range 25-49 years in the tribal and urban areas.

Peltzer (2012) found that HIV risk behaviors are significant risk factor in HIV infection; in order to curb this behavior health providers need to encourage harm reducing behaviors during counseling and opportunistic health promotion, and more programs using health provider as facilitator encouraged. The coverage of VCT can be improved by incorporating more and varieties of health providers. For instance, Traditional healers are enthusiastic about collaborating with medical practitioners in the prevention of HIV as they already service the health needs of a large percentage of the South Africans (George, Chitindingu, & Gow, 2013). Although George, Chitindingu, and Gow (2013) demonstrated that bio-medical knowledge of traditional healers in SA was not adequate, they had statistically significant knowledge of HIV prevention and referral, and less than 50% of trained and untrained traditional healers will treat HIV positive persons if the need arose. Therefore, it is important to consider the use of traditional healers in areas where medical facilities are scarce, few, or inaccessible. In this study, tribal areas had the lowest VCT uptake and already used traditional healers as their source of care. Consequently, Traditional practitioners can be trained in VCT counseling and referral procedures to assist persons with HIV in their communities to get into mainstream medical care.

The ITHBC considers social integration of various drivers of behavior change (VCT uptake) for optimum result. It seems that the more facilities and methods for VCT uptake, the

better and more likely the change. Considering the above, it is important that multiple methods of testing and facilities be used to provide testing: Opt-in or opt-out; provider-initiated, client-initiated, or self-testing methods; Clinic-based, urban-mobile, rural-mobile, and stand-alone facilities. The ability of all to uptake VCT will depend on if the method of delivery is matched to the socio-demographics of the area. Clinic-based, urban-mobile, rural-mobile, stand-alone, PICT, CICT, opt-out, and opt-in are various models of VCT delivery. Urban mobile units had the highest numbers of male clients (52%) while Rural mobile units are likely to reach first timers (61%) that reported no perceived risk (64%) of HIV (Mabuto et al, 2014). Considering this the benefit of mobile units in rural areas is questionable. This study found the VCT uptake in urban-informal and peri-urban area to be low, and this could be related to fear of victimization and stigmatizations coupled with improved knowledge in these areas (De Koker et al., 2012); the use of mobile units in this area is likely to help this situation and improve uptake.

In addition, HIV testing in mobile facilities has been found to reach young and geographically remote people with earlier stages of the disease than clinic based facilities.The mobile testers are also more likely to undergo CD4 counts and other HIV linked care than clinic based testers (Bassett et al., 2014). This study demonstrated that uptake of VCT is lowest among young (16-24 years old) males in tribal settlements. Male persons in these remote settlements can be targeted with mobile units to improve uptake of VCT for early diagnosis and treatment.

Since the ITHBC theory suggest that for change; knowledge in the index person is necessary and the health providers provide the vehicle for such change through appropriately researched methods and infrastructure. It is necessary to provide appropriate social facilitation like health facilities, training, and communal forum to promote VCT among identified socio-demographic groups. In addition, social, welfare, and disability grants need to be included in

government policies and laws that sort to increase testing, curb inter-generational sex, protect spouses and partners in relationships, and act as deterrent to those who know their status but fail to protect others from HIV infection.

It therefore behooves the health providers to identify such groups, and concentrate counseling and VCT promotion in groups that need it most using the most effective and evidence-based methods for the group to achieve commensurate behavior change (VCT uptake). It is also important that health providers disseminate findings of researches to all community groups involved in HIV prevention. Door to door campaigns can also be used in peri-urban and urban-informal areas since these areas have high uptake as well as population of unemployed person. Horizontal clinics, work-place clinics, and discussion clinics may also be helpful in urban-formal areas with more educated persons and where stigmatization, victimization, and discrimination may be rife. These avenues can be used to preach VCT uptake and prevention of social problems arising from HIV like intergenerational sex and disclosure.

For VCT uptake programs to succeed it is important that a clear and simple message be sent to the most vulnerable groups with lowest VCT uptake. Appropriate and multiple VCT methods be used in various settings to include as many persons as possible. This study clearly identifies a target group that VCT uptake will make the most impact as; black unemployed men of low to medium socio-economic status, between the ages of 15-49years, living in peri-urban and urban-informal areas, in all provinces but especially in Eastern Cape, Northern Cape, and North West provinces of South Africa.

Finally, this study will have the impact it desires with proper disseminated of its findings through journals to physicians, HIV clinician, and individuals affected by HIV. Publications in

journals like HIV clinician's journal, Southern Africa HIV Journal, Biomedical central and Web med central.

Implication

Positive Social Change

The premise of this study is that as no cures exist at this time for HIV, the main management remains prevention. Prevention exists at different level for HIV including reduction of risk of infection, morbidity, and mortality. Recently, it was reported that SA has met the millennium goal for HIV, reversing the spread of HIV and increasing life expectancy from 51 in 2005 to 61 in 2015 (UNAIDS, 2015). It did this by concerted HIV control programs, reducing the spread of HIV, and providing ART free-of-charge to those without medical insurance. With these it reduced new infection, morbidity, and AIDS associated mortality by 58% (UNAIDS 2015). The present study advocates that VCT uptake is the simplest and most cost-effective way to prevent HIV; reduce risk and bring about change at different levels of society impacted by HIV. Recognizing the impact of socio-demographic determinants on VCT uptake in SA will help direct services to areas and individuals that need it most.

At the individual level, this study informs us of the specific need for VCT uptake and assists the HCP to concentrate counseling and advice for VCT uptake on individuals and couples considering their needs. For instance, it demonstrates that the odds of VCT uptake are low in individuals that are not married but living together than in married persons; HCP could increase counseling and PICT in these groups of patients. Also since the odds of uptake decreases among

single, widowed, and divorced individuals it is important to encourage these group of individuals about the benefits of VCT and use PICT for opportunistic health promotion.

At the family level, it was shown in this study that settlement of families are predictors of uptake. For instance urban-formal settlements had the lowest odd of uptake of VCT despite the findings that more people are accessible to health care in the urban areas where the distance to clinic are shorter and SES better (Stellenberg, 2015). It is possible that this has something to do with the lower number (less than 2%) and response rate of whites in this study who live predominantly in the urban areas and have better access to health facilities, albeit private facilities in urban areas (Stellenberg, 2015). Whatever the reason, concerted effort in the urban areas need to be made to improve VCT uptake through horizontal public clinics and clinic environments improved to encourage better uptake of VCT. This also has implication for Private practitioners' in urban areas so as to improve PICT.

At the organizational level, NGOs in South Africa and other organizations need to recognize the impact of socio-demographic factors on VCT uptake. This will improve their services and channel it to areas where they are more likely to impact social change. For instance, they could make more inroads among blacks in the urban areas; they could target the 25-49 years age groups; they could also focus on the unemployed persons in urban settlements to impact VCT positively. The findings that VCT uptake is low in tertiary educated persons can also create an opportunity for door-to-door, intra-campus testing sites, or VCT clinics nested in horizontal clinics in tertiary institutions campuses to improve uptake with little stigmatization.

At the societal and policy levels, companies can introduce horizontal clinics at the work places where it does not exist, especially in the urban areas to improve uptake. Conduct periodic health examinations and encourage open discussions at the work places about VCT uptake.

Further in communities where the families live in clusters, ART uptake can affect the uptake of VCT if one has family members that have been impacted positively by ART. Communities can also provide the basis for targeted information and communication of VCT uptake messages in SA. Daily street campaigns can also be better constituted by knowledge of the demographics of the area. Further the increase access to ART and communication coupled with decreased stigmatization and discrimination can make it easier to drive VCT messages at all levels of society; hence improving discussion on HIV control.

At the policy level, the adoption of the Opt-out method in SA is long overdue, although already practiced in some facilities policy statement are needed to reduce the bureaucratic bottlenecks caused by excessive documentation due to consent protocols. Since social good and change supersede individual autonomy and informed consent (April, 2010) there is need to reconsider the lengthy counseling and consent procedure that precede HIV testing. Although, opt-out method does not exclude consent before testing, it informs the patient of the usual and standard performance of the HIV testing in clinical encounters and gives the patient a chance to opt-out of an otherwise 'normal' procedure. This encourages testing and reduces exceptionalism to HIV testing. Opt-out also avoids an automatic classification of HIV as a communicable disease in a class of its own; HIV is the only communicable disease requiring extensive informed consent with signatures and forms before testing, making it necessary to "opt-in" before testing (April, 2010). The opt-in process seems to advocate that patient's informed consent takes precedence over social good. This often leads to a decline of testing by patients. New policies and guidelines are needed in SA that will lean towards inclusivity and normalization of the testing process if VCT needs be improved.

Finally, this study advocates the protection of the most vulnerable in the society. It suggests that the ethical rules of beneficence and non-malificence apply to HIV patients through the formulation of policies and laws. This is to prevent intergenerational sex and negligent spread of HIV to spouses or partners involved with the HIV-infected. The need to reduce infection has become more important as the number of persons on ART increases due to the use and availability of ART. It is also important as this study found that single, divorced, and widowed individuals have low VCT uptake, and high HIV infection and inter-generational sex rates (HRSC, 2012).

Implications for Practice

The method of delivery or the source of VCT is important for uptake. The underlying factors that drive preferred testing are the need for privacy, confidentiality, fear of discrimination, stigma, distrust of the health care system, and avoidance of face-to-face counseling (Van Dyk& Alta, 2013). A study using semi-structured questionnaire conducted with 466 participants in the 9 provinces of SA to determine the preferred method of testing indicated that 22.3% of the respondent preferred self-testing, 66.1% preferred client-initiated and 11.6% provider-initiated counseling and testing. Respondents that preferred self-testing for HIV were mostly ($p < 0.05$) males, whites, lived in cities or towns, did not know their HIV status, and were unlikely to test in the future at a medical facility (van Dyk& Alta, 2013).The results in this study demonstrated that Whites had the highest non-response rate and are more likely to uptake urban private facilities which are often expensive. Self-testing with telephone counseling is an inexpensive and evolving method of VCT that can be considered among Whites or persons of other race, unlikely to use public facilities, live in urban areas, and

perceive their risk to be minimal. It is important for practitioners to be aware of these modes of testing in order to make decisions or counsel as the situation may demand.

Several findings in this study can be explored and used for practical application in professional medical practice to increase VCT uptake, reduce HIV prevalence, and seek out novel ways to improve VCT uptake among partners, spouses, and communities. It is also important to consider these findings during the process of counseling for VCT. Opt-out methods have been recommended in practice of clinical and family medicine as it increases uptake (April, 2010). As mentioned above opt-out do not exclude consent before testing but it implies the normal and standard performance of the HIV testing in clinical encounters. It also normalizes the testing procedure and eliminates steps likely to discourage HIV testing in practice.

There is need for improved discussion on VCT as an entry tool for primary and secondary prevention of HIV. Behavioral and life skills are important to increase uptake and reduce the fear of stigmatization in relationships. The reduction of fear and improvement of knowledge at the point of testing has been known to improve VCT uptake (De Koker et al., 2010). For instance, the protective effect of ART can be emphasized during VCT to provide a basis for testing and portray testing as a means and not an end. In addition, Couple VCT need emphasize evidence-based findings. For instance, Couple VCT can reduce HIV incidence among couples, despite this there is high level of discordance among couples in SA (Kilembe, et al., 2015); this creates an opportunity for clinicians to emphasize couple VCT as a tool to protect non-infected spouses and prevent secondary infections.

The finding that VCT uptake is lowest among co-habituating individuals makes it necessary to re-visit values and norms in the SA society. Although, it is also possible that this trend is associated with the high cost of marriage in SA, the association is worrying and needs to

be emphasized during the VCT process; so that people do not see their relationships as 'safe' but as one that warrants a constant concern for their HIV status. It is also important that condom use and single partnership be encouraged to reduce infection.

VCT uptake is higher in urban settlements-both formal and informal. In formal settlement it is possible that health seeking behavior is mainly private and could account for the finding in this study. However, the informal settlement seems to be well known for high prevalence of HIV in addition to poor socio-economic conditions (HRSC, 2002, 2005, 2008, 2012). The high uptake of VCT could also signify a higher prevalence, making this an area in need of resources for better control. VCT uptake programs therefore need target these areas as priority to reduce HIV prevalence.

VCT uptake can be affected by communication and demographic variables in a community. A study involving the variables of socio-demographic determinant and the uptake of VCT undertaken to identify the barriers to VCT in a peri-urban township in Limpopo Province concluded that enhancing communication between partners and family members could facilitate HIV testing (De Koker et al, 2010). In this study VCT is high in the Unemployed; in addition HIV prevalence is also high among provinces with lowest SES like Kwa-Zulu Natal and North-west province (JHESSA, 2012). These communities may need better community effort and focal group engagement rather than electronic means of communication.

The finding that the uptake of VCT among the 16-24years is lowest is worrying; this is more so since youths have been found to have higher rates of multiple sexual partners (JHESSA, 2012). This has implication for inter-generations sex which is on the increase in SA. On the other hand, the finding in this study that uptake of VCT is highest in the 25-49 year age group is beneficial as it will help in HIV prevention. This is because youths that decide to have sex with

older women will be at lower risk and older men that have intergenerational sex with younger girls will also be at lower risk (Shisana, Rehle & Simbayi et al., 2005). This makes it necessary to encourage prevention strategies that reduce this type of transmission by encouraging VCT uptake in all age groups and discouraging socio-behavioral factors that promote intergenerational sex. Some interventions like the child-welfare, foster, and disability grants in South Africa provide meager income to child-headed household, young girls with children under their care, or the chronically sick (Cluver, Boyes & Orkin et al., 2011).

Methodological and theoretical Implication

According to the ITHBC theory, in order to achieve health behavior change an index group must be identified with the health providers providing the necessary idea, research, and drivers for change. Social facilitators are also needed to enhance integration into a larger society. However, it is important to note that the ITHBC theory is silent on how to deal with various delivery or methods of change. One thing that is clear from this study is that to make behavior change at a societal level it is important to consider various alternatives to change. In this study self-testing, PICT, CICT, opt-in, and opt-out methods are various avenues that have been mentioned and that could be used for VCT. This study suggests that the more the avenues available to individuals for VCT uptake, the better and more the change that could be achieved. Therefore, the ITHBC need to incorporate multi-dimensional methodological approaches for the index person for change.

In the research method session nominal variables were used, achieved by coding and re-classification of variables. It is important to note that, in a different scenario or reclassification of the variables into different groups may produce a different result. Therefore, interpretation of

these results must consider the approach used, and methodological differences and categorization in a different situation could produce a different result.

Further, this study recognizes self-efficacy and communication as central and facilitators of VCT and the ITHBC. Self-efficacy is an individual's ability to initiate, ensure, continue, and comply with positive behavior or life-style changes that are self-prescribed, popularly accepted, or health provider prescribed (Bandura, 1977, 1986). In addition, "The theory of communicative action explains that to transmit and renew cultural knowledge and achieve mutual understandings it is necessary to coordinate action towards social integration and solidarity" (Habermas, 1981). These suggest that group socio-demographics can be used to facilitate behavior change.

Implication for future study:

The need for future studies into the impact of marital status on VCT uptake among single individuals is needed with a view to establishing the reason for poor uptake. Disclosure is necessary for spouses and even families of positive persons to reduce further HIV spread; what factors act as determinant of spousal and family disclosure and what are the roles of socio-demographic factors of patients in disclosure, and are there ways of ensuring that spouses are informed of partner's results? Does the right of positive individuals supersede their spouse's? Further, researches need to determine what constitutional and ethical policy changes are required for Opt-out testing in SA.

A study to establish which is more important in improving VCT uptake- focal group, family communication or community mediated communication. Mobile communication. Television, or health provider-initiated, or client-initiated communications- needs further clarification. An important means of improving support for patients in VCT centers is by using

cellular phone technology for support and follow-up counseling for VCT by treatment supporters and others charged with patient care. Can the use of mobile technology serve a dual purpose: Ongoing support and education of treatment supporters and providing ongoing counseling for risk reduction for negative or positive persons by the supporters.

Further research is also needed to consolidate the impact of bio-psycho-social support on VCT uptake with a view to identifying what support is needed to encourage VCT uptake. VCT uptake is not an end but a means to HIV prevention; it is important to understand what constitute an end for the tested or what could motivate VCT uptake for example availability of ART, social and disability support or vaccines?

An elucidation and better understanding of the triad of HIV prevalence, VCT uptake, and poor socio-economic status is needed. Finally, there is need to look at studies that sort to use VCT uptake as an avenue for managing other social problems including violence against women, rape, and domestic violence; can the opportunity for VCT be used for other health promoting behavior by the health provider as suggested by the ITHBC theory?

Conclusion

Self-efficacy in HIV prevention is necessary to achieve behavior change; it requires campaigns exploring sound communication theories and principles. In addition, VCT can be improved by knowledge, self-regulation, skills, and social facilitation (Ryan, 2009).This study identifies persistent and consistent communication as a means to facilitate VCT uptake and promote discussion around HIV testing through community leaders and role models.

This study found that socio-demographic factors can drive and impact VCT uptake among South Africans: It demonstrated that VCT uptake is higher in the urban-formal locations, among young adult females, between 16-24years, in the high SES, with matric education. However, according to the ITHBC theory, in order to achieve health behavior change a clear identification of the index group targeted for change must be made, the change needed identified, and social facilitators recognized; it is with this understanding that this study identifies a target group that improved VCT uptake will make the most impact; as Black unemployed Men, of low to medium socio-economic status, between the ages of 15-49 years, living in peri-urban and urban-informal areas, in all provinces but especially in Eastern Cape, Northern Cape, and North West provinces of South Africa.

Finally, this study also recommends that innovative and diversified testing methods and facilities are necessary to improve VCT uptake; all along matching the socio-demographics of the area with the VCT method used, delivery options, and type of health facility.

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Appendix

Appendix A:
Institutional Review Board Feedback
Walden University

Last Name of Researcher: Woke	Date of Review:May 12, 2015

Each of the ethical standards below must be adequately addressed by the researcher in order for this study to be approved by the Institutional Review Board (IRB), on behalf of Walden University.

The IRB REVIEWER uses the yellow column to indicate the revisions that are required for IRB approval.

The RESEARCHER must complete the blue column when resubmitting IRB materials.

	Ethics Reviewer's assessment: (In each row, the Ethics Reviewer should either enter **Yes, No, or NA**.With each "No," the reviewer must specify which particular parts of the ethics application require revision or clarification.)	**Researcher response:** The researcher must use this column to describe how and where each of the ethics reviewer's concerns (in the yellow column) has been addressed.
The first 13 questions apply to all studies (even when the researcher is not interacting with participants to collect new data). **Hover the mouse over the blue footnoted words to view extra tips and definitions.**		
1. Has each data collection step[i] been articulated such that risks/burdens can be identified?	***Please submit a copy of your CV.***	*No contact will be made with the respondent.A copy of result of study will be sent to primary data holder.* CV is Attached.
2. Will the research procedures ensure privacy[ii] during data collection?	***This is not clear. Item #16A states that the data will have identifiers. This statement is confirmed in #25 in which you indicate the dataset will be confidential (meaning it will have identifiers). However, item #17 of the application states***	*The data is de-identified. It is not possible to link the names of the respondent to data used in this study.*

	the identifiers will be removed. ***Thus, please clarify the data that will be provided to you. Is it expected the data would have identifiers included or will these be removed as part of the standard practice for sharing data? Section 5 of the data user's agreement is written as if only deidentified data will be shared (as users may not try to link the data with personally identifiable information).***	
3. Will data be stored securely[iii]?	***Yes***	
4. Will the data be stored for at least 5 years?	***Yes***	
5. If participants' names or contact info will be recorded in the research records, are they absolutely necessary[iv]?	***This cannot be determined until the issue raised in #2 above has been addressed.***	*No. The data will be de-identified.*
6. Do the analysis/writeup plans include all possible measures to ensure that participant identities are not directly or indirectly[v] disclosed?	***This cannot be determined until the issue raised in #2 above has been addressed.***	*Yes. The analysis or write-up will include measures to ensure that participants are not directly or indirectly identified.*
*7. Have confidentiality agreements[vi] been signed by anyone[vii] who may view data that that contains identifiers? (e.g., transcriber, translator)	***N/A***	
8. Has the researcher articulated a specific plan[viii] for sharing results with the participants and community stakeholders?	***Yes***	
9. Have all potential psychological[ix],relationship[x], legal[xi], economic/professional[xii], physical[xiii], and other risks been fully acknowledged[xiv] and described?	***Please complete item #31 of the application to confirm you are aware of any applicable laws that may have an impact on your research.***	
10. Have the above risks been minimized as much as possible?Are measures in place to provide participants with reasonable	***This cannot be determined until the issue raised in #2 above has been addressed.***	*Yes. Data de-identificationwill ensure privacy and hence protect respondents from distress,economicloss,*

protectionfromdistress, psychological harm, economic loss, damage to professional reputation, and physical harm?		*damage and psychological harm.*
11. Has the researcher proactively managed any potential conflicts of interest[xv]?	***Yes***	
12. Are the research risks and burdens[xvi] reasonable, in consideration of the new knowledge[xvii] that this research design can offer?	***Yes***	
*13. Is theresearchsitewilling[xviii] to provide aLetter of Cooperationgrantingpermission[xix]for all relevant data[xx]access, access to participants, facility use, and/or use of personnel time for research purposes? (Note that some research sites will only release data if a more formal Data Use Agreement is in place, often in addition to a Letter of Cooperation.)	***The data user's agreement does not seem to indicate approval for the release of the data. The representative signature seems to note this person's support for your study rather than approval for the data release. Please submit documentation confirming you have obtained approval for the data to be released to you. This doesn't need to be anything extremely formal and could include a copy of a letter/email they provided to you confirming approval, if they simply provided you with the data upon receiving the data user's agreement you could state that, etc.***	*Data was released to me upon receiving my data user's agreement. See letter for data use release attached.*
The remaining questions only apply to studies that involve recruiting participants to collect new data.		
14. Is participant recruitment coordinated in a manner that is non-coercive[xxi]? Coercive elements include: leveraging an existing relationship to "encourage" participation, recruiting in a group[xxii] setting, extravagant compensation, recruiting individuals in a context of their treatment or evaluation[xxiii], etc. A researcher must disclose here whether/how	***N/A***	

the researcher may already be known to the participants and explain how perceptions of coerced research participation will be minimized[xxiv].		
15. If vulnerable[xxv] individuals will be specifically sought out as participants, is such targeted recruitment justified[xxvi] by a research design that will specifically benefit that vulnerable group at large?	***N/A***	
16. If vulnerable[xxvii] adults might happen to be included (without the researcher's knowledge), would their inclusionbejustified[xxviii]?	***N/A***	
17. If anyone would be excluded from participating, is their exclusion justified? Is their exclusion handled respectfully and without stigma[xxix]?	***N/A***	
18. If the research procedures might reveal criminal activity or child/elder abuse that necessitates[xxx] reporting, are there suitable procedures in place for managing this?	***N/A***	
19. If the research procedures might reveal or create an acute psychological state that necessitates referral, are there suitable procedures in place to manage this?	***N/A***	
20. Does the research design ensure that all participants can potentially benefit equally[xxxi] from the research?	***N/A***	
21. Applicable for student researchers: Will this researcher be appropriately qualified[xxxii] and supervised[xxxiii] in all data collection procedures?	***N/A***	
*22. If an existing survey or other data collection tool will be	***N/A***	

used, has the researcher appropriately complied with the requirements[xxxiv] for legal usage?		
Questions 23-40 pertain to the process of ensuring that potential participants make an informed decision about the study, in accordance with the ethical principle of "respect for persons."		
23. Do the informed consent[xxxv] procedures provide adequate time to review the study information and ask questions before giving consent?	***N/A***	
24. Will informed consent be appropriately[xxxvi] documented?	***N/A***	
25. Is the consent formwritten using language that will be understandable[xxxvii] to the potential participants?	***N/A***	
26. Does the consent formexplainthe sample's inclusion criteria in such a way that the participants can understand how/why THEY are being asked to participate?	***N/A***	
27. Does the consent form include an understandable explanation of the research purpose?	***N/A***	
28. Does the consent form include an understandable description of the data collection procedures?	***N/A***	
29. Does the consent form include an estimate of the time commitment[xxxviii] for participation?	***N/A***	
30. Does the consent form clearly state that participation is voluntary?	***N/A***	
31. Does the consent form convey that the participant has the right to decline or discontinue participation at any time? When the researcher is already known to the participant, the consent form must include written assurance that declining	***N/A***	

or discontinuing will not negatively impact the participant's relationship with the researcher or (if applicable) the participant's access to services.		
32. Does the consent form include a description of reasonably foreseeable risks[xxxix] or discomforts?	***N/A***	
33. Does the consent form include a description of anticipated benefits to participants[xl] and/or others?	***N/A***	
34. Does the consent formdescribe any thank you gift(s), compensation, or reimbursement (for travel costs, etc.) or lack thereof?	***N/A***	
35. Does the consent form describe how privacy will be maintained[xli]?	***N/A***	
36. Does the consent form disclose all potential conflicts of interest?	***N/A***	
37. Does the consent document preserve the participant's legal[xlii] rights?	***N/A***	
38. Does the consent form explain how the participant can contact the researcherand the university's Research Participant Advocate? (USA number 001-612-312-1210 or email addressirb@waldenu.edu).	***N/A***	
39. Does the consent form include a statement that the participant should keep/print a copy of the consent form?	***N/A***	
40. If any aspect of the study is experimental (unproven), is that stated in the consent form?	***N/A***	

General comments from the IRB reviewer(s) that might not be directly related to research ethics:

(Note: the comments above are offered collegially in the interest of promoting top quality research, and are NOT stipulations for IRB approval.)

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[i] In order to weigh potential risks against benefits, the researcher first needs to plan and clearly articulate all of the following that apply:

how existing data or contact information of potential participants will be obtained,
format and context of the initial contact with potential participants,
informed consent procedures,
assignment to groups (if applicable),
description of any pilot activities,
data collection steps,
transcript review and/or membercheck (if applicable), and
how results will be shared with stakeholders.

[ii] Privacy risks might include unintended breach of confidential information (such as educational or medical records); being observed/overheard by others while meeting researcher or providing data; or intrusion on the privacy of others who not involved in study (e.g. participant's family). It is not appropriate for authority figures (i.e., teachers, managers) to be informed about who participated and who didn't. It is fine if other participants are aware of who participated (and who didn't) as long as the data itself remains private.

[iii] Secure data storage requires password protection on electronic files and locks for physical data.

[iv] Note that consent forms do not require signatures if the participant can indicate consent by some action such as clicking on a link, returning a completed survey, etc.

[v] Participant identities might be "indirectly" and unintentionally disclosed if a researcher's final research report fails to withold demographic details or site descriptions that might permit a reader to deduce the identity of a participant. So the researcher needs to think about which demographic descriptors are most important to collect and report, while ensuring that the identity of individual participants is protected. Also, the name of the site/organization is typically masked in scholarly research such as the dissertation though in some cases, the organization can elect to publicize their name along with the research results.

[vi] A sample confidentiality agreement can be found on the IRB website.

[vii] Confidentiality agreements are required for transcribers or interpreters but not for the researcher or Walden faculty/staff who are automatically bound to confidentiality. Some professional transcribers/statisticians/etc address confidentiality in their work agreement and this is acceptable.

[viii] It is important that the format is audience-appropriate. Stakeholders may lack the time or inclination to digest a full research article or dissertation. Typically a 1 to 2 page summary or verbal presentation is most appropriate.

[ix] Psychological risks include stress greater than what one would experience in daily life (e.g., materials or topics that could be considered sensitive, offensive, threatening, degrading).

[x] Relationship risks are present if the recruitment or data collection process are likely to alter the existing dynamics between the researcher and participant (who may be coworkers or have some professional relationship), among participants (if they know one another), or between the participant and the participant's friends, coworkers, or family members.

[xi] Legal risks are present if data collection might result in a participant's disclosure of violation of laws.
[xii] Economic/professional risks are present if data collection could result in the participant disclosing violation of workplace policies, disagreement with leadership decisions, poor work performance, or anything else that could be damaging to the participant's position, professional reputation, promotability, or employability.
[xiii] Physical risks are not common in social science research but would involve risk of serious physical injury.
[xiv] Minimal risks are acceptable but must be identified upfront. Minimal risk is defined as when: "the probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves than those ordinarily encountered in daily life."
[xv] A conflict of interest is caused when the researcher has some sort of dual role in the research context, such as being a teacher, therapist, investor, business-owner, manager, etc. Conflict of interest must be managed to ensure that the research reveals "truth," not just the outcome that the researcher might desire to see due to their other role. The simplest way to ensure this impartiality is to conduct research OUTSIDE of one's own context but other methods are possible (e.g., using anonymous data collection to encourage honest responses).
[xvi] All research activities place some degree of burden on the participants by asking the participants to share personal information, volunteer time, and assume risks.
[xvii] Examples of "new knowledge" include: effectively addressing a gap in the literature, generating new theory, enhancing understanding of a phenomenon, assessing effectiveness of a particular professional practice, addressing a local practical problem via data analysis.
[xviii] If a site requires the researcher to obtain Walden's IRB approval before they can provide their written approval, that's fine. (Walden can issue a "conditional IRB approval" letter to the researcher and then Walden's IRB approval will then be finalized once the Walden IRB receives the community partner's letter of cooperation.)
[xix] No documentation of permission is required (a) if the researcher will simply be asking organizations to distribute research invitations on the researcher's behalf, or (b) if the researcher is using only public means to identify/contact participants.
[xx] Note that when medical, educational, or business records would be analyzed or used to identify potential research participants, the site needs to explicitly approve access to data for research purposes (even if the researcher normally has access to that data to perform their job).
[xxi] For example, anonymous surveys and/or low-pressure communications such as email invitations permit potential participants to opt out with minimal fear of retaliation or other negative consequences.
[xxii] It is not ethically acceptable to invite a "captive audience" to participate in research on the spot (i.e., to ask an entire class or a group of meeting attendees to complete a survey during their session). Such a dynamic would not provide sufficient privacy or respect for their right to decline research participation. However, a researcher may use the last few minutes of a class session or meeting to introduce a study and distribute materials, such that the potential participants can then take their time to decide later about participation.
[xxiii] Generally, data collection cannot be approved during work hours or school hours unless a "free period" has been identified (e.g., lunch, study hall) so the research activities can be separated from the participants' regular activities. It is important to maintain an "opt in" dynamic rather than implying that employees/students/group members are expected to participate.

[xxiv] Doctoral research directly benefits the student (allowing him or her to obtain a degree), and so the researcher should minimize the potential for either (a) conflict of interest or (b) perceived coercion to participate. Researchers who are in positions of authority or familiarity must take extra precautions to ensure that potential participants are not pressured to take part in their study. Examples:
-a professor researcher may recruit her studentsAFTER grades have been assigned
-a psychologist researcher may recruit clients from ANOTHER psychologist's practice
-a manager researcher may conduct ANONYMOUS data collection so that subordinates do not perceive their responses or [non]participation as being associated with their job standing
[xxv]Vulnerable participants include students, patients, the researcher's subordinates, children, prisoners, residents of any facility, mentally/emotionally disabled individuals, crisis victims, or anyone else who might feel undue pressure to participate in the study or be in any way limited in protecting their own best interests. Pregnant women (and their unborn children) are only considered a vulnerable population when a study involves physically risky data collection.
[xxvi]Targeted recruitment of children as participants can only be approved when a majority of the IRB votes that the study's benefits justify its risks/costs (such as disruption to instructional time). For recruitment of adult vulnerable populations, IRB staff will determine on a case-by-case basis whether approval must be issued via the full board's vote (as opposed to expedited ethics review).
[xxvii] It is ethically acceptable to unknowingly include certain vulnerable adult populations if screening for that particular status would be overly invasive, given the research topic: for example, a researcher might unknowingly have participants who happen to be pregnant, residents of a facility, mentally/emotionally disabled, victims of a crisis, or elderly. We don't expect researchers to screen for these statuses routinely for minimal risk research. However, minors may never be unknowingly recruited; adult recruitment procedures must deliberately avoid recruiting minors and/or include a reliable way of discerning that participants are 18 or older.
[xxviii] Usually, studies possibly involving unknowing inclusion of vulnerable adults are still eligible for expedited ethics review.
[xxix] When applicable, the exclusion criteria should be listed on the recruitment material (flyer, invitation email,etc.) or consent form to prevent situations in which the researcher rejects volunteers in a stigmatizing manner.
[xxx] Any limits to confidentiality (i.e., duty to report) must be mentioned in the consent form.
[xxxi] Control groups must be eligible to partake in the intervention after the study, if results show the intervention to be beneficial. If the design does not involve a control group, then the researcher only needs to ensure that allinvitedindividuals (potential participants) have equal access to the study results.
[xxxii]Researchers must be able to document their training in the data collection techniques and the IRB might require the researcher to obtain additional training prior to ethics approval. For most student researchers, the research course sequence is sufficient but some research procedures (such as interviewing people with mental disabilities) may require additional training. For psychological assessments, the manual indicates specific qualifications required. Data collection from children requires a background check/clearance through a local agency.
[xxxiii] Remote supervision is suitable for most studies but onsite supervision may be required for certain types of sensitive data collection (e.g., interviews or assessment regarding emotional topics).

[xxxiv] READ THIS IF YOU ARE USING A PUBLISHED INSTRUMENT:

Many assessment instruments published in journals can be used in research as long as commercial gain is not sought and proper credit is given to the original source (United States Code, 17USC107). However, publication of an assessment tool's results in a journal does not necessarily indicate that the tool is in the public domain.

The copyright holder of each assessment determines whether permission and payment are necessary for use of that assessment tool. Note that the copyright holder could be either the publisher or the author or another entity (such as the Myers and Briggs Foundation, which holds the copyright to the popular Myers-Briggs personality assessment). The researcher is responsible for identifying and contacting the copyright holder to determine which of the following are required for legal usage of the instrument: purchasing legal copies, purchasing a manual, purchasing scoring tools, obtaining written permission, obtaining explicit permission to reproduce the instrument in the dissertation, or simply confirming that the tool is public domain.

Even for public domain instruments, Walden University requires students to provide the professional courtesy of notifying the primary author of your plan to use that tool in their own research. Sometimes this is not possible, but at least three attempts should be made to contact the author at his or her most recently listed institution across a reasonable time period (such as 2 weeks). The author typically provides helpful updates or usage tips and asks to receive a copy of the results. This type of communication with the author is not necessary when a website or publisherclearly states that the tool is publicly domain.

Many psychological assessments are restricted for use only by suitably qualified individuals. When in doubt, researchers must check with the test's publisher to make sure that they are qualified to administer and interpret any particular assessments that they wish to use.

READ THIS IF YOU ARE CREATING YOUR OWN INSTRUMENT OR MODIFYING AN EXISTING INSTRUMENT:

It is not acceptable to modify assessment tools without explicitly citing the original work and detailing the precise nature of the revisions. Note that even slight modifications to items or instructions threaten the reliability and validity of the tool and make comparisons to other research findings difficult, if not impossible. Therefore, unless a purpose of the study is to compare the validity and reliability of a revised measure with that of one that has already been validated, changes should not be made to existing measures.

[xxxv] Informed consent is not just a form; it is a process of explaining the study to the participant and encouraging questions before the participant makes a decision about participation. The IRB website provides an informed consent form template that researchers are invited (but not required) to use.

[xxxvi] While documenting consent via signature is common, note that anonymous surveys can obtain "implied consent" by informing the participant, "To protect your privacy, no consent signature is requested. Instead, you may indicate your consent by clicking here/returning this survey in the enclosed envelope.")

[xxxvii] Walden encourages tailoring the language to the readers as long as a professional tone is maintained.

[xxxviii] Provide an estimate (in minutes or hours) of each component of data collection (e.g., survey, interview, memberchecking. etc.)

[xxxix] Describe only the possible harms that go beyond the risks of daily life.

[xl] For most social science studies, it is appropriate to state that there are no particular direct benefits to the individual. In this case, just present the benefits to society.

[xli]The consent form should explain any coding system that will permit the researcher to not use names in the research report; how names,contact info, and research data will be secured and eventually destroyed; and that the data will not be used for any purposes other than research. It is not always clear to participants how a research interview is different from a journalistic interview, in which informants might be named. So the consent form should make this distinction clear. For sensitive interviews, the researcher might also want to assure participants that recordings will be destroyed immediately after transcription.

[xlii]A consent form should not ask a participant to waive any legal rights.

Appendix B:

IRB Materials Approved - Felix Woke

IRB <IRB@waldenu.edu> Jun 6

to me, Chester, Ji

Dear Mr. Woke,

This email is to notify you that the Institutional Review Board (IRB) confirms that your study entitled, "Socio-Demographic Determinants of VCT Uptake In South Africa," meets Walden University's ethical standards. Our records indicate that you will be analyzing data provided to you by John Hopkins health and educations South Africa as collected under its oversight. Since this study will serve as a Walden doctoral capstone, the Walden IRB will oversee your capstone data analysis and results reporting. The IRB approval number for this study is 06-05-15-0147397.

This confirmation is contingent upon your adherence to the exact procedures described in the final version of the documents that have been submitted to IRB@waldenu.edu as of this date. This includes maintaining your current status with the university and the oversight relationship is only valid while you are an actively enrolled student at Walden University. If you need to take a leave of absence or are otherwise unable to remain actively enrolled, this is suspended.

If you need to make any changes to your research staff or procedures, you must obtain IRB approval by submitting the IRB Request for Change in Procedures Form. You will receive confirmation with a status update of the request within 1 week of submitting the change request form and are not permitted to implement changes prior to receiving approval.

Please note that Walden University does not accept responsibility or liability for research activities conducted without the IRB's approval, and the University will not accept or grant credit for student work that fails to comply with the policies and procedures related to ethical standards in research.

When you submitted your IRB materials, you made a commitment to communicate both discrete adverse events and general problems to the IRB within 1 week of their occurrence/realization. Failure to do so may result in invalidation of data, loss of academic credit, and/or loss of legal protections otherwise available to the researcher.

Both the Adverse Event Reporting form and Request for Change in Procedures form can be obtained at the IRB section of the Walden website: http://academicguides.waldenu.edu/researchcenter/orec

Researchers are expected to keep detailed records of their research activities (i.e., participant log sheets, completed consent forms, etc.) for the same period of time they retain the original data. If, in the future, you require copies of the originally submitted IRB materials, you may request them from Institutional Review Board.

Both students and faculty are invited to provide feedback on this IRB experience at the link below:

http://www.surveymonkey.com/s.aspx?sm=qHBJzkJMUx43pZegKlmdiQ_3d_3d

Sincerely,

Libby Munson

Research Ethics Support Specialist

Office of Research Ethics and Compliance

Email: irb@waldenu.edu

Fax: 626-605-0472

Phone: 612-312-1283

Office address for Walden University:

100 Washington Avenue South, Suite 900

Minneapolis, MN 55401 Information about the Walden University Institutional Review Board, including instructions for application, may be found at this link: http://academicguides.waldenu.edu/researchcenter/orec

Appendix C:

Curriculum Vitae

Personal Details:

1. Name:	DR. Felix IkechiWoke
2. Date of Birth:	23rd November 1971 (43 Years)
3. Gender:	Male
4. Religion:	Christian and Catholic
5. Marital Status:	Married with 3 children
6. Identity Number.	7111235916085
7. Country of Birth:	Nigeria
8. Nationality:	South Africa
8. Postal Address:	P.O.Box 55251,
	Arcadia 0007. Pretoria,
	Gauteng. South Africa.
9. E-mail:	feso20@webmail.co.za.
	feso200@gmail.com.
10. Contact Numbers:	+27835175912 (Cell).
	+2712 9913004 (Home)
	+27123224541(Work)

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11. Residential Address: 3 Swellendam Street,

Boardwalk Meander Estate

Faerie Glen, Pretoria East

Pretoria

Summary of Qualification:

1. Bachelor of Medicine; Bachelor of Surgery (MB; BS). Port Harcourt. Nigeria.
2. Diploma in Tropical Medicine and Health (DTM&H). Pretoria.
3. Post-graduate Diploma in Family Medicine (DFM). Pretoria.
4. Master of Public Health (MPH). Pretoria.
5. Post- graduate Diploma in HIV Management. College of Medicine (SA).
6. Certificate of Clinical Competence in HIV medicine. USA.
7. Fellow of the College of Family Physician (FCFP). College of Medicine(SA).
8. Elected Fellow of the Royal Society of Public Health FRSPH (UK).
9. Master of Medicine Family Medicine (Specialization Family Medicine). Pretoria
10. Ph.D. Public Health (Specialization in Epidemiology).Dissertation in progress.

Details of Academic Qualifications, Certifications and Honors:

College of Health Sciences: University of Port Harcourt. Nigeria. (1988-1995)

1. Provost prize for overall Best graduating student in the college.

2. Best graduating student in Internal Medicine.
3. Bachelor of Medicine; Bachelor of surgery (**MB; BS**).

School of Health Systems and Public Health (SHSPH).University of Pretoria.

1. Diploma in Tropical Medicine and Health (**DTM&H**). (2000-2001).

   A post-graduate course on management of emerging and re-emerging tropical diseases including STDs, HIV & AIDS, Tuberculosis and Malaria. Host, Reservoir, Vector and Environment. 1 year block posting in Sizwe Tropical Hospital Edenvale, Johannesburg.
2. Master of Public Health **(MPH). (**2001-2004). Specialization in Communicable Disease Control. This course revolves around health systems and services management, With concentration in communicable disease management including HIV/AIDS/STDS, Epidemics control and health measurement.

Department of Family Medicine. University of Pretoria

1. Diploma in Family Medicine **(DFM-*Cum laude*)**. 2000-2001. A course in Primary health Care management of common disease and conditions especially in Primary care setting.
2. Master of Medicine-Family Medicine. 2002-2005. Specialization in Family Medicine. This course revolves around bio-psycho-social basis of disease and diagnosis. It also emphasizes treatment at the clinical, individual and contextual levels of the patient and uses epidemiology as a tool in prevention and diagnosis of disease.

Faculty of Health Sciences, Walden University, Baltimore, USA

1. Ph.D. Public Health with specialization in Epidemiology (unofficial transcript of all Completed courses are attached).

Fellowships, Diplomas and Certifications

1. Diploma in HIV Management-College of Medicine, South Africa. 2004
2. Fellow of the Royal institute of Public Health-FRIPH-United Kingdom. 2004
3. Fellow of the College of Family Physicians (FCFP)- College of Medicine, South Africa. 2004

Secondary and Primary Education:

1. Attended the University Demonstration Secondary, Port Harcourt, Nigeria. 1983- 1998
   - Winner of the Young Scientist Competition, Rivers State(1987)
   - Award winners National Young Scientist Competition. Nigeria (1988)
   - General Certificate of Education (G.C.E). 8 Distinctions (1987)
   - West Africa School Certificate (WASC). 6 Distinctions (1988)
   - Best graduating student in Biology, Physics, Chemistry (1988)
   - Overall best graduating student in demonstration school(1988)
   - Library prefect (1987)

2. Attended Army Children's Primary School. Elele, Rivers State, Nigeria. 1977-1983.
   - Best graduating scholar and Head pupil
   - First school leaving certificate. (FSLC).Distinction.

Job Experience:

1. University of Port Harcourt Teaching Hospital, Rivers State, Nigeria. Oct.95- May97.

- **House Officer (Internship) & Medical Officer.** Rotation included pediatrics ward, Obstetrics, outpatient department, internal medicine and surgery.

2. Braithwaite Memorial Hospital, Rivers State, Port Harcourt, Nigeria.
   - **Medical Officer** in Casualty and Pediatrics. National Youth Service Corps. A outreaches and community services and work in rural areas. It is basically a service for the country at very minimal remuneration. Jun.97- May.98.
3. Holy Trinity Hospital, Port Harcourt, Nigeria. **Medical Officer.** Jun 98- Mar 99.
   - Duties included general ward works and gynecological Services. Administration was also a major part of my duties.

4. **Senior Medical Officer**. Amajuba Memorial Hospital, Volksrust, SA. July 01- June 02.

   A small town at the border of Mpumalanga and Kwazulu-Natal, the two provinces with the highest incidences of HIV/AIDS in South Africa.
   - Duties included running of the primary health care clinics and management of chronic and communicable diseases in the local clinics drained by the hospital. Community outreaches to provide services and teach communities simple health skills and provide management of common diseases in communities with referrals when necessary.
   - Rotations in casualty, maternity, surgical, medical wards and clinics monthly.

5. F.H. Odendaal Hospital, Nylstroom, Limpopo Province. SA. **Principal Medical**

Officer and Acting Chief Medical Officer and Superintendent fromJul 02-Aug 03.

- My duties included the following: Combining and coordinating with other Management structure to provide charismatic and effective leadership with program implementations. Meetings and decision making in conjunction with the chief Matron of the hospital and hospital CEO.
- Establishment of a disability grants committee for the hospital in conjunction with the department of Social Welfare.
- Strengthening of the Health services coordinating committee with the intention to include local clinic in addressing prominent health problems in the locality including home based care and prevention of HIV/AIDS/STDS transmission.
- Provision and implementation of several management protocols for chronic diseases and carrying out quality assurance cycles to access improvement and upkeep with standards.
- In the area of mother to child transmission of HIV, I helped in the intial implementation and the take-off of the prevention of mother to child transmission of HIV/AIDS, through the administration of Nevirapine to mother and children born to HIV positive mothers.
- Morbidity/Mortality meetings, Doctors daily morning meeting and presentations to discuss morbidities and mortalities with use of action research and program evaluation to assess disease management and training of interns and community service doctors.
- Appointment of intern curator and strengthening of interns training.

- Placement and recruitment of new medical staff and part-time doctors.
- In service training program.
- Financial Management: Orientation of interns and community service doctors in area of cost control in laboratory investigation request and their use of the department of health protocols in disease and patient management.
- Improvement of services at the Out Patient Department.

6. **Principal Medical officer and Lecturer**. Jul 2003-Jan 2005.

Department of Internal Medicine, Medical University of Southern Africa (MEDUNSA).

- Worked at the HIV/AIDS, pulmonology, and Rheumatology clinics. Also worked in Hypertension, Diabetic and Endocrine clinics. Medical out-patient and ward management of patients.
- Infectious diseases/HIV/AIDS and its associated opportunistic Infections and chronic diseases made up 90% of patients managed.
- Duties also included lecturing of 4th-6th year medical, pharmacy and dental students.

7. **Currently** in Private Practice in One Health Medical Practice, Pretoria Central. From February 2005- Date. Responsibilities includes

- Specialist Family Physician/Primary Care Physician.
- HIV clinician, HIV- associated condition and antiretroviral therapy management.
- As a Clinical Practice Manager of One Health Medical Practice.

- Responsible for managing and employing secretarial and administrative staff.
- Responsible for implementation of situational, transformational, path-goal and team-member leadership model where appropriate for staff, patient, financial, organizational structure and general management of practice.
- Development of clinical protocol on disease management on evidence based medicine, quality improvement cycles, implementation and monitoring.
- Community interaction and practice advertisement.

Research and Projects:

1. Screening for Diabetes Mellitus, Breast Cancer and hypertension-An outreach study by the Port Harcourt University Students Association in Bille, a small fishing settlement in Rivers State of Nigeria.
2. Contraceptive use among female undergraduate students at the University of Port Harcourt, Nigeria-A KAP Study under the auspices of the University of Port Harcourt Department of Preventive and social medicine, as part fulfillment for the award of the Bachelor of Medicine; Bachelor of Surgery.
3. Pregnancy by choice not by chance-A Health message campaign at various high school in Port Harcourt municipality in Nigeria by the Anti-Child Abuse Society of Africa (ACASA).
4. HIV Prevalence Study among blood donors in the University of Port Harcourt, Nigeria Hematology laboratory.
5. Evaluation of the Syndromic STD Management among Health Care Providers in Volksrust Health District, Mpumalanga. South Africa. A completed research project leading to the

award of Master of Public Health (M.P.H.) at the School of Health Systems and Public Health. University of Pretoria, South Africa.

Authorship: DR. F I Woke, Prof. B. Girdler-Brown, Prof. Ijjessemuden.

6. Evaluation of Voluntary counseling and testing (VCT) at the F.H. Odendaal Hospital, including the assessment of alternative testing methods used by health professionals in Nylstroom, Limpopo province of South Africa. A completed research project approved by the University of Pretoria Ethics committee.

   Authorship: DR. F I WOKE, Prof.PA Matthews, Prof. J. Blitz.

7. Socio-Demographic Determinants of Anti-Retroviral Therapy Adherence in South Africa: A Systematic Review (In press). Submitted to the Southern Africa HIV Journal for Publication. Authorship: Dr. Felix I. Woke.
8. The Role of Socio-demographics factors in Voluntary Counselling and Testing uptake in South-Africa. A proposal study using population based secondary data from the National Communications survey (NCS) of the John Hopkins Institute, South Africa. Submitted to the Walden University (in progress) as part fulfilment of the Ph.D (Epidemiology). Authorship: Dr. FI Woke; Supervisors: Dr. Chester Jones; Dr. Ji Shen.

Professional Registration:

1. Medical and Dental Council of Nigeria.FM23543. 1995
2. Health Professions Council of South Africa. MP0506486. 1999

Social Organizations:

1. Vice-President of the Anti-child abuse society of Africa.
2. Financial secretary of the Port Harcourt University Medical Association.
3. Secretary of the Elele-Alimini League of friends.

Hobbies:

Football, Tennis, Reading, Golf and Computers. Good personality, proven managerial skills with excellent knowledge and insight of current issues in chronic and infectious diseases management including HIV, AIDS, STI and Tuberculosis.

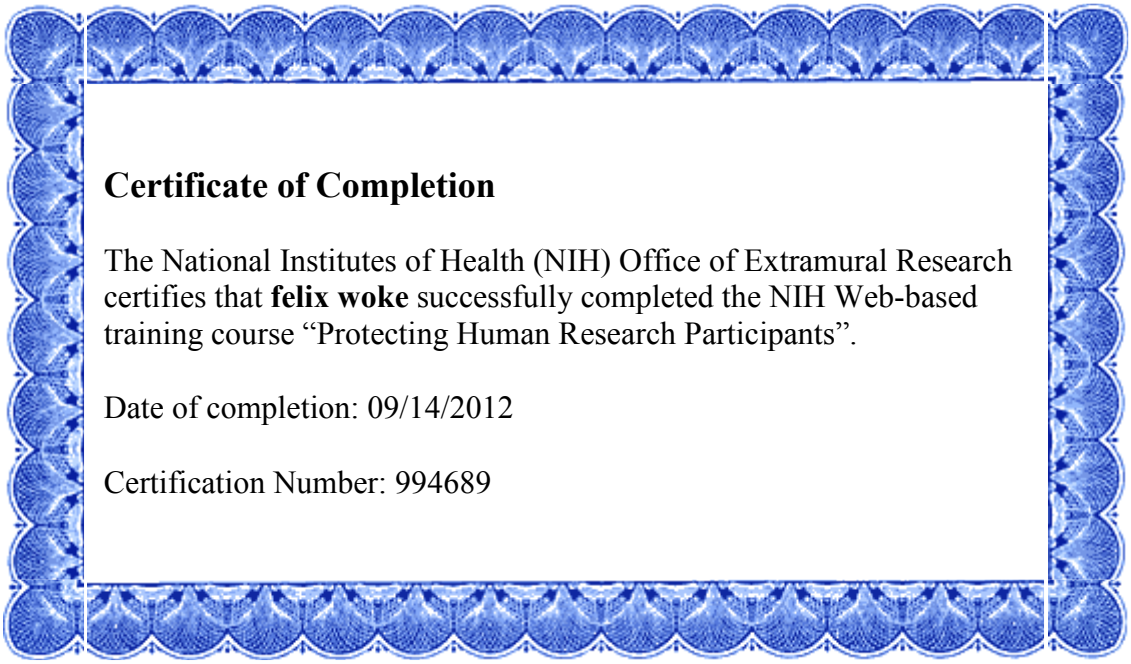
References:

1. Prof. N.D Briggs M.B; BS; FRCOG; FMCOG; FWACS.
   Provost College of Medicine. University of Port Harcourt.
2. Prof. B.Girdler-Brown B.sc; MB;chB; MMED(COM.MED);MBA.
School of Health Systems and Public Health. Pretoria. South Africa.
3. Prof. P.A. Matthew. MB; chB; MCGP, MfamMED. Principal Family Physician and Departmental head, University of Pretoria, Mpumalanga branch.
4. Dr. Damian Eze. MbCHb; MPH; DrPH. (Medunsa, SA.)
Medical practitioner, secunda.SA.

Yours truly,

DR. FI WOKE.

Appendix D:



Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **felix woke** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 09/14/2012

Certification Number: 994689

Appendix E:

INBOX Viewing message 3 / 31820 Page 1

and To:
Subject: RE:
From: LusandaMahlasela<lusanda@ccisa.org.za>
To: 'felix woke' <feso20@webmail.co.za>
Date: Thu, 14 May 2015 08:34:35 +0200 (2 hours, 7 minutes ago)
Contacts:
ReplyReply to allForwardAttachEdit as new || Full headersRawviewPrintviewThreadviewWhitelist Sender
Unread (29402) :

Tags:

Message Parts

```
Hi Dr Woke,

Please find attached your data user's agreement which confirms that the data
was released to you. I am also confirming that the respondents are de-
identified on the dataset.

Kind regards

Lusanda N. Mahlasela
Director: Research, Monitoring and Evaluation
Centre for Communication Impact t/a JHHESA
Tel: 012 366 9300
```

Appendix F:

DATA USER'S AGREEMENT
Third National HIV Communication Survey: 2012

The National HIV Communication Survey (NCS), 2012 Steering Committee, encourages all interested users to request for Data/ Data Sets. Users are however required to read and sign the User's Agreement for Information, which stipulates the conditions for use of the Data /Data Sets before the requested Data /Data Sets is made available.

Please read the following agreement. All users Data Sets agree to the conditions listed below. If you accept these conditions, fill in the required information and sign at the appropriate place.

1. The User agrees that the NCS Steering Committee is the owner of the Data Set(s).

2. The use of these Data Sets in research communication, scholary papers, journals and the like is encouraged, but the authors of these communications and documents are required to acknowledge/cite the NCS steering committee as the source of the Data. Data should be acknowledged using the following statement:

   The data used in this paper are from the Third National HIV Communication Survey (NCS). The NCS is a collaborative survey undertaken by Johns Hopkins Health and Education in South Africa (JHHESA), loveLife and Soul City. The survey was managed by Health and Development Africa (HDA). The Johns Hopkins Bloomberg School of Public Health Center for Communication Programs (CHU CCP) provided technical support and oversight at all stages of the study. Data were gathered by Freshly Ground Insights (FGI). This study was funded by the Department of Health, the United States Agency for International Development (USAID) through the President's Emergency Plan for AIDS Relief (PEPFAR) and the Global Fund.

3. A copy of any document produced from the Data Set for publication or other forms of circulation should be submitted to the NCS steering committee.

4. The User agrees that any use of the Data or reliance by the User or any of the Data is at the User's own risk and that the NCS steering committee shall not be liable for any loss or damage howsoever arising as a result of such use.

5. The User agrees that he/she will not attempt to link nor permit others to attempt to link the records of persons in these Data Sets with personally identifiable

Exhibit F-1
27/03/14