

Condom Use and HIV Testing Behaviours of Men working in the Construction Industry in Western Cape, South Africa

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January 7, 2024

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The sexual act is in time what the tiger is in space.

Georges Bataille (1967, *The Accursed Share: An Essay on General Economy*)

ABSTRACT

In 2017, UNAIDS published a report titled “Blind Spot: Reaching Out to Men and Boys”, which highlighted a global pattern where men experience worse outcomes than women in the HIV prevention and treatment cascade. This issue is particularly evident in South Africa, where men have been found to be less engaged in HIV prevention and treatment services compared to women. To address this disparity, targeted interventions are urgently needed to improve HIV-related health outcomes for men. However, many such interventions lack a clear theoretical foundation, making it difficult to replicate or assess their effectiveness. This study addresses this gap by empirically testing the Health Belief Model (HBM) and the Theory of Planned Behaviour (TPB) within a purposive sample of men who are at high risk for HIV/AIDS and hard-to-reach through traditional health facility-based interventions, male construction workers. The study found that an integrated model combining HBM and TPB constructs provided a statistically significant explanation of HIV testing and condom use. Key findings include the direct influence of perceived threat of HIV/AIDS, attitudes and subjective norms on HIV testing, and the significant role of self-efficacy and attitudes towards condom use on condom use intention. In addition to socio-demographic factors such as age and education, experiential factors associated with the impact of someday antiretroviral (ARV) therapy initiation under Universal Test and Treatment (UTT), such as knowledge of where to obtain ARVs, were also found to directly influence the HBM and the TPB, underscoring the importance of the evolving social context of HIV prevention and treatment in understanding HIV-related health outcomes. Finally, the study offers a structured approach for assessing and documenting theory-based interventions, facilitating systematic investigation and replication across different settings

LIST OF PUBLICATIONS¹

- Kamal Yakubu, Paul Bowen & Rajen Govender (2023) The influence of type of sexual partnership on male condom use: empirical evidence from the South African construction industry, African Journal of Aids Research [published online ahead of print, 2023 Nov 1:1-16] <https://doi.org/10.2989/16085906.2023.226590>
- Kamal Yakubu, Paul Bowen & Rajen Govender (2022) Determinants of HIV testing behaviour among male South African construction workers, AIDS Care – Psychological and Socio-medical aspects of AIDS/HIV, 34:7, 847- 855, <https://doi.org/10.1080/09540121.2021.1981222>
- Paul Bowen, Kamal Yakubu & Rajen Govender (2022) Predictors of moderate to high risk of alcohol harm among site-based South African construction workers, Construction Management and Economics, 40:6, 442- 458, <https://doi.org/10.1080/01446193.2022.2080241>
- Bowen, P, Yakubu, K, Zhang, R P and Govender, R (2022) Determinants of Alcohol Risk of Harm Profiles Among South African Construction Workers In: Tutesigensi, A and Neilson, C J (Eds) Proceedings of the 38th Annual ARCOM Conference, 5-7 September 2022, Glasgow, UK, Association of Researchers in Construction Management, 207-216. <https://www.arcom.ac.uk/-docs/archive/2022-Indexed-Papers.pdf>

¹ The publication data (n = 450) is different from the study data (n = 310). While both datasets are derived from a questionnaire completed by a total of 574 respondents across 18 construction sites, missing data were imputed using the EM (Expectation-Maximization) algorithm for the publications, and complete case analysis (listwise deletion), including only participants for which there is no missing data was used for the study.

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LIST OF ABBREVIATIONS

AGYW	Adolescent Girls and Young Women
ANC	African National Congress
ARV	Anti-Retroviral
ART	Anti-Retroviral Therapy
ATCS	Attitude Towards Condoms Scale
AZT	Azidothymidine
BCT	Behaviour Change Technique
BToS	Bartlett's Test of Sphericity
CAB-LA	Long-Acting Cabotegravir
COSATU	Congress of South African Trade Unions
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
DBE	Department of Basic Education
DoH	Department of Health
DPW	Department of Public Works
DSSM	Dynamic Social Systems Model for Considering Structural Factors in HIV Prevention and Detection
EFA	Exploratory Factor Analysis
GASA	Gay Activists of South Africa
HAART	Highly Active Anti-Retroviral Therapy
HBM	Health Belief Model
HBT	Health Behaviour Theory
HFBC	Health Facility Based Care
nHFBC	Non-Health Facility Based Care
HIV-KQ	HIV Knowledge Questionnaire
HIVST	HIV Self-Testing Kit
HLR	Hierarchical Linear Regression
HSRC	Human Sciences Research Council
HTAS	HIV Anti-Body Testing Scale
HTS	HIV Counselling and Testing Services
KMO	Kaiser-Meyer-Olkin Measure of Sampling Adequacy
LO	Life Orientation
MCC	Medicines Control Council
MCSA	Minerals Council South Africa
MDM	Multiple Domain Model of Condom Use
MEC	Member of Executive Council
MI	Modification Indices
MSM	Men Who Have Sex With Men
NACOSA	National AIDS Convention of South Africa
NAPWA	National Association of People Living With HIV
NCHCTMP	National Comprehensive HIV Care, Treatment, and Management Programme
NSP	National Strategic Plan for HIV, TB and STIs
NIRM	Network-Individual-Resource Model for HIV prevention
PEPFAR	US Presidents Emergency Plan for AIDS Relief
PEP	Post Exposure Prophylaxis
PrEP	Pre-Exposure Prophylaxis
PHI	Pharmaceutical Health Intervention
nPHI	Non-pharmaceutical Health Intervention
PLHIV	People living with HIV
PMA	Pharmaceutical Manufacturers Association
PMTCT	Prevention of Mother to Child Transmission
RAA	Reasoned Action Approach
RDP	Reconstruction and Development Programme
RMSEA	Root-Mean-Square Error of Approximation
SADC	Southern African Development Community
SAINT	South African Intra-Partum Nevirapine Trial
SAIRR	South African Institute of Race Relations
SANAC	South African National AIDS Council
SDI	Same day initiation of anti-retroviral therapy
SEM	Structural Equation Modelling

SLP	Scripted Lesson Plan
Stats SA	Statistics South Africa
STI	Sexually Transmitted Infection
TAC	Treatment Action Campaign
TB	Tuberculosis
TPB	Theory of Planned Behaviour
TRA	Theory of reasoned action
UNAIDS	Joint United Nations Programme on HIV and AIDS
USAID	United States Agency for International Development
USCDC	United States Centre for Disease Control
UTT	Universal Test and Treatment
WHO	World Health Organization

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1 INTRODUCTION

1.1 Background and Context

The availability of HIV counselling and testing services (HTS) has increased significantly in South Africa in recent years. At the end of 2019, it was estimated that over 4500 public health facilities offered both provider-initiated and client-initiated counselling and testing services (Mabuto *et al.*, 2019). HTS are also available in the private sector through community and non-health facility-based care services (nHFBC) (National Department of Health of South Africa (henceforth DoH), 2016). A policy of universal test and treat (UTT) was introduced in September 2016, making anti-retroviral therapy (ART) available to all HIV positive persons regardless of CD4 count (DoH, 2016). In August 2017, the DoH provided a further directive, requesting all public health facilities to scale up ART initiation, with an emphasis on providing same-day initiation (SDI) for individuals newly diagnosed with HIV who were clinically and psychologically ready for treatment (Onoya *et al.*, 2021).

Because of the aforementioned initiatives as well as the seriousness with which the South African government, civil society, and other stakeholders² have responded to the HIV/AIDS epidemic since the mid-2000s, the overall national estimate for HIV prevalence (for all ages) in 2022 was 12.7% (95% CI: 12.0 – 13.4), translating to an estimate of 7.8 million people living with HIV (PLHIV). This recent estimate is 1.3% lower than the 2017 prevalence rate, which was 14.0% (95% CI: 13.2 – 14.8) (Human Sciences Research Council (henceforth HSRC), 2023). Relatedly, the percentage of people who know their HIV status in the country increased from 49.1% in 2008 to 66.8% in 2017 (HSRC, 2018).

Despite the success in controlling the HIV epidemic, sustained investment in advocacy and behaviour change interventions are still needed to improve condom use, reduce risky sex behaviour, and increase the demand for HTS and treatment. About a third of persons who are aware of HTS have not made use of the freely available services (Ryan *et al.*, 2020). Furthermore, only an estimated 60.9% of people living with HIV (PLHIV) were on treatment in 2017. The percentage was higher among females (65.5%) as compared to males (56.3%) (HSRC, 2018).

² The US Presidents Emergency Plan for AIDS Relief (PEPFAR) program has been especially instrumental.

Women have a higher biological susceptibility to HIV/AIDS than men (Abbai *et al.*, 2016; Mahathir, 1997). Furthermore, a significant population of young girls tend to engage in sexual relationships with older men (Evans *et al.*, 2016). This behavioural pattern is influenced significantly by the informal rules which impact on an individuals' choices and expectations in sexual relationships (Kugelberg, 2021; Mampane, 2018; Rutenburg *et al.*, 2003), as well as the norms which regulate the gendered power dynamics and distribution of resources in many communities (Hunter, 2010; Jewkes & Morrell, 2010; Jewkes *et al.*, 2010). Because of these biological, behavioural, and structural factors, the HIV/AIDS epidemic in South Africa can be described as being gendered. This gendered context is supported by empirical findings which show that HIV incidence is up to eight times higher among adolescent girls and young women (AGYW) than in their male peers (Harrison *et al.*, 2015). Furthermore, according to the most recent national survey, HIV prevalence was nearly twice as high among females (20.3%) as compared to males (11.5%) among adults aged 15 years or older (HSRC, 2023)

Given the gendered context of HIV risk, and particularly the vulnerability of women and AGYW to HIV/AIDS, a majority of response efforts have historically targeted females. While the response to an epidemic is certainly not a zero-sum game, it is increasingly becoming apparent that relatively little attention has been given to males (Mills *et al.*, 2009), who have recently been described as “missing” (Grimsrud *et al.*, 2020); “ignored” (Trivino-Duran & Makeleni, 2018); and as a “blind spot” (Shand *et al.*, 2014) in the HIV/AIDS response. This situation has attracted the attention of van Rooyen *et al.* (2019), who have observed that:

More than 30 years into the epidemic, interventions and research focusing on the prevention and care needs of men are notably absent. Our attention thus far on women is without dispute. Gender inequality is a key driver that impacts women's health and access to HIV services and creates specific vulnerabilities for women to HIV infection...when men are included in HIV prevention and treatment, the focus is frequently on men as the problem (i.e., as transmitters of HIV), with outcomes that focus specifically on improving women's health, not that of men (van Rooyen *et al.* 2019:2).

It is important to note that HIV incidence is disproportionately higher among women than men in South Africa, and so it is expected that there will be a strong positive correlation between national HIV response outcomes and female outcomes. Between 2012 and 2017, there was a significant reduction in the incidence of HIV, particularly among females aged 2 years and

older (as shown in figure 1). This decline can be viewed as an indication of the effectiveness of the expanded HIV/AIDS response initiatives, as well as female targeted interventions.³ As the HIV/AIDS pandemic has matured and more individuals access HTS, it has been observed that males are twice as likely to succumb to HIV-related complications than their age-matched female counterparts (Bhushan *et al.*, 2023). Men have also been found to be less likely to know their HIV status, start treatment after being diagnosed with HIV, and less likely to adhere to treatment regimens across all age groups (Osler *et al.*, 2020).

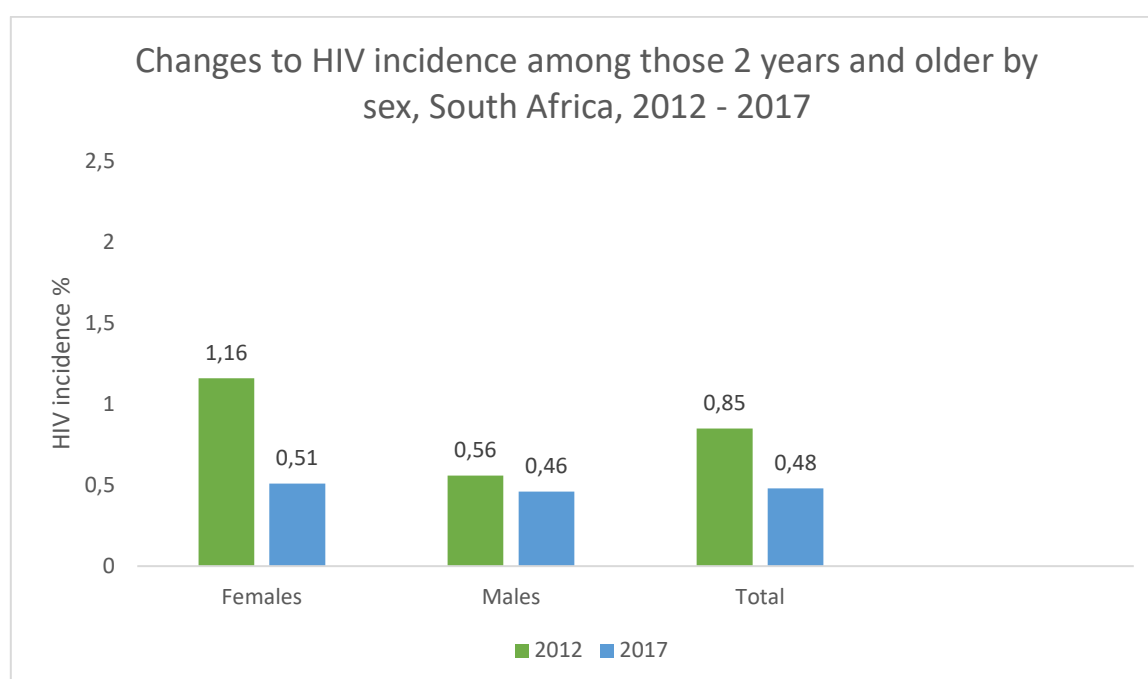


Figure 1 Changes to HIV incidence in South Africa, 2012 - 2017 (HSRC, 2018)

Following the publication of the report – *Blind spot: Reaching out to men and boys* (UNAIDS, 2017), there has been an increased appreciation of the barriers that men face in accessing HTS. Consequently, a variety of factors have been identified as explanations for this gender disparity, including, inter alia, restrictive social norms around masculinity; the role of alcohol and drugs in decision making; and HIV-related stigma from the pre-ART era where an HIV-positive

³ An example of such an intervention is the prevention of mother-to-child transmission (PMTCT) policy guideline which mandates that all pregnant or breastfeeding patients who visit public health institutions and have an unknown or previously negative HIV status receive HTS and be placed on treatment if required (Peltzer *et al.*, 2010). Also see: https://www.westerncape.gov.za/text/2018/November/pmtct_guidelines_23112018.pdf

diagnoses was perceived as a death sentence (Treves-Kagan *et al.*, 2017; Fleming *et al.*, 2016; Cornell, 2013; Dageid *et al.*, 2012).

Health workers have also pointed out that while most women have regular opportunities to engage in sexual and reproductive health services, men generally have fewer opportunities to do so. This becomes even more challenging with employment because of the need to balance going to the clinic with the need to not miss a day of work. One health worker explained:

“In some families it is only the man working most of the time. So, if the man is normally expected to be at work, then that means that self-care is not a priority and is not going to improve because that guy needs to be at work. So, you find that especially when ARVs came out and they were every two weeks, people complained about their bosses at work. Some men were retrenched if HIV positive because they had to go to the clinic (to get their pills) ...those who are working would love to ensure care, but sometimes it's impossible” (Mbokazi *et al.*, 2020: 5)

Considering the potential impact of employment on male health seeking behaviours, moving the provision of HTS from health facility-based care models (HFBC) has the potential to improve access to treatment (Limbada *et al.*, 2021). Various non-health facility base care models (nHFBC) have been tested and implemented. These models are now being increasingly recognised as safe and effective alternatives to the standard HFBC. Examples of nHFBC include health-care worker managed groups (e.g., adherence clubs), digital health interventions, community-based condom and HIVST distribution points, as well as home-based delivery of PrEP and ARV prescriptions (Grimsrud *et al.*, 2016; Grimsrud *et al.* 2015; Bemelmans *et al.* 2014).

Improving the engagement of men in HTS is not only essential for reducing their own HIV risk, but also the risk of transmission to their partners. Considering the gender differences in HTS coverage and HIV-related health outcomes, the workplace is seen as an optimal setting to provide nHFBC interventions aimed at changing HIV-related behaviours among employed men in this study.

1.2 HIV/AIDS in the Construction Industry

The term *key population* refers to “groups that are at elevated risk of HIV infection, stigmatised by society because of their identities or behaviours, and less likely than other groups to be reached by interventions. Traditionally, key populations have included “men who have sex with men (MSM), sex workers and their clients, people who inject drugs, transgender persons, and incarcerated people” (Shisana *et al.* 2015: p 664). While a focus on key populations is important, Shisana *et al.* (2015) remind us that within the general population, there may be groups that are vulnerable, and at risk of HIV/AIDS, that may not fit into the narrow definition of a key population. In low- and middle-income countries, groups that do not fall within the traditional definition of a key population are often not the focus of targeted HIV prevention interventions. The difficulty is that these high-risk groups are larger sub-populations relative to the traditional key population groups, and as a result are not easily distinguishable from the general population. However, it is important to identify these groups and the social factors that affect them because the overall HIV incidence in a country is unlikely to decrease unless these high-risk groups are targeted with interventions that address their specific needs.

Consequently, Shisana *et al.* (2015) make the case for expanding the definition of key populations. They define key populations as “communities that have higher HIV prevalence than the general population, or those disproportionately affected by HIV when compared to the general population” (Ibid; p 64). The definition of key populations therefore depends on the epidemiological profile of the country and the social dynamics that operate in that country. Most importantly, the reason for increased vulnerability varies, and includes factors such as occupation, living arrangements and socio-cultural norms.

In the South African context, occupational groups that have been identified as vulnerable include soldiers, miners, long-distance truck drivers and construction workers (SANAC, 2017; Shisana *et al.* 2015). According to the Department of Public Works (DPW) (2004), the construction industry has the third highest HIV incidence rate per sector, after the mining industry and the logistics industry. Construction work in South Africa has a predominant migratory male labour force (Aneke, 2015; Jahn, 2009), making it a prime contributor to the transmission of HIV/AIDS as workers have been found to be prone to engage in the services of sex workers or have multiple sexual partners when they are separated from their families for extended periods (Harinarain & Haupt, 2014a). Furthermore, due to adherence to non-scientific beliefs about the causes of disease (Govender *et al.*, 2017), coupled with socially constructed expectations of what it means to be a man (Stern & Buikema, 2013), the predominantly male

work force may not take adequate measures to protect themselves from HIV or uptake in HTS (Haupt & Smallwood, 2003). Work-related travel also takes workers away from the proximity of healthcare facilities and social support networks with which they are familiar. Other factors of industry level vulnerability include the comparatively low levels of worker education and high rates of alcohol and drug abuse among workers (Bowen *et al.*, 2014a; Meintjes *et al.*, 2007).

Because of the industry's vulnerability, several empirical studies have sought to establish the nature and extent of the impact of the HIV/AIDS pandemic in the South African construction industry. However, because of the fragmentation of the industry and the numerous small and medium sized companies, it is impossible to draw a representative sample of construction workers to establish classic sample to population generalizability. Based on a purposive sample of 10,243 construction employees drawn from 55 companies nationwide, Bowen *et al.* (2008) report an HIV infection rate of 13.96% among employees in the construction industry. In a follow up study, Bowen *et al.* (2018) purposively sampled more than 57,000 construction workers and estimated the industry infection rate to be 10.1%. Consistent with the national trend, Bowen *et al.* (2015) found female workers to be 4.45 times (95% CI, 1.25-15.82) more likely than their male counterparts to have been tested for HIV. Relatedly, Bowen *et al.* (2017) found gender to be an indirect determinant of condom use among workers in construction.

1.3 Problem Statement

Over the past two decades, South Africa's response to HIV/AIDS has benefited substantially from pharmaceutical interventions, including expanded access to diagnostics such as rapid HIV testing kits, HIVST, as well as ART under UTT and SDI policies. With the availability of new bio-medical prevention products such as injectable pre-exposure prophylaxis⁴ and the potential of a vaccine⁵, non-pharmaceutical interventions can generate demand for, and increase uptake of the available prevention and treatment services, particularly among high-risk community populations. In particular, well-tailored behaviour change interventions can play a key role in increasing the demand for HIV prevention and treatment services and promote healthier decision making.

⁴ [Health Beat #3 | Meet the first SA women to get the anti-HIV jab – Bhekisisa](#)

⁵ [The anti-HIV injection will be made in SA: Here are 4 benefits of the deal that made it happen – Bhekisisa](#)

There is a growing body of work on HIV-related health behaviours among employees in the South African construction industry. However, the systematic application of health behaviour within this context is rare. Even in instances where theoretical frameworks are used, their adoption can be categorised as ‘theory-inspired’ rather than ‘theory-based’, in the sense that when constructs derived from a theoretical model are incorporated within a study or an intervention, explicit reference to the overarching theoretical model is often omitted. For example, Bowen *et al.* (2016); Bowen *et al.* (2014b) and Haupt *et al.* (2005), make use of theoretical constructs from the health belief model, social cognitive theory, and theory of planned behaviour to explain HIV-related health behaviours of construction workers without mentioning the origins of the constructs that they use to explain health behaviours.

The sparse acknowledgement of theory undermines the synthesis of research findings and presents a barrier to the development and implementation of theory-based interventions. As a consequence, there is a need for better descriptions of, and reporting of health behaviour theory in research and in the design of interventions. This dissertation uses health behaviour theory to examine a set of multilevel factors hypothesized to influence HIV testing and condom use behaviours.

The novelty of this research lies in its focus on HIV-related health behaviours among a specific, highly vulnerable and hard-to-reach population group in Western Cape, South Africa — adult males. Compared to females, males in the province have been determined to be less likely to engage in HIV prevention and treatment (Osler *et al.*, 2020). Moreover, while there is extensive research on HIV prevention among the general population and various subgroups (e.g., AGYW, pregnant women and mothers, MSM, sex workers), the unique occupational and socio-economic dynamics of construction work warrants particular attention.

Firstly, male construction workers often face unique risk and testing dynamics due to the nature of their work. These individuals frequently experience high levels of mobility, transient living conditions, and separation from stable family and community support structures, all of which can contribute to increased risk behaviours and challenges in accessing consistent healthcare services. The occupational environment may also contribute to stress and substance use, further elevating HIV risk. Moreover, reaching employed males with HIV interventions has historically been challenging due to their work schedules, mobility, and sometimes limited access to healthcare services during working hours. The construction industry, being male-dominated, offers an ideal opportunity to reach this hard-to-reach group (van Rooyen *et al.*, 2019). Implementing workplace-based interventions can effectively engage these men in HIV prevention and care,

leveraging their employment setting to provide consistent and convenient access to prevention and treatment services.

Secondly, the theoretical constructs of the health belief model (HBM) and the theory of planned behaviour (TPB) are not unique to construction workers; however, their application to this specific group provides novel insights. The attitudes, perceived behavioural control, and social norms within the construction industry may differ significantly from those in other labour-focused industries, influencing how these constructs predict HIV-related behaviours. For instance, the perception of vulnerability and severity of HIV, as well as the perceived benefits and barriers to preventive behaviours, may vary based on the distinct social and occupational contexts of construction workers. By focusing on this specific population, this study contributes to a more nuanced understanding of how HBM and TPB constructs operate within a high-risk group that has been underrepresented in HIV prevention research. The findings have the potential to inform targeted interventions that consider the unique occupational and social environments of construction workers and other male-dominated industries, thereby enhancing the effectiveness of HIV prevention efforts in this and similar populations.

In 2017, UNAIDS published a report highlighting the gender disparities in HIV outcomes across the world, including lower testing and treatment rates among men, significant disparities in HIV knowledge across gender, cultural and social barriers which hinder male engagement in services as well as the knock-on effect of a lack of male engagement in services on children and women. Around the same time that the UNAIDS report was published, the fifth survey in a series of population-based, cross-sectional household surveys designed to assess the prevalence of HIV and related health indicators was released. In the fifth South African National HIV Prevalence, Incidence, Behaviour and Communication Survey (henceforth SABSSM V), it was observed that even though the overall HIV prevalence had increased between 2012 and 2017, there was a notable reduction in HIV incidence, especially among females. In particular, the annualized rate of new HIV infections among females showed a significant percentage drop from 1.16% to 0.51%, compared to a smaller decrease among males from 0.56% to 0.46%. Historically, HIV interventions in South Africa have predominantly focused on females due to their higher prevalence rates and increased vulnerability. However, the gap in HIV incidence between genders is an indication that males face growing risks. Relatedly, the SABSSM V report highlighted that among People Living with HIV (PLHIV), males had lower viral load suppression (VLS) rates than females, indicating poorer health outcomes and levels of engagement in treatment.

The most recent, SABSSM VI report (2022) further supports these observations. HIV prevalence in 2022 was observed to have decreased to 12.7% from 14% in 2017, however, the reduction among females (17.3% to 15%) was more pronounced than among males (10.6% to 10.3%). In conclusion, the changing dynamics in HIV vulnerability underscore the importance of developing targeted interventions for men. By addressing the unique risks and barriers faced by men, and by implementing strategies to enhance their engagement in HIV prevention and treatment, we can better address the evolving landscape of HIV/AIDS in South Africa

1.4 Research Objectives

The purpose of this study is to systematically apply health behaviour theory to explain HIV testing and condom use among a sample of male construction workers in South Africa. That said, understanding the progression of HIV/AIDS, how and when it emerged, and the timing of local, national, and international responses is essential in establishing how the virus became a pandemic, as well as the present context, so as to better understand where efficiency and accountability in the HIV/AIDS response can be improved. Given this aim, the specific objectives of the study are as follows:

1. To provide a chronological analysis of events and actions, from 1982 when the first case of HIV/AIDS was identified, to 2023, the year of publication of the most recent, 5th National strategic plan (NSP) for HIV, TB and STIs, 2023 – 2028.
2. To compare and contrast how well the health belief model (HBM) and the theory of planned behaviour (TPB) explain HIV testing and condom use among study participants.
3. To provide an empirical basis for identifying factors and behavioural pathways to target with a behavioural change intervention for a specific subpopulation of men at increased risk.
4. To demonstrate how standardised reporting frameworks such as the behaviour change wheel (BCW) and the behaviour change technique taxonomy (BCTT) can be used to document a behavioural change intervention.

To summarize, this study makes use of a historical and interpretive approach to examine the framing and representation of the HIV/AIDS problem and illustrate how the progression of the HIV/AIDS response in South Africa reflects the interaction between various actors and stakeholders with competing interests. Following the historical analysis of policy, health behaviour theory is used to examine associations among participant socio-demographic characteristics, HIV risk perceptions, social norms, attitudes, and HIV-related health behaviours. Through the specific research objectives, the study responds to the call for more theory-informed interventions and evaluations in the response to HIV/AIDS (George *et al.*, 2021; Ganz *et al.*, 2017). Additionally, the focus on men employed in the construction industry fills an important gap in the current evidence base on engaging men in HTS in South Africa – the need for more research on specific sub populations of men at an increased HIV risk (Colvin, 2019).

2 THE PROGRESSION OF HIV/AIDS IN SOUTH AFRICA, AND THE RESPONSES TO IT

One of the basic tasks of history is to provide a basis for explaining present behaviour and predicting future behaviour. An historical analysis helps in “meeting new situations, because an understanding of human behaviour in the past makes it possible to find familiar elements in present problems and thus makes it possible to solve them more intelligently” (Quoted in Phillips, 2001: 12). The purpose of this chapter is to demonstrate the following:

- Provide an overview of the origin and progression of the HIV/AIDS pandemic in South Africa
- Show how the progression of the pandemic was impacted by state intervention, as well as the contestation between the state and the private sector, civil society, and activist groupings on the type of response required.
- Highlight the increased relevance of non-pharmaceutical interventions (nPHI) in a mature stage of the pandemic, where pharmaceutical interventions (PHI) have been secured but are not being efficiently used.

The approach adopted is a mix of historical analysis, analysis of language and discourse, and an examination of putative ideologies underlying the progression in the response to HIV/AIDS in the country from when it was first discovered in 1982 until 2023, the year of publication of the most recent, 5th National strategic plan (NSP) for HIV, TB and STIs, 2023 – 2028.

2.1 A Lack of Urgency by the Apartheid Government Amplifies the Role of Non-State Actors

In 1982, one year after the United States Centre for Disease Control (USCDC) announced the emergence of a new disease in New York and California, primarily among men who have sex with men (MSM), the first deaths attributed to HIV/AIDS in South Africa were reported in two male South African Airways flight attendants (Ras *et al.*, 1983). The deaths of the two male stewards were acknowledged by the Apartheid government, though HIV itself was not elevated to the level of a public health crisis until much later (Sher, 1989). The lack of urgency is evident in a speech by then Director General of the DoH, wherein South Africans were reassured that they should not panic because ‘white homosexuals’ and ‘injecting drug users’ were the only

community population groups at risk, and that the men who had died were ‘two isolated cases’ who contracted HIV on a trip to the United States (see Grundlingh, 2001:125).

In 1985, the DoH responded to what it called a ‘mass hysteria’ caused by media coverage on the possibility of being infected with HIV through blood transfusion. The department assured the public and especially those suffering from haemophilia that quick action had been taken to protect blood transfusion services in the country, and that HIV was firmly under control (Grundlingh, 2001). In 1986, 130 male Malawian mine workers were identified as HIV positive.⁶ Shortly afterwards, the government demanded that all HIV positive migrant workers be repatriated. In October 1987, the law was amended, permitting the denial of entrance or deportation of foreign nationals who were HIV positive (Phillips, 2001). This amendment, however, was viewed as draconian, and was met with resistance by the private sector and civil society. For example, the Chamber of Mines⁷, opposed the government, and argued that the repatriation of HIV positive workers would have no significant impact on the transmission of HIV/AIDS in the country. Consequently, the mining industry opted to follow what it described as a ‘compassionate road’, and adopted a position where HIV positive migrant workers were treated in the same way as workers with any other disease or injury (Grundlingh, 2001:134). Other government-led interventions which were resisted by the private sector and civil society in the 1980s include the mandatory HIV testing of all immigrants and self-identified gay men, a proposed national registry of HIV positive individuals as well as the forced quarantining of HIV positive persons (Grundlingh, 1999).

In November 1983, representatives of Gay Activists of South Africa (GASA) met with the DoH to discuss the HIV/AIDS problem (Gevisser, 1995). For GASA, recognition by the DoH as the official voice of the gay community was seen as a positive development. However, despite GASA representing the majority of people living with HIV/AIDS in the country at the time, consultation did not translate into representation on policy making bodies and GASA was excluded from the HIV/AIDS advisory group set up by the government in 1988 (Mbali, 2005).⁸ Consequently, GASA, and other civil society organisations were left by the government to take the initiative upon themselves to address the HIV/AIDS problem. In this regard, GASA tried its best to educate people about the potential threat posed by HIV, however, it was constrained

⁶ South African Institute of Race Relations (SAIRR), Race Relations Survey, 1986, part 2: 759

⁷ now known as Minerals Council South Africa (MCSA)

⁸ See also: [A History of Official Government HIV/AIDS Policy in South Africa | South African History Online \(sahistory.org.za\)](http://sahistory.org.za)

by a lack of resources. A further constraint was the unevenness of the response efforts. Gevisser (1995) has observed of the time that while the Cape Town GASA branch was “providing a range of HIV prevention and care services, the Johannesburg branch, played down the threat posed by HIV” (Gevisser, 1995:59). Grundlingh (2001; 1999) has argued that the relative apathy on the part of the government, and the lack of budget spending on HIV prevention implied that the state judged some people more worthy of being kept alive than others. Official government portrayal of HIV/AIDS emphasised small minority at risk groups to which the virus would be limited and against which the public had to be protected.

Moreover, because of the novelty of the virus, and the limited knowledge on it at the time, media coverage was exaggerated, and was often accompanied by conspiracy theories and non-scientific beliefs. The mix of stereotyping, sensationalism and conspiracy theories evoked a cascade of finger pointing which influenced the context of decision making at the time. Mbali (2005) has discussed how MSM were depicted in the media as ‘pathological’, ‘disease carrying’, ‘sexual predators’ who lied about their HIV infection and wilfully infected innocent others (Mbali, 2005:6). In some circles, HIV/AIDS was viewed as a justified divine punishment for the ‘sin’ of homosexuality (Grundlingh, 1999:62). Phillips (2001) has noted that when viewed in the *longue durée*, the blaming of certain groups for an illness is not unique to HIV/AIDs or to South Africa, rather, it is the typical reaction of members of a society faced with the threat of a new illness.

Perceptions began to change in the late 1980s as more HIV cases were recorded among heterosexuals. As the levels of heterosexual HIV transmission in the country increased, sections of the public started accusing the Apartheid government of purposeful inaction and neglect. Consequently, the National Party began to focus its attention on HIV/AIDS and started to allocate resources for broad based programmatic interventions (Sher, 1989). In 1988, the government launched a nationwide education campaign (Grundlingh, 2001). This campaign made extensive use of print and film media, and included posters, leaflets, outdoor advertising, as well as radio and television messaging in all the major South African languages. It also included a national HIV/AIDS crisis hotline. In 1989, condoms were advertised on television for the first time (Grundlingh, 2001; Whiteside and Niftrik, 1995).

The 1980s represent a critical juncture in the progression of the response to HIV/AIDS in South Africa. At the start of the decade, the first local cases were documented. By the close of the decade, the National Party government was defending itself against accusations that it had not acted swiftly enough to keep HIV/AIDS in check. The perceived inaction of the apartheid government served as a catalyst for future response efforts. In particular, it facilitated and

amplified the role of industry, civil society, and activist organisations in helping to create what is now regarded as one of the most progressive and human-rights centric public health responses to HIV/AIDS in sub-Saharan Africa.

2.2 The Transition to Democracy, Breakages in Old Solidarities and HIV/AIDS Denialism

The HIV/AIDS response and the transition to democracy in South Africa are fundamentally linked (Butler, 2005a ; 2005b). The volatile political situation created an atmosphere of mistrust and anxiety within which it was challenging for the government, civil society, and the private sector to adopt a unified and sustained response (Phillips, 2001). In 1990, soon after the African National Congress (ANC) was unbanned, representatives of the ANC, the Congress of South African Trade Unions (COSATU), and other anti-apartheid activist organisations met in Mozambique to discuss the HIV/AIDS problem (Draft Maputo Statement, 1990). Delegates at the conference were urged to incorporate the response to HIV/AIDS within the broader struggle for political change (van der Vliet, 2004).

Following this meeting, the National AIDS Convention of South Africa (NACOSA) initiative was started, bringing together people from a range of sectors to coordinate a process of policy development, and ultimately to draft a national HIV/AIDS plan (Schneider and Stein, 2001).⁹ Even though the national HIV/AIDS plan (NACOSA, 1994) was endorsed by cabinet and designated by then president, Nelson Mandela, as a ‘presidential lead project’ in the Reconstruction and Development Programme (RDP) (ANC, 1994), it quickly became buried under other tasks, and “paradoxically remained unconsulted and largely ignored” (van der Vliet, 2004:54). Crewe (2000) has noted that the poor implementation of the NACOSA HIV/AIDS plan was a “disillusioning experience for those who had hoped that South Africa’s handling of HIV/AIDS would astonish the world as much as its transition to democracy” (Crewe, 2000: 28).

During this period, HIV increased its footprint in the country. HIV prevalence in all age groups increased from 7.6% in 1992 to 14.2% in 1996 (van der Vliet, 2004). It is important to note that unlike the period leading up to the 1994 elections, where the HIV/AIDS response was

⁹ Two of the eight member NACOSA drafting committee - Nkosazana Dlamini-Zuma and Manto Tshabalala Msimang, would go on to serve as health ministers in the ANC government from 1994 – 1999 and 1999 – 2008 respectively.

characterised by a “push and pull” of various actors including the Apartheid government, the ANC, COSATU and a range of civil society and activist organisations, there was very little consultation between the ANC government and non-governmental actors after the 1994 elections (Schneider, 2002). And so, the failure of the NACOSA plan has been described as being a result of breakages in solidarity, caused by a lack of consultation between the ANC and non-governmental actors that were involved in drafting the policy document in the first place (Natrass, 2008).

In 1995, the DoH commissioned a musical production, *Sarafina II*, to promote HIV/AIDS awareness. However, when knowledge of the ministerial decision to grant a contract of R14 million for the production became public, there was an outcry regarding the apparent secrecy of the tendering process and the amount of money involved (Schneider, 2002). This generated a lot of media attention, and *Sarafina II* became the subject of the first investigation by the new office of the Public Protector. Then Public Protector, Selby Baqwa, subsequently wrote a highly critical and condemning report on the tendering process (Office of the Public Protector, 1996), which the ANC later admitted was a mistake.¹⁰ The furore associated with *Sarafina II* did little to help advance the national HIV/AIDS response, and if anything, it detracted from it as attention was diverted towards tender and procurement processes rather than public health messaging.

In 1997, two South African scientists invented a drug, *virodene*, which they claimed was an effective treatment for HIV/AIDS (Natrass, 2008). Cabinet resolved to help the local scientists win approval for scientific drug trials.¹¹ *Virodene*, however, contained an industrial solvent, *dimethyl-formamide*, which had been branded by the country’s drug regulatory body, the Medicines Control Council (MCC), as toxic and dangerous (van der Vliet, 2004). And so, the *virodene* application was rejected by the MCC. The DoH in turn, under the leadership of the then Minister Nkosazana Dlamini-Zuma, accused the MCC of working in the interests of the global pharmaceutical industry and retarding access to locally developed life-saving therapies. The *virodene* saga pitched the government against the biomedical research community and created a context of uncertain information which gave rise to a myriad of aetiological narratives

¹⁰ *Cape Argus*. “ANC has made serious mistakes, admits Mandela”, 20 January 1997.

¹¹ *The Cape Times*. “Preliminary results impressed cabinet: Zuma encouraged HIV drug researchers”, 17 February 1997.

and conspiracy beliefs about HIV/AIDS and the efficacy and toxicity of ARVs (Nattrass, 2013).¹²

Around the same time as the virodene saga, a clinical trial conducted in Thailand demonstrated that a short course of *Azidothymidine* (henceforth AZT)¹³, given to an HIV positive mother starting at 36 weeks of pregnancy, significantly reduced the likelihood of mother to child HIV transmission (Shaffer *et al.*, 1999). As news about the Thailand study spread around the world, representatives from the National Association of People Living with AIDS (NAPWA) and other civil society organisations appealed to the government to take the necessary steps to make AZT available for pregnant women attending public hospitals in the country (van der Vliet, 2004). Following national elections in June 1999, a Thabo Mbeki led ANC government, promised a new approach to address HIV/AIDS. It is important to recognize that in the 1990s, biomedical developments, particularly increases in the efficacy of ARVs, had begun altering perceptions of HIV from a terminal illness to a manageable chronic illness. This shift, together with the legacy of human rights activism in South Africa, created a highly contested policy environment within which issues concerning the role of the state in protecting the health of individuals were debated (Grebe, 2011; Mbali, 2004).¹⁴

Initially, the demands for AZT were positively received, and the government responded that it would start a phased pilot testing of PMTCT programmes. However, shortly after this announcement the decision was reversed on the grounds of cost. In a public statement, the health minister reported that the cost of AZT treatment for the 4 million South Africans who needed it was about ten times the total of the health budget.¹⁵ The minister also argued that despite the fact that AZT had been recommended for PMTCT, there were competing claims about its toxicity, and so the risks of use outweighed the benefits. Furthermore, the minister disclosed that she had instructed the MCC to review the toxicity of AZT, and that the government would prioritize cost-effective prevention and treatment options (Schoofs, 1998). Political opposition to the use of AZT continued even after the MCC and the WHO reported that the benefits of using AZT outweighed the risks (Heywood, 2003).

¹² Including the belief that HIV/AIDS was deliberately created by Western scientists as a bioweapon (Nattrass, 2013).

¹³ AZT was approved for use among adults in the USA by the USFDA in 1987.

¹⁴ By the late-1990's, highly active antiretroviral therapy (HAART), was gradually becoming available for HIV/AIDS treatment and prevention in the USA and in some European countries, however these therapies were relatively expensive for the average South African.

¹⁵ South Africa says it can't afford anti-AIDS drug AZT. *AIDS Weekly*. 1999 Nov 29-Dec 6:20-1. PMID: 12349345. Available at: [South Africa says it can't afford anti-AIDS drug AZT - PubMed \(nih.gov\)](https://pubmed.ncbi.nlm.nih.gov/12349345/)

The political opposition to the use of AZT has been explained as the diffusion of Thabo Mbeki's denialist views within the ANC. In October 1999, Mbeki delivered a speech wherein he questioned the causal relationship between HIV and AIDS, the safety of AZT, and warned that the drug was "in fact a danger to health" (Heywood, 2003: 282), and that until a review of its toxicity was complete, it would not be used in South Africa. Thabo Mbeki's mistrust of the science of HIV/AIDS has been variously explained as a reaction to racist colonial constructions of the African as an inherently diseased other (Posel, 2005); as a political predisposition to see science as corrupted by industrial interests (Sheckels, 2004); as a regrettable case of political denialism;¹⁶ as a convenient clause to avoid drastic increases in public spending due to a desire to adhere to neo-liberal economic policies (Mbali, 2004); and as a misguided attempt to advance a pseudo-scientific framework (Geffen, 2005).

It is impossible to determine the balance of factors which provoked Mbeki's scepticism of HIV/AIDS science, and, to a large extent, it does not matter what these factors were. In terms of the HIV/AIDS response, his scepticism ultimately led him and other prominent members of his government, such as the then health minister, Manto Tshabalala Msimang, to portray HIV/AIDS science as dubious, and to argue that more research was needed into the apparent toxicity and clinical effectiveness of drugs such as AZT. In terms of policy and interventions, the alleged toxicity of ARV's became an important justification for the government's reluctance to pursue pharmaceutical interventions.

2.3 The Role of the Treatment Action Campaign in Advancing Human Rights Principles

The Treatment Action Campaign (TAC) was established in December 1998 to promote affordable treatment for all persons with HIV/AIDS (Grebe, 2011; Mbali, 2005; Heywood, 2003). Reviving a legal tradition exploited by lawyers who used affidavits as legally sanctioned instruments to tell the stories of lives affected by apartheid, the TAC's founding affidavit refers to "lobbying, advocacy and all forms of legitimate social mobilisation". For the TAC, "legal action to enforce any right that is explicitly recognised in the constitution emerges and feeds back into a social context" (Heywood, 2003: 300). In addition to the demands for the use of AZT for PMTCT, civil society and activists aligned with the TAC challenged global

¹⁶ *Mail and Guardian*. "The dead hand of denialism", 17 April 2003.

pharmaceutical companies to lower the prices of essential medication to treat HIV/AIDS related diseases (Achmat, 2022). At the heart of TAC's challenge was a contestation of the manner in which international trade laws had been appropriated, and in the interests of forces with no formal law-making power, and then imposed on governments. Thus, the "TAC's intervention, rather than attempting to emasculate state power, aimed to assist the government to defend its right to pass legislation to fulfil its constitutional obligations to progressively realise rights of access to health care services" (Heywood, 2001: 136). It represented a "strategic intervention into circumstances where although the new democratic government has political power, a great deal of economic power remains in non-state hands, limiting the ability of the state to address inequalities in health service delivery" (Heywood, 2001: 136).

In July 2000, the TAC launched a defiance campaign against patent abuse and AIDS profiteering, wherein it challenged Pfizer and their parent body, the pharmaceutical manufacturers association (PMA), to lower the price of *Fluconazole* to R4.00 per 200mg capsule. In response, Pfizer announced the donation of *Fluconazole* to the DoH, free for all PLHIV who could not afford the drug. Pfizer made its donation a public relations exercise and did very little to finalize its donation, neither did it meet the request for a lower price (Achmat, 2022). Consequently, the TAC organised a visit to Thailand to purchase generic *Fluconazole*. The campaign reached a highpoint in October 2000, when the TAC chairperson, Zackie Achmat returned to South Africa from Thailand with 5000 tablets of *biozole* (bio-equivalent generic *Fluconazole*). This visit exposed the profiteering and patent abuse by Pfizer, who charged 16 times the generic price in the South African public sector and up to 45 times the generic price in the private sector (Achmat, 2022).¹⁷ This dominated the news headlines for weeks and led to intense public discussion about the morality of patent abuse and pricing of medicines. A further effect was that it cultivated sympathy and popular support for the TAC.¹⁸ The TAC scored a legal victory in its defiance campaign, which saw the PMA withdraw a lawsuit preventing the manufacturing and distribution of generic and cheaper versions of essential medication. The TACs defiance of the PMA, particularly, the focus on the pricing of

¹⁷ The price of *Fluconazole* in Thailand was R1.78 per 200mg capsule. In the public sector, it was R28.57 per 200mg capsule and up to R80.24 per 200mg capsule in the private sector.

¹⁸ "A cartoon in the *Cape Times* depicted the Minister of Health standing beside a bedridden person with AIDS and two jars of medicines, one labelled 'Big Company AIDS Drugs \$\$\$' and the other "cheap generic AIDS drugs courtesy of TAC' and saying "You can't have these because they are too expensive, and you can't have these because they're illegal. Now is there anything else I can help you with?", to which the person responds, "oh ja – I was wondering if its just a coincidence that 'Hippocratic and hypocritical sound so similar?'" Quoted in Heywood, (2001: 141)

medicines, patents, and health rights, significantly expanded the support base for an incipient movement that advocated for health as a human right, and promoted the idea that commodities such as medicines should be treated differently under patent law to commodities that do not have any intrinsic link to human dignity and well-being (Heywood, 2001). The TAC's successful campaign mounted pressure on the government to respond to the demands for a national PMTCT programme.

In 1999, the results of a clinical trial conducted in Uganda comparing the efficacy of another ARV medication, *Nevirapine* and *AZT* for PMTCT were released. The results indicated that *Nevirapine* was just as effective as *AZT*. However, an advantage of *Nevirapine* over *AZT* was that it was much simpler to administer (Guay *et al.*, 1999). At the behest of civil society and activist groupings, the South African Intra-partum Nevirapine Trial (SAINT) was instituted (Heywood, 2003). Because of the success of SAINT, the government decided in principle to develop a *Nevirapine* based PMTCT programme. A phased plan was adopted in which the programme would first be tested over a two-year period at two 'pilot sites' per province in order to determine its long-term feasibility. However, a consequence of this phased plan was that medical practitioners and health care workers who were not based at the pilot sites were unable to prescribe *Nevirapine* to their patients, even if it was available and they had the capacity to prescribe it safely. There were also some allegations of political interference in the *Nevirapine* registration process.¹⁹

Under these circumstances, the TAC launched legal action against the government. On the 17th of July 2001, TAC sent out its first letter of demand to the minister of Health and the nine provincial members of the executive council (MEC).²⁰ In the letter, the TAC asked the minister and MECs:

1. To provide legally valid reasons why *Nevirapine* had not been made available to patients in the public health sector, except at the designated pilot sites.²¹

¹⁹ See, *Cape Argus*. "MCC held up release of free AIDS drug", 7 April 2001.

²⁰ According to Heywood (2003), the decision to cite the 9 MEC's and request for responses from each of them proved to have significant legal and political implications in the long term.

²¹ *Paraphrased*. See Founding Affidavit TAC vs Minister of Health. Available at: [Minister of Health v Treatment Action Campaign \(TAC\) \(2002\) 5 SA 721 \(CC\) | ESCR-Net](#)).

2. To put in place a programme which would enable all medical practitioners in the public sector to decide, in their professional opinion, whether or not to prescribe *Nevirapine* for their pregnant patients.²²

The minister of health instructed the provincial MEC's not to reply individually - her letter was to be the only response from the government.²³ The minister's response included the following conclusion:

“We do not underestimate the ethical dilemmas that confront health professionals in the public sector. However, at the same time we (*the government*) need to balance their desire to provide the best treatment that they can for their patients with the government's obligation to root our public policies in *the practical realities of the daily life experiences of all of our citizens, equally*”.²⁴

The minister's response to the TAC suggests that the position of the government was that it was not practical (cost-efficient) to make *Nevirapine* available beyond the designated pilot sites. However, the pressure of ongoing legal action, advocacy and social mobilisation by the TAC and other organisations prompted the government to radically change its position, first through an acknowledgement that “ARV treatments could help improve the conditions of people living with HIV” and eventually promise “a universal roll out plan to be completed as soon as possible” (See Heywood, 2003:310).

²² *Paraphrased*. See Founding Affidavit TAC vs Minister of Health. Available at: [Minister of Health v Treatment Action Campaign \(TAC\) \(2002\) 5 SA 721 \(CC\) | ESCR-Net](#))

²³ All the MEC's complied with this, except for the Western Cape MEC, who replied to the TAC and explained that he had also written to the minister of health “to provide details of the MTCT programme in the Western Cape province with a view that this information be included in the minister's reply to you” (Heywood, 2003: 292). In the letter, the Western Cape MEC also set out the provincial plan for a PMTCT programme that aimed to reach 90% coverage by mid-2002 and declared that the province “would like to reach 100% coverage as soon as possible...and believed that such an approach was commensurate to ‘the rollout out of MTCT programmes in Thailand, Brazil and Botswana’” (Heywood, 2003:292). The Western Cape MEC's letter to the TAC set up a contrast between the position adopted by eight provinces, each of which claimed that they could not make *Nevirapine* available outside of the two pilot sites, and the Western Cape. Heywood (2003) has observed that this disjuncture between the provinces was the undoing of the government's legal argument because “it extended moral pressure on the other provinces to extend *Nevirapine* beyond the artificial boundaries of the pilot sites” (Heywood, 2003: 292).

²⁴ Quoted in (Heywood, 2003: 291). *Italics added*.

Two distinct ideological positions emerge in the movement of the government's HIV/AIDS response. The first position, an *economistic paradigm*, is expressed in the governments' view that expansion of the *Nevirapine* programme was impractical. In this ideological position, health is largely viewed through a utilitarian value system, and is expressed through the prism of the economy. In other words, health interventions are largely understood in terms of a budget constraint and the optimization of costs. In its defence, the government argued that the 'real' cost of delivering *Nevirapine* was not the cost of manufacturing, but all the costs of the infrastructure for treatment and care, including: HIV testing, counselling, follow-up as well as the provision of breast milk substitutes, for which it lacked the capacity and the resources to provide, and which the TAC had not taken into account before making its demands (Heywood, 2003).

The second ideological position, a *human-rights paradigm*, was the view adopted by the TAC. According to this perspective, government restrictions on the availability of *Nevirapine*, particularly, limiting its prescription to medical practitioners at pilot sites, and the failure of the government to develop a reasonable plan for PMTCT violated the right to health of HIV-positive pregnant women and their children as guaranteed in the South African constitution. In this position, health is largely viewed through human-rights principles, and the right to life and access to health care are viewed as non-negotiable.

On the 5th of July 2002 the Constitutional Court gave judgement and unanimously ruled in favour of the TAC. The ruling on the first issue was that the government's policy of restricting *Nevirapine* to a limited number of pilot sites violated the health care rights of women and newborns under the South African constitution. To the second issue – the court ruled that “sections 27(1) and (2) of the constitution required the government to devise and implement within its *available resources* a comprehensive and coordinated program to realise progressively the rights of pregnant women and their newborn children to have access to health services to combat mother-to-child transmission of HIV”.²⁵

According to Mbali (2005), TAC's legal victory can be considered as a triumph of the *human-rights* principle in the response to HIV/AIDS and health policy in South Africa. The South African Constitution (1996) is an integral part of the transformation of the social, political, and

²⁵ *Minister of Health v. Treatment Action Campaign*, Constitutional Court of South Africa, 2002 (10) BCLR1033. *Italics added.*

economic fabric of South African society. The right to health, and access to health care is most elaborately described in Section 27, which states that:

1. Everyone has the right to have access to:
 - a. Health care services, including reproductive health care;
 - b. Sufficient food and water; and
 - c. Social security, including, if they are unable to support themselves and their dependents, appropriate social assistance.
2. The state must take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of each of these rights.
3. No one may be refused emergency medical treatment.

It is apparent from the language in particular, that the Judiciary has an important role over matters of health policy, including budgetary appropriations (Ngwena, 2000). Section 27 also recognises a range of fundamental rights and sets out the state's positive and negative duties in relation to these rights.²⁶

Price (1986) has argued that section 27 is particularly important due to the differential expenditure on health services across population groups, as well as the inequality between rural and urban health services under Apartheid. The ANC inherited a two-tiered, and highly unequal health care system (Benatar, 2013). On the one hand, there was the private health sector, with highly paid doctors and modern facilities, funded through individual contributions to medical schemes and insurance, which served approximately 30% of the population. On the other hand, there was the public health sector, which was state funded and catered to the majority (approximately 70%) of the population (Rensburg, 2021). Because the majority of previously disenfranchised South Africans could not afford the exorbitant cost of private health care, the state assumed the responsibility of providing care for the majority of the population that the medical aid schemes, which finance private health care deemed as uninsurable (i.e., the chronically sick, poorly remunerated, and elderly sections of the population) in post-apartheid South Africa (Ngwena, 2000).

²⁶ Positive duties are obligations that make the State act in certain circumstances and in particular ways (what it must do), while negative duties are obligations which stop the State from doing certain things (what it must not do)

As per constitutional court proceedings, the government initially opposed the TAC's demands on the grounds that *Nevirapine* "was unaffordable; that its efficacy and safety was not fully proven; and that widespread use would result in a public health catastrophe – through the development of drug-resistant variants of HIV" (Heywood, 2003: 296). The government also argued that since breastfeeding carried a risk of HIV transmission, the decision to restrict the use of *Nevirapine* to pilot sites was the most cost-effective and economically rational option available. The government position was that even if a child was able to avoid HIV infection at birth as a result of *Nevirapine* use, the future risk of infection through breastfeeding justified denying the intervention until infant formula and clean water could reach all those who needed it, or until breastfeeding habits of HIV-positive mothers changed (Annas, 2003).

In its justification of the decision to restrict *Nevirapine* to pilot sites, the government resorted to a discourse of affordability, within which it paradoxically did not account for the cost of its own actions (denying access to a medically proven intervention), while stretching the notion of economic rationality to embrace all human phenomena.²⁷ The government also claimed that it was not possible to extend the programme beyond the identified pilot sites because there was simply no capacity to provide such a service. However, the picture of a lack of capacity of the health service was contradicted by fact, and the government's own documentation. For example, despite an underspending of the health budget of R473 million in 2000/01 (as per the 2001 intergovernmental fiscal review), "it was claimed by all but three of the provincial heads of health that budget limitations constrained their ability to do what was necessary" to roll out a *Nevirapine* based PMTCT policy (Heywood, 2003:297).²⁸ Moreover, barely 6 months after the TAC had launched legal action against the government, the designation of certain hospitals was changed from "non-pilot sites" to "pilot sites" without them being given any additional

²⁷ An implication of the governments' position is that it would have had to reify (put a monetary value) on lost human lives as a result of its restrictive policy in order to compare it with the monetary value of a broad-based *Nevirapine* based PMTCT policy. If the monetary value of the latter was determined to be larger than the former, then it would provide justification for cost-efficiency. However, there was no evidence or mention of this in the government's response to the TAC. And so, although the government claimed that it was making an economically rational, and cost-efficient decision, it was not following its own argument to its logical conclusion by not considering the present and future value of human lives lost as a result of the current policy.

²⁸ In TAC's affidavit, Helene Schneider, then the Director of the Centre for Health Policy (CHP), drawing largely from the government's own published reports, illustrated how there was a latent capacity to support the provision of *Nevirapine* in eight out of the nine provinces, and concluded that "the complexity of a PMTCT programme", was "no greater than tackling malnutrition, tuberculosis and other chronic diseases – aspects that the SA health system has committed itself to dealing with" (Heywood, 2003:299).

resources.²⁹ This observation is meaningful because according to the government's own reasoning and justification of its restrictive *Nevirapine* policy, one would expect a careful cost-benefit analysis to justify any investment (or shift from non-pilot site to pilot site).

While it is impossible to identify the exact motivations behind the government's restrictive *Nevirapine* policy, it is important to recognize that the change in the government's response was based on the outcome of a struggle involving global pharmaceutical companies, the government, health professionals, civil society groups, activists, HIV positive mothers and their unborn. In other words, the government's decision to restrict the use of *Nevirapine* to two pilot sites per province, and the shift in policy caused by the constitutional court's ruling in favour of the TAC presents a historical context which illustrates how civil society and activist groupings countered the ANC government's inclination to 'monopolise implementation' of policy in favour of more 'bottom-up', human rights and participatory approaches (Fourie, 2006).

In passing its judgement, the constitutional court underlined the fact that the government could not simply plead a lack of resources when it came to realising fundamental human rights, instead it had to make a convincing case that it was indeed limited by resources. Moreover, according to the ruling, the State had failed to provide clear evidence showing that it faced an issue of limited resources. Specifically, the court ruled that the number of lives that could be saved as a result of the expansion of a *Nevirapine* based PMTCT policy did not support the contention by the government that the costs of such a program would outweigh the benefits. Most importantly, the resolution of this high profile and precedent setting court case pushed the responsibilities of the government, and the interests of the global pharmaceutical industry into an uncomfortable spotlight and mobilised civil society.

²⁹ The TAC's founding affidavit included an affidavit signed by two senior members of the SA paediatric association (SAPA), "who were working at hospitals that were not pilot sites, but which had the capacity to provide the full service" (Heywood, 2003: 293). A letter from the head of a Johannesburg hospital was also attached to the affidavit explaining how although the hospital was now a designated pilot site, "it has not been given any additional staff resources", the only difference being that it "was no longer necessary for our patients to rely on donations". (Heywood, 2003: 293).

2.4 The Increasing Relevance of Non-Pharmaceutical Health Interventions

In 2003, the DoH formally announced that it would start a national comprehensive HIV care, management, and treatment programme (NCHCMTP) which would include the provision of ARV's at accredited access points across the country (Evans, 2013; South African Government, 2003). In April 2004, the government introduced free ART in public health care facilities nationwide. By 2006, there was at least one ART service point in every district (Simelela & Venter, 2014). Non-state actors continued to play an influential role in shaping the HIV/AIDS response. As a consequence of international and local condemnation by various activist organisations, the DoH issued a directive in 2004 indicating that the possession of a South African ID was not a requirement for accessing treatment, thus allowing foreign nationals resident in the country to access ART (Simelela and Venter, 2014).

In 2006, through a widely consultative process, the national strategic plan (NSP) for HIV, TB and STIs, 2007 – 2011, was developed. The primary goals of the NSP were to reduce HIV infections, increase access to highly active antiretroviral treatment (HAART) and broaden PMTCT coverage.³⁰ The widely consultative process, and collaboration between civil society and the government in formulating the 2007-2011 NSP has been described as a positive shift from the controversies in the past (Lodge, 2015). In May 2009, then president, Jacob Zuma, acknowledged that HIV/AIDS was one of the most important challenges facing the country, and the minister of health, Aaron Motsoaledi, remarked that the country had spent the last 'ten years pedalling backwards, and the healthcare system needed extensive overhauling' to achieve better outcomes in its response to HIV/AIDS (Bateman, 2009).

The Government's urgency in addressing the HIV/AIDS problem is reflected in the significant increase in public health expenditure after 2007 (Hlafa *et al.*, 2019; Bidzha *et al.*, 2017). Furthermore, financial, and technical assistance from international agencies and donors such as the US Presidents' Emergency Plan for AIDS Relief (PEPFAR), allowed the NCHCMTP to progress rapidly. In 2010, the DoH revised its guidelines for ART, expanding treatment to all children under 1 year, all pregnant women (regardless of CD4 count) and all HIV patients co-infected with tuberculosis (TB) who had a CD4 count less than 350 cells/ μ l (Johnson, 2012). By the end of 2011, South Africa had one of the world's largest public ART programmes

³⁰ Department of Health, 'HIV and AIDS and STI Strategic Plan for South Africa: 2007-2011' (Draft 9, Department of Health, Pretoria, 14 March 2007; http://data.unaids.org/pub/externaldocument/2007/20070604_sa_nsp_final_en.pdf

(Evans, 2013). Estimates suggest that increased ARV coverage between 2003 and 2011 significantly contributed to a decline in HIV related mortality (Bor *et al.*, 2013). According to Venter (2014), even though the indicators of health outcomes such as infant mortality rate and life expectancy at birth remains lower than other middle-income countries, “it is hard not to call the post-2007 HIV/AIDS response anything other than a public health, human rights and political success” (Venter, 2014:3).

An important feature of the NCHCTMP has been the gradual relaxation of the eligibility criteria for starting ART. The CD4 count threshold which capped the number of persons eligible for treatment was increased from 200 cells/ μ L in 2004 to 350 cells/ μ L in 2010, and then to 500 cells/ μ L in January 2015 (Onoya *et al.*, 2020). In 2015, new evidence suggested that there was a clinical benefit in starting treatment in asymptomatic patients with CD4 counts higher than 500 cells/ μ L (Meintjes *et al.*, 2017; Lundgren & Babiker, 2015; Danel & Moh, 2015). As a consequence, the WHO recommended that a patient’s CD4 count should no longer be used as a threshold for initiating treatment (Bigna *et al.*, 2016). In September 2016, the DoH updated its ART initiation guidelines as per the new recommendations of the WHO and introduced a policy of universal test and treat (UTT), making ARV available to all HIV positive persons regardless of CD4 count. The UTT policy was updated in September 2017, with a directive to start treatment on the same day of a patients’ HIV diagnosis (DoH, 2017).

Pharmaceutical public health interventions (henceforth PHIs) involve the use of biomedical innovations, such as medicines and vaccines, to prevent, treat and control disease. On the other hand, non-pharmaceutical public health interventions (nPHIs) aim to prevent, treat, and control the spread of diseases by promoting changes in individual and communal health behaviours (Molla *et al.*, 2023). In the contestation between the global pharmaceutical industry, the South African government, civil society, and activist groupings in the 1990s to the mid-2000s, as well as the successful rollout of ART programmes since 2007, has also been a juxtaposition of PHIs with nPHIs.

In particular, the spotlight on health rights, patent abuses and securing access to life saving medicines has led to the consolidation of PHIs, and a relaxation of focus on nPHIs in the South African response to HIV/AIDS. And yet, the effectiveness of a PHI depends on complementary nPHIs. In the context of ART, the effectiveness of the intervention depends on, among other things, the behaviour of patients and service providers as well as good promotion of prevention and treatment services available. de Wit *et al.* (2011) have expressed concern about how PHIs are taking up a larger share of the HIV/AIDS response expenditure in low and middle-income countries. In particular, they posit that this trend may not be

sustainable, especially in countries where the government budget is partly funded by international organizations and donors. Consequently, they warn that a singular focus on increasing the number of people receiving ART may divert attention away from proven and cost-effective nPHIs. Similarly, other scholars have observed that PHIs should not be viewed as a silver bullet which magically solves the HIV/AIDS problem, rather they argue for a shift in orientation towards a more holistic approach which includes a role for PHIs and nPHIs in the response to HIV/AIDS (see Glanz and Bishop, 2010; Coates *et al.*, 2008).

2.5 The Rationale of the Study

Despite the slow start, the response to HIV/AIDS in South Africa is now internationally recognised as one of the world's largest and most ambitious public sector ART interventions (Garrett *et al.*, 2018). According to Venter (2013), it is helpful to distinguish the South African response to HIV/AIDS into three eras: a pre-2004 era, during which ART was not available in the public sector; a 2004 – 2008 era, during which the NCHCMTP was launched, despite interference from senior political figures and profiteering by global pharmaceutical companies; and a post-2008 era, which heralded in a new political dispensation and a scaling up of the NCHCMTP.³¹

Despite the post-2008 scale up of the NCHCMTP, several challenges remain. These include stark differences between rural and urban areas in terms of public health infrastructure (Evans, 2013) and how to deal with co-occurring morbidity of TB (Chimbindi *et al.*, 2013). Another concern has been poor HIV-related health outcomes for males aged 15 – 64 years, which suggests that men appear to be accessing NCHCMTP at a disproportionately lower rate than women and children (Makusha *et al.*, 2020; Gottert *et al.*, 2020; Colvin, 2019). Even when men start ART, they have been found to be more likely to die from HIV related complications than other community population groups. Furthermore, estimates indicate that men present

³¹ At the end of 2017, there were an estimated 4.5 million people accessing ART in the country. 88.9% of HIV positive females and 78% of HIV positive males aged 15 – 64 years were estimated to know their HIV status. Furthermore, among persons aged 15 – 64 years who know their HIV status, 72.2% of females and 67.4% of males were on treatment. 90% of females on treatment were found to be virally suppressed compared to 82.1% of males (HSRC, 2018).

with more advanced HIV than women, are more likely to be co-infected with TB and are also more likely to not adhere to the treatment regimens prescribed to them (Mbokazi *et al.*, 2020).³² Without a doubt, the success of the NCHCMTP depends on PHIs, specifically, the affordability and availability of ARVs in the public health sector. That said, it has also become increasingly clear that this must be complemented with behavioural change interventions, so as to promote HTS uptake among high-risk population groups such as adult males. There is an impressive body of evidence which shows behavioural change interventions are capable of changing risk behaviours related to sexual practices and treatment uptake (Bell *et al.*, 2021, 2019; Carey *et al.*, 2011). Because behavioural interventions can be tailored to meet specific needs, they can account for the cultural diversity of different populations and can be adapted for delivery in community settings, including specific venues (schools, workplaces etc.) where at-risk community populations are located or come together.

Health behaviour theories (HBT) commonly guide behavioural interventions and programs by playing a central role in understanding factors associated with, and the mediating pathways and barriers to behavioural change (Tran *et al.*, 2019; Conner & Norman, 2017; Prestwich *et al.*, 2015; Sniehotta *et al.*, 2014a; Fishbein, 2000). Thus, to further improve the effectiveness of the NCHCMTP, further HBT research is needed to understand the cultural, social, and contextual factors underpinning the dynamic and evolving HIV pandemic in South Africa, including the low HTS uptake by high-risk community population groups, and the changing patterns of transmission from high-risk community populations to the general population.

A cornerstone in the South African response to HIV/AIDS is the NSP for HIV, TB and STIs. This document leverages lessons from past intervention efforts and commits the government, civil society, and private sector to addressing HIV/AIDS through a strategic road map for a collective and unified response. The 5th NSP for 2023-2028, is dedicated to breaking down barriers, and maximising access to HTS. Even though it does not explicitly identify adult males as a key or priority population, it recognises that women and girls are doing better across the HIV treatment cascade than are men and boys (DoH, 2023). Moreover, it acknowledges that harmful gender norms and masculine identities adversely affect health-seeking behaviour and pose a challenge for the HIV-related health outcomes of boys and men in South Africa.

³² Between 2008 and 2018, 39% of first ever CD4 counts in men attending public hospitals in Western Cape was < 200 cells/μL, compared to 25% in women (Osler *et al.*, 2020). HIV positive men were also found to be more than twice as likely as women to be co-infected with TB (Osler *et al.*, 2020).

Given the current context of disparity in HIV-related health outcomes of males aged between 15 - 64 relative to other community population groups, this study recognises the continued importance of nPHIs such as health education, health promotion and behavioural change interventions in the national HIV/AIDS response. Such a perspective concurs with Coates *et al.* (2008) who have noted that successful HIV responses ought to include a combination of behavioural and biomedical approaches, integrated in a mix that is appropriate to specific local epidemiological contexts. Consequently, this study is based on the premise that the national HIV response is currently at a crossroads. In this regard, PHIs, including the rapid upscaling of ART, have led to substantial progress, and there are grounds for some optimism that universal access to treatment will have a noticeable effect on stemming the cycle of HIV transmission in the country. However, recent empirical findings that males aged 15-64 are ‘missing’ in the HIV/AIDS response (Grimsrud *et al.*, 2020), is a reason for continued vigilance and caution in celebrating achievements. It also draws attention to the fact that the response to HIV/AIDS is much more complex than simply making biomedical technologies available and accessible. Most importantly, it recognizes that the effectiveness of PHIs also depends on a critical understanding of health behaviour.

The rationale for this study is to better understand HIV-related health behaviours of males in South Africa in an effort to address their relatively poor HIV-related outcomes. By focusing on a sub-sample of employed men at an increased risk, the study highlights the challenge of reaching employed men with interventions at public sector health facilities as well as the role of disposable income in what Hunter (2010, 2002) has described as the “materiality of everyday sex” - referring to a behavioural pattern of transactional sexual relationships characterised by social inequalities and gendered power dynamics wherein it is typical for example, for young girls to engage in sexual relationships with older men (see also Hunter, 2005). The study also broadens the empirical basis of theory and interventions and offers a systematic examination of a sub-sample of males at high HIV-risk with which to compare to other samples.

3 THEORETICAL & EMPIRICAL OVERVIEW

The previous chapter demonstrated how the response to HIV/AIDS in South Africa has been shaped by various non-state actors, the role of human rights principles in the progression of the HIV/AIDS response and the consolidation of PHIs as evidenced in UTT and SDI policies. It also illustrated how it was important, at this mature stage of the HIV/AIDS epidemic, to shift our attention to nPHIs, given that there are community population groups who disproportionately access HTS despite increases in expenditure and upscaling of the NCHCMTP. As George et al. (2021) point out, the position taken in this study is that the present task confronting the response to HIV/AIDS in South Africa is how to use theory and in particular HBT to improve the effectiveness of existing programmes.

In this chapter, the theoretical and empirical orientation of the study is discussed. However, before moving forward, a distinction is drawn between three related, but often conflated concepts - ‘theory’, ‘statistical model’ and ‘data’. According to Fried (2020a), theory refers to a “body of knowledge that is broad in scope and aims to explain robust phenomena using sets of axioms and assumptions” (Fried, 2020a: 336). Data contain the phenomena that we are interested in, but also noise (e.g., measurement error, transcription error, researcher bias). Statistical models are specific instantiations of theory which are narrower in scope and often more tangible than theory. They typically link theory to data by illustrating the mechanisms that might explain a robust phenomenon “by decomposing it into relevant parts, properties of these parts, relations between the parts and temporal dynamics of their change” (Fried, 2020a: 337). From this perspective, statistical models serve as intermediaries between theory and the phenomenon to be explained. The analogy of a geographical map illustrates this: just as a map simplifies reality to aid navigation, statistical models simplify theoretical constructs to facilitate empirical analysis (Fried, 2020a).

Although statistical models are simple abstractions of theory, choosing an appropriate statistical model that imposes assumptions consistent with theory is instrumental in bringing data to bear on theory (Watts et al., 2020). In this dissertation, data on the phenomenon to be explained, HIV-related health behaviours, was collected by means of a cross-sectional survey instrument (see Chapter 4), and structural equation modelling was used to formulate an abstraction of theory (see Chapter 7). While structural models are used to test the statistical validity of theory on the study data, care is taken not to conflate statistical modelling with theory, and model fit is viewed as an unreliable marker of theoretical validity. The potential for conflation occurs when the limitations of statistical models are not acknowledged.

Statistical models are tools for understanding and validating theory; however, they are not exhaustive representations of theoretical concepts. DeYoung & Krueger (2020) argue that relying on statistical models alone for causal inference—particularly with cross-sectional data—can lead to misunderstandings if one assumes these models fully capture the theoretical constructs or causal relationships (DeYoung & Krueger, 2020). This conflation arises when statistical models are interpreted as providing a complete depiction of theory or when model fit is incorrectly taken as a definitive marker of theoretical validity. In this dissertation, structural equation modelling is used to abstract theoretical concepts and test their validity against the study data. It is crucial to recognize that while these models provide valuable insights, they are simplifications of broader theoretical frameworks. The goal is to use these models as tools to inform and validate theoretical understanding, rather than to conflate them with the theory itself

3.1 Understanding Health Behaviours

Without a clear definition of what is meant by health behaviour, we cannot have a reliable and valid measurement. Kasl and Cobb (1966) differentiate between health behaviours, illness behaviours and sick-role behaviours. They define health behaviour as “any activity undertaken by a person believing himself to be healthy for the purpose of preventing disease or detecting it at an asymptomatic stage” (Kasl & Cobb, 1966: 246). On the other hand, illness behaviour is defined as “any activity undertaken by a person who feels ill, to define the state of his/her health and to discover a suitable remedy...the principal activities here are complaining and seeking consultation from relatives, friends, and from those trained in matters of health” (Kasl & Cobb, 1966: 246). Sick-role behaviour is defined as “any activity undertaken by those who consider themselves ill, for the purpose of getting well...it includes receiving treatment from appropriate therapists, and generally involves dependent behaviours which lead to some degree of neglect of one’s usual duties” (Kasl & Cobb, 1966: 246).

Kasl and Cobb’s (1966) definition of health behaviour is narrow in the sense that it excludes individuals who are already ill. Given the range of activities involved in preventing HIV infection, such as – condom use, regular HIV testing, ART adherence and monitoring of viral load (in the case of an HIV positive status) – an inclusive and broader definition of health behaviour which includes individuals who are already ill is needed. Consequently, the definition of health behaviour in this study expands on Kasl and Cobb’s (1966) definition to

include illness and sick-role behaviours. Thus, in this study, health behaviour includes all activities undertaken by an individual (whether they regard themselves as ill or not) to detect and prevent disease and to generally maintain good overall health and subjective wellbeing.³³ While ‘disease’, ‘illness’ and ‘sickness’ are often used interchangeably, they have distinct meanings

- Disease refers to the pathological condition of the body, an abnormal condition affecting the body of an organism. It is often diagnosed by medical professionals based on specific symptoms and signs.
- Illness is the personal experience and perception of feeling unwell or in poor health. It is subjective and influenced by personal, social, and cultural factors. Illness refers to how the disease is perceived and lived with by the individual.
- Sickness is the social role that a person with illness or disease assumes, including how society views and interacts with the individual. It is shaped by societal expectations and norms.

The trilogy of disease, illness, and sickness helps to understand the different dimensions of health. In particular, disease is a biological malfunction; Illness is the personal and emotional response to the disease and sickness is the social dimension and the external recognition of a diseased condition. Parsons introduced the concept of the sick role to describe the social expectations of how society should view the sick and how the sick should behave (Varul, 2010). According to Parsons, the sick role has four main aspects:

1. The sick person is not expected to perform their normal duties.
2. The sick person is not blamed for their illness.
3. The sick person should try to recover as quickly as possible.
4. The sick person should seek and follow medical advice.

³³ In this way, health behaviours are conceptualised as “overt behavioural patterns, actions and habits that are associated with health maintenance, health restoration and health improvement” (Conner & Norman, 2017: 395).

In the context of HIV-related health behaviour among male construction workers in South Africa, the aforementioned distinctions are crucial. Understanding health beyond mere disease prevention allows for a more comprehensive approach to interventions, addressing not just the physical aspects of HIV but also the personal and social dimensions. This broader perspective supports the development of more effective and holistic health strategies. HBTs come in diverse forms and span various intellectual traditions, research methodologies, and approaches. Because of this, Glanz and Bishop (2010) have noted that HBTs can be classified into two broad categories: explanatory theories and change theories.³⁴

Explanatory theories describe ‘why’ people do, or do not practice health promoting behaviours, and typically focus on identifying the determinants of a health behaviour. For example, given the gender disparities observed in HIV-related outcomes, an explanatory HBT would identify factors within an individual (e.g., perceptions of behavioural control, attitudes, beliefs), factors in a community (e.g., subjective, and descriptive norms), or structural factors (e.g., health services and policy, laws, and regulations) associated with low ART adherence among men. On the other hand, change theories are concerned with ‘how’ to effectively change health behaviour. They typically focus on the association between behavioural change techniques (BCTs) and changes in health behaviour. BCTs are systematic procedures included as an active component of interventions designed to change behaviour, and include goal setting, feedback and monitoring, social support, shaping knowledge and comparison of behaviour (Armitage *et al.*, 2021; Michie *et al.*, 2014, 2013; Michie & Johnston, 2012). Using the same example, a change HBT would identify which BCT has been successful in increasing ART adherence among men.

Even though explanatory and change theories have different emphases, they complement each other (Noar & Mehrotra, 2011; Glanz & Bishop, 2010). That said, because of the cross-sectional survey instrument used, this dissertation is limited to explanatory theories, and so it is unable to adequately address the question of *whether changes in hypothesized constructs lead to changes in health behaviour*. Instead, it addresses the question of *whether hypothesized constructs are associated with health behaviour*. If hypothesized constructs are found to be associated with health behaviour, it can be inferred that changes in the construct will also lead to changes in health behaviour.

³⁴ Using a similar distinction, Noar and Mehrotra (2011) refer to explanatory theories as “theories of health behaviour” and theories of change as “theories of health behaviour change”.

3.1.1 A Definition of HIV-related Health Behaviours

HIV-related health behaviour is an inclusive term which refers to all health behaviours specific to preventing HIV infection. It includes the avoidance of behaviours associated with an increased risk of contracting HIV (non-condom use, alcohol and drug use before sex, multiple and concurrent sexual partnerships etc). It also includes the uptake of recommended health behaviours associated with a decreased likelihood of contracting and transmitting HIV (condom use, regular HIV testing, ART adherence, use of PrEP in anticipation of a risky activity etc.) (Rogers *et al.*, 2016; Prabawanti *et al.*, 2015).

The DoH has been implementing a national male condom distribution programme since 1992, and a national female condom distribution programme since 1998 (Beksinska *et al.*, 2012). Following concerns about the quality of publicly distributed condoms, the DoH launched rebranded condoms in 2004 in an effort to increase demand (Ashmore & Henwood, 2015). However, despite the widespread distribution of free condoms, condom use remains below optimal levels (DoH, 2023), and only 55.6% of individuals aged 15-64 years with two or more sexual partners reported having used a condom at last sex (HSRC, 2018).

Knowledge of HIV status facilitates early diagnosis and access to treatment. Moreover, the counselling component of HTS motivates people who test HIV negative to maintain their negative status. Despite the scaling up of the NCHCTMP and the availability of HIVST, many studies report that men in South Africa continue to face significant barriers in terms of knowing their HIV status (Gittings, 2017).

Against this backdrop, HIV-related health behaviour primarily refers to male condom use and HIV testing in this dissertation.

3.2 Multi-level Determinants of HIV-related Health Behaviours

Contemporary theories on condom use and HIV testing conceptualize these behaviours as occurring within an “individual-structural spectrum” (Kaufman *et al.*, 2014a: S251), and by so doing incorporate multiple levels of analysis into their explanations (Ward-Peterson *et al.*, 2018; Albarracin *et al.* 2010; Diez-Roux, 2000). Separating out factors into distinct levels of analysis, it has been argued, allows the researcher to critically incorporate the individual within a changing social context (Kaufman *et al.*, 2014b), to better understand the determinants of health in terms that extend beyond the proximate individual-level factors (Glass & McAtee, 2006; McMichael, 1999); to integrate theories and methods from the social sciences into

individual-level psychological explanations of health behaviour (Beaglehole & Bonita, 2004); and to identify the broadest possible range of antecedents of health behaviour (Seeley *et al.*, 2012).

The individual-structural spectrum ranges from factors at the individual level (such as individual perceptions, beliefs, and attitudes); interpersonal level (dyadic and family influences including relationship satisfaction and family support; subjective norm); community level (social capital/network resource, descriptive norms); institutional level (a well-functioning health system including – e.g., the availability of medication, and professionalism of staff) to factors at the structural level (e.g., policies which prioritise HIV prevention) (see Figure 2).

Structural	Institutional	Community	Interpersonal	Individual
•Poverty •Political context and government priorities •Access to funding	•Confidentiality and privacy •Competent and supportive health providers •Provision of appropriate services	•Social norms •Stigma •Community mobilization •Cultural norms (masculinities)	•Relationship power and equity •Family support •Partner support •Relationship satisfaction	•HIV knowledge •Risk Perception •Substance Use •Personal beliefs •motivation and intention •Self-efficacy

Figure 2 Multilevel influences on HIV-related health behaviours (see Kaufman et al., 2014a)

In terms of the practical implications, empirical evidence suggests that interventions which operate across multiple levels are more effective than within-level interventions (Skovdal *et al.*, 2017; Cook *et al.*, 2014). It is important to note that, even though a distinction is made between qualitatively different levels of analysis spanning the individual-structural spectrum, in practice, these levels are highly interactive, and it is often difficult to distinguish explicitly between them. Thus, the benefit of conceptualizing health behaviour within the individual-structural spectrum comes at the potential cost of obscuring some of the mechanisms through which these levels are interlinked.

The current focus on explaining condom use and HIV testing within a multi-level framework grew out of a critique of explanations that put an emphasis on the individual level (McNeish *et al.*, 2017). These individual level theories, having largely grown out of the social psychology canon, tended to emphasize cognition, intention, attitudes, and beliefs as determinants of behaviour than other non-individual-level influences (Kaufman *et al.*, 2014a). Although these individual-level theories have been associated with effective behaviour change interventions, reviews have raised several criticisms, including being hamstrung by the lack of an explicit consideration of higher-levels of analysis (Crosby *et al.*, 2011; Albarracin *et al.* 2005) and the lack of recognition of different cultural contexts (Airhihenbuwa & Obregon, 2000).

Compared with individual-level explanations, multi-level explanations of HIV-related health behaviours are relatively new. As a result, there have been few empirical studies evaluating their assumptions. Three of the most recent multilevel explanations are discussed below - the multiple domain model of condom use (Zimmerman *et al.*, 2007); the network-individual-resource model for HIV prevention (Johnson *et al.*, 2010); and the dynamic social systems model of structural factors in HIV prevention and detection (Latkin *et al.*, 2010).

Multiple domain model of condom use

According to the multiple domain model (MDM) (see Figure 3), condom use is influenced by a set of multilevel factors which can be categorized into 5 domains of influence. These are the *social-structural*, *personality and individual difference*, *social-environmental*, *social-psychological*, and *situational* domains. In the social-structural domain are socio-demographic variables such as age, gender, and ethnicity. These variables are hypothesized to have both a direct and an indirect role on condom use. The social-environmental domain refers to family and community influences and includes variables such as family support and perceived social support. Like the social-structural domain, variables in the social-environmental domain are hypothesized to have both a direct and an indirect effect on condom use.

The personality and individual difference domain include two dimensions of personality that have received considerable empirical support in explaining risk taking behaviour: sensation seeking and impulsivity (see Hoyle *et al.*, 2000; Donohew *et al.*, 2000). Sensation seekers are individuals who have a greater inclination for novel, exciting and unusual experiences; and impulsive decision makers are individuals who tend to make decisions without a great deal of thought and are less likely to plan ahead. In the MDM, sensation seekers and impulsive decision makers are hypothesized as being more likely to engage in risky behaviours.

The social-psychological domain includes constructs from the theory of planned behaviour (TPB), and refers to individual attitudes, social norms, intentions, and perceptions of control over condom use. In addition to these constructs, preparatory behaviours are included in the social-psychological domain. An example of a preparatory behaviour is buying condoms or taking PrEP in anticipation of a risky sexual encounter. The preparatory behaviours act as mediators between an individual's intention to use a condom and their actual behaviour (Carvalho *et al.*, 2015; Zimmerman *et al.*, 2007). Finally, the situational domain refers to influences directly related to the context within which condom use occurs (e.g., was there alcohol or drugs consumed?).

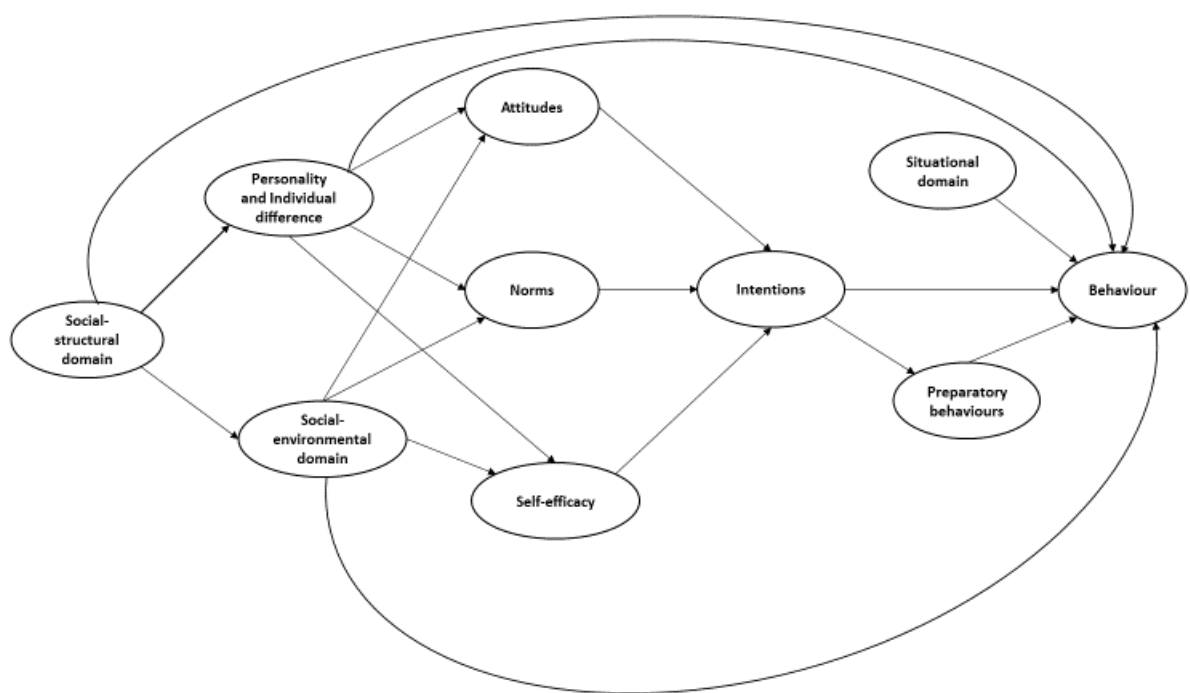


Figure 3 Multiple domain model of condom use (see Zimmerman *et al.*, 2007)

The MDM posits that the proximal determinants of condom use are to be found in the situational domain. The variables in this domain are directly involved in the sexual situation and so directly influence the decision to use a condom. For example, whether alcohol is being consumed before sex is postulated as having a direct influence on the likelihood of using a condom. Another situational factor that may have a direct influence is the type of relationship with the sexual partner. People in long term and committed relationships may have built a degree of trust and as a result may be less likely to use a condom than people who just met. After the situational factors, preparatory behaviours are hypothesized to be the next most

proximal determinant of condom use. In this perspective, a condom will only be used if the individual prepares to use them and has them readily available when the situation arises. Relatedly, discussing the use of a condom with a partner is a preparatory behaviour which has been postulated as having a direct influence on the likelihood of condom use (Zimmerman *et al.*, 2007). The other determinants of condom use are the following (in order of most to least proximal): social-psychological factors (intentions to use a condom, normative influences, attitudes toward the use of condoms, and self-efficacy); personality and individual difference factors (sensation seeking and impulsivity), social-environmental factors (support of family and friends). Social-structural factors are postulated to be the most distal determinants of condom use.

The network-individual-resource model for HIV prevention

The network-individual-resource model (NIRM) for HIV prevention assumes that the best way to prevent HIV transmission is to focus on the network to which an individual belongs, and the pathways through which a network influences individual behaviour.

Thus, the two key constructs in the NIRM are *networks* and *resources*. A network is defined as a social unit “composed of two or more individuals who share a characteristic in common, interacting either momentarily or permanently over time” (Johnson *et al.*, 2010: 4). Individuals identify with multiple sets of networks across their life span. Furthermore, individuals seek and affiliate with networks that provide resources to satisfy their needs and avoid networks which constrain need fulfilment.

According to the NIRM, the likelihood of an individual engaging in a behaviour which puts them at risk of HIV/AIDS is determined by the degree to which the individual can satisfy their needs with *mental* and *tangible* resources, which derive, in part, from their networks. Key mental resources include goal intentions and attitudes aligned with recommended health behaviours, as well as high perceived and actual control over recommended health behaviours. Furthermore, it is postulated that an individuals’ access to tangible resources moderates the influence of mental resources on their behaviour (Johnson *et al.*, 2010). Thus, according to the NIRM, individuals will engage in recommended health behaviours for HIV prevention when they have sufficient mental and tangible resources to satisfy all their personal needs. On the other hand, individuals will engage in behaviours which place them at an increased risk when these tangible resources are not sufficient. Importantly, an implication of the NIRM is that persons who lack basic, tangible needs may have difficulty maintaining healthy behaviours

because efforts to satisfy their immediate, tangible needs may outweigh the distant and probabilistic concerns about HIV risk.

The NIRM distinguishes between two types of tangible resources: positive tangible resources and negative tangible resources. Positive tangible resources satisfy individual needs and so reinforce healthy behaviours while negative tangible resources undermine healthy behaviours. Positive tangible resources relevant for HIV prevention include resources such as income, and material possessions. It also includes specific HIV-related items such as condoms, medication, PrEP and clean needles, which if unavailable in certain circumstances increase the likelihood of HIV transmission (Johnson *et al.*, 2010). Negative tangible resources refer to events or experiences in an individual's life which diminish their ability to satisfy their needs. These resources include structural factors such as poverty and traumatic experiences like intimate partner violence.

At its core, the NIRM considers how well individuals cope with stressors in networks; how resources are contested and shared to meet individual needs, and how these factors contribute to the transmission of HIV/AIDS. Networks have the potential to reinforce or discourage individual involvement in behaviours that place them at an increased risk of HIV/AIDS. For example, even if an individual initially possesses the appropriate mental resources to behave in a healthy manner, networks can normatively influence them to behave in a risky manner.

The dynamic social systems model of structural factors in HIV prevention and detection

According to the dynamic social systems model (DSSM), the individual is part of an interactive and reciprocal social system which has a crucial influence on their health behaviour (Latkin *et al.*, 2010). The DSSM organizes structural factors into three dimensions that may influence behaviour, viz; the condition of resources, degree of social influence and control, and social context. These structural dimensions indirectly affect individual health behaviour through cognitive and affective processes.

An important component of the DSSM are *inter-individual processes* which underpin the interaction between structural factors and individual-level outcomes. These processes include the transfer of resources from larger social structures to the individual and vice versa. They also include social influence and control processes. For example, individuals with greater access to resources within a network tend to have greater power to influence others within the network. Other social influence factors include the transference and imitation of behaviours within a social network via social norms.

The DSSM also includes a *within individual: processes and attributes* variable which represents cognitive and affective processes and how they affect behaviour. Key cognitive processes include self-efficacy, perceived norms, motivations, and beliefs. Affective processes include depression and the physical and psychological impact of drug and alcohol use. Furthermore, both affective and cognitive processes may be influenced by social norms associated with demographic factors such as age, gender, ethnicity (see Figure 4).

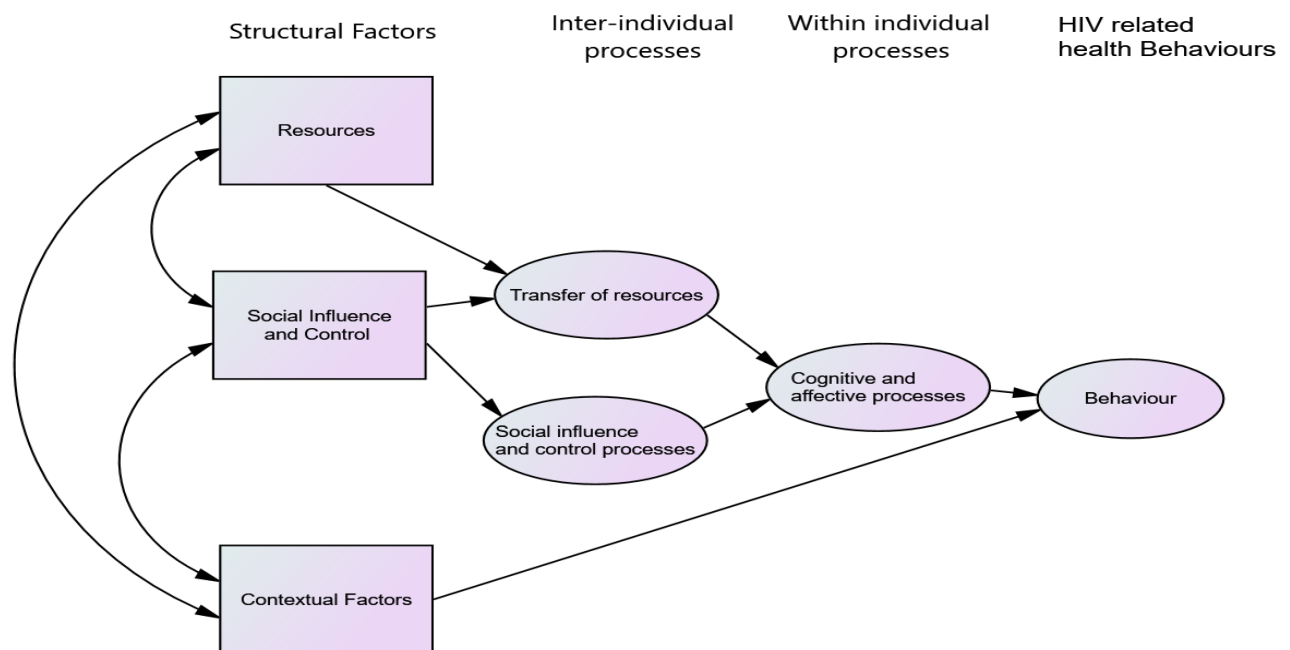


Figure 4 Dynamic social systems model for considering structural factors in HIV prevention (see Latkin *et al.*, 2010)

The DSSM underscores the inherent complexity of the structural factors and their interrelatedness. It also posits that interventions need to focus on different levels of analysis. Most importantly, it employs a systems perspective to describe the interconnectedness and the dynamic processes of change within a social system (Latkin *et al.*, 2010).

Of the three multi-level explanations of HIV-related health behaviours reviewed, only the MDM and the NIRM have had substantial empirical research testing their plausibility. MDM research has generally supported the hypothesis that situational and preparatory behaviours are proximal determinants of individual-level health behaviours and that the socio-structural factors, have a distal, mediating effect (Mehrotra *et al.*, 2013; Xiao *et al.*, 2010). Similarly, NIRM research has found empirical support for the influence of mental and tangible resources on individual-level health behaviours (Pellowski *et al.*, 2017; Reid *et al.*, 2015). In contrast

with the MDM and the NIRM, there have not been many studies which have directly evaluated the DSSM. Indeed, at the time of writing there has only been one study that has directly assessed the DSSM. In this study, the hypothesized relationships were confirmed, and the DSSM was found to be useful for revealing feedback loops that maintained HIV risks in a community (Siegler *et al.*, 2013).

Despite a consensus that explanations of HIV-related health behaviour require methodological approaches that allow for the examination of factors beyond the individual-level, there is currently no agreement on how the relationships between the various levels should be conceptualized. For example, while the MDM makes use of multiple ‘domains of influence’, in the NIRM ‘network’ is used and in the DSSM, ‘social system’ is used. Moreover, all three explanations adopt interdisciplinary perspectives characterized by the integration of constructs from different intellectual traditions.

For example, Johnson *et al.* (2010) note that the NIRM’s emphasis on network resources is steeped in social capital theory (Coleman, 1988). However, they also point out that the idea that a network can have positive or negative impact on an individual’s health behaviour comes from Kurt Lewin’s concept of valence (Lewin, 1938). According to Latkin *et al.* (2010), the concept of a social system originates from dynamic systems theory (Ashby, 1947). The DSSM also relies on social learning theory (Bandura, 1977) as well as social interconnectedness theory (Simmel, 1955). Relatedly, Zimmerman *et al.* (2007), have observed that the MDM is an attempt to integrate the theory of planned behaviour (TPB) with insights from personality trait research (Hoyle *et al.*, 2000).

3.3 Agentic Capabilities & HIV-related Health Behaviours

Human agency refers to the capacity for human beings to make choices and to impose those choices on the world. Bandura (2008) defines agency as the ability “to intentionally influence one’s functioning and life circumstances” (Bandura, 2008:16). Cenciotti *et al.* (2021) concur with Bandura (2008), however, they offer an alternate definition which highlights what they refer to as “agentic capabilities”.

For Cenciotti *et al.* (2021), human agency is the cultivation of the agentic capabilities of intentionality, forethought, self-reactiveness, and self-reflectiveness. Placing an emphasis on these core agentic capabilities, they posit, will allow researchers to better understand whether and how individuals “intentionally build their psychological resources, starting from

determinants that are at a more basic level like beliefs to constructs such as self-efficacy” (Cenciotti *et al.*, 2021: 250). Moreover, it is through these agentic capabilities that people “reflect on their past experiences and behaviours, monitor their own conduct and project themselves in future situations” (Cenciotti *et al.* 2021: 250).

The MDM postulates that individuals who intend to, and are prepared to use a condom, are more likely to use a condom than those who intend to use a condom but are not prepared (Zimmerman *et al.*, 2007). Similarly, according to the NIRM, individuals cope with their environments by seeking and using tangible resources, and “will behave in a healthy way when they possess certain mental and tangible resources and engage in risky behaviours when these resources are lacking” (Johnson *et al.*, 2010: 28). In the DSSM, cognitive and affective capabilities are moderated by the allocation of resources, social influence, and control processes (Latkin *et al.*, 2010).

All three multi-level explanations identify and associate certain individual-centric processes with health behaviours, a perspective which aligns with the view of Cenciotti *et al.*, (2021) on the role that agentic capabilities play in behaviour. Having largely grown out of social cognitive theory (Bandura, 2001), human agency is often explained from the perspective of the individual. The MDM, NIRM and DSSM take up the challenge of expanding from the individual-level to be inclusive of other levels of analysis. By so doing they provide insights into how theoretical constructs developed to explain human agency may be incorporated into multi-level explanations of behaviour. For instance, an implication of the MDM is that it confirms the significance of constructs which have their origins in the theory of planned behaviour (TPB) such as condom use intention, attitude toward condom use and self-efficacy in explaining condom use in a multi-level perspective. Similarly, the DSSM illustrates how cognitive and affective processes can be incorporated into a multi-level framework and the NIRM recognizes how networks possess resources that bear on social norms and individual behaviour.

All three multi-level explanations emphasize the link between agentic capabilities and non-individual level factors. Based on the difference between these three explanations, the current approach in the literature, it seems, is one in which researchers have complete autonomy to create their own theoretical approaches based on their own judgement. That is, researchers are integrating constructs from different individual level theories in multi-level frameworks and offering empirical support of their theories. Furthermore, because different structural factors may influence individual health behaviour in different settings or at different times, the critical influence of contextual factors has been highlighted. These contextual factors range from the

policy priorities of the government and access to funding at the structural level, access to health services at the institutional level, social norms, and influences at the communal level, to the consumption of alcohol, or buying condoms in anticipation of a sexual encounter at the individual level (Kaufman *et al.*, 2014b).

Since it is possible to trace the origins of the MDM, DSSM and NIRM to individual-level theories of behaviour, two of the most extensively used individual-level health behaviour theories, the health belief model (HBM) and the theory of planned behaviour (TPB) are empirically tested in this dissertation. While the HBM and the TPB have been found to be valid and reliable in explaining HIV-related behaviours in South African samples (Buldeo & Gilbert, 2015; Bryan *et al.*, 2006), few data-based empirical comparisons of the HBM and TPB exist in the South African literature. Furthermore, none of the South African studies have empirically compared the HBM and TPB with respect to workers in the construction industry, despite the fact that the male dominated industry is particularly vulnerable to HIV/AIDS, and the fact that men in South Africa experience worse HIV-related outcomes than women.

3.3.1 Theory of Planned Behaviour (TPB)

The theory of planned behaviour (henceforth TPB) is an extension of the theory of reasoned action (henceforth TRA) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). Conner and Sparks (2005) have observed that the TRA and the TPB should be considered as “deliberative processing models” because they assume that human beings process all the information available to them before deciding on what action to take (Conner & Sparks, 2005: 170).

Briefly stated, the TRA posits that behaviour is primarily determined by behavioural intention (Fishbein & Middlestadt, 1989). Behavioural intention represents a person’s motivation in the sense of a conscious plan, decision, or self-instruction to exert effort to perform a specified behaviour (Conner & Sparks, 2005). The TRA postulates that the greater an individual’s behavioural intention, the greater the likelihood of the individual performing the intended behaviour and vice versa. Furthermore, intention is conceptualized as a function of two belief-based constructs – attitude toward the recommended behaviour and subjective norm about the recommended behaviour. Fishbein and Ajzen (1975) define, an attitude as “a learned disposition to respond in a consistently favourable or unfavourable manner with respect to a given behaviour” (Fishbein and Ajzen, 1975: 6), while subjective norms refer to an individuals’ beliefs about the responses of important referent others (e.g., family members, close friends,

sex partners) to the specified behaviour, and the influence that these referent others have on the individual's decision to perform or not perform the specified behaviour. In other words, attitudes are the positive or negative evaluations of performing a specified behaviour, and the subjective norm reflects the perceived support or pressure from significant others, regarding the performance of the specified behaviour.

While the TRA has historically demonstrated effectiveness in explaining health behaviours across many contexts and populations, it appeared to poorly predict behaviours over which people had little or no volitional control. Thus, a critique of the TRA was the apriori assumption that an individual could always behave in ways that they chose, thereby failing to account for the fact that behaviour depended at least to some degree on external factors, including the cooperation of others, time, and resources. In response to this critique, Ajzen (1985) modified the TRA to account for behaviours that were not completely under volitional control by introducing the concept of perceived behavioural control. Perceived behavioural control refers to the perceived ease or difficulty of performing a behaviour and is assumed to reflect the challenges that an individual has encountered in past performances of the behaviour (Ajzen & Madden, 1986).

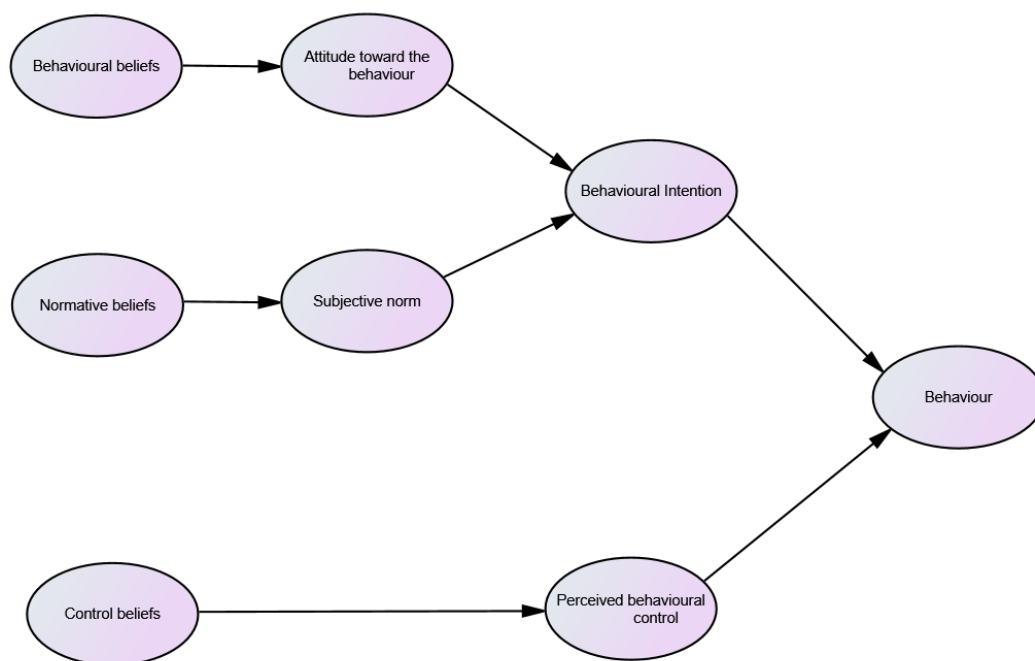


Figure 5 Theory of planned behaviour

The TPB (see figure 5) extends the TRA by proposing that people with a high degree of perceived behavioural control are more likely to form behavioural intentions to perform the

specified behaviour than those who perceive that they have little or no control over the specified behaviour. Moreover, it posits that in circumstances where individual perceptions of control closely reflect actual control, perceived behavioural control will directly predict behaviour (Ajzen, 1991). In the original formulation of the TPB, behaviour was conceptualized as being driven by three kinds of considerations “beliefs about the likely consequences or other attributes of the behaviour (behavioural beliefs), beliefs about the normative expectations of other people (normative beliefs), and beliefs about the presence of factors that may further or hinder performance of the behaviour (control beliefs)” (Ajzen, 2002: 665). In their respective aggregates, “behavioural beliefs produce a favourable or unfavourable attitude toward the behaviour; normative beliefs result in perceived social pressure or subjective norm; and control beliefs give rise to perceived behavioural control” (Ajzen, 2002: 665). Taken together, attitude toward the behaviour, subjective norm, and perceived behavioural control, predict behavioural intention, which is postulated as the proximal determinant of behaviour (Ajzen, 2002). The stronger the intention to engage in a behaviour, the more likely that the behaviour will be enacted. Moreover, if intentions are held constant, the recommended behaviour will be more likely to be performed as perceived behavioural control increases.

The TPB has been widely applied and has been successful in predicting a variety of behaviours, including condom use (Albarracin *et al.*, 2001). Notwithstanding the TPB’s overall success, some problems have been encountered in its utilization. For instance, it has been criticized for its focus on rational reasoning and neglecting the impact unconscious influences on behaviour (Sheeran *et al.*, 2013). Relatedly, Conner *et al.* (2013) have argued that emotions are not adequately addressed by the TPB. Furthermore, the problem of “inclined abstainers”, i.e., individuals who form an intention and subsequently fail to act on the intention (Orbell & Sheeran, 1998), has been recognised as an important limitation that remains unaddressed by the TPB (Sniehotta *et al.*, 2014b).

Because of its limitations, various scholars have suggested that the TPB be extended. For instance, Conner and Armitage (1998) provide empirical evidence which supports the inclusion of other variables to the TPB. Given the evidence supporting the extension of the TPB with past behaviour and moral norm constructs (Liu & Liu, 2020; Conner *et al.*, 2007; Heath & Gifford, 2002), two versions of the TPB model are empirically tested in this study – the original model and a modified model, which includes moral norms and past behaviour (see figure 6).

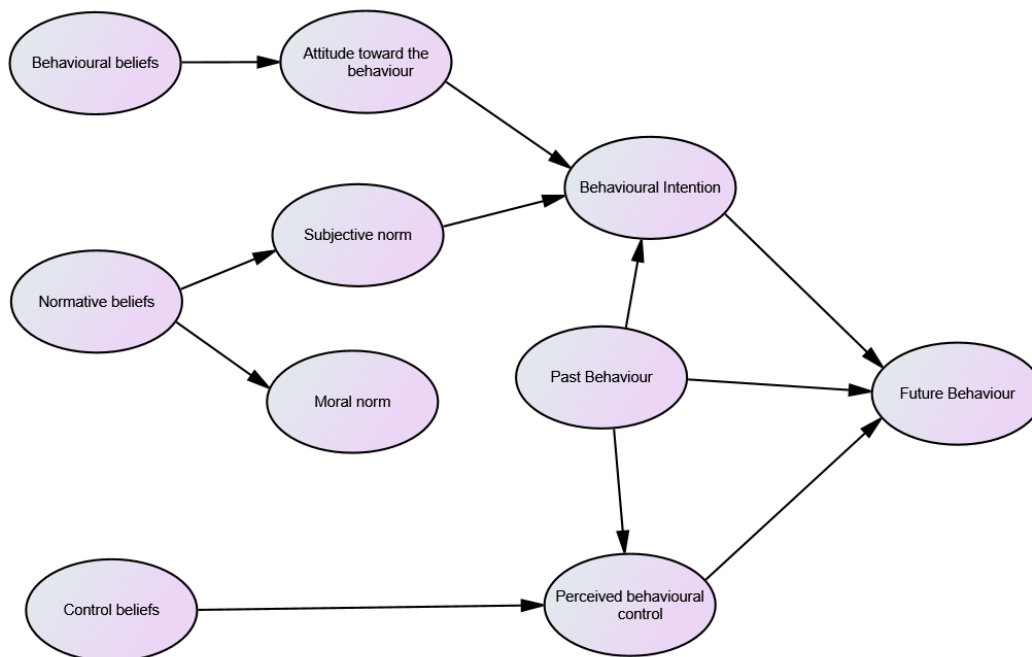


Figure 6 A modified theory of planned behaviour

Past Behaviour

It has been posited that frequent performance of a behaviour may bring the behaviour under greater control of habitual processes and so may make subsequent behavioural performance more likely regardless of intention (Albarracin & Wyer, 2000). For this reason, past behaviour has been added to the TPB, and it has been typically found to be strong predictor of intention and behaviour. Some researchers have even found past behaviour to explain a higher percentage of explained variance over and above that accounted by the other TPB variables (Conner *et al.* 2007; Conner and Armitage, 1998; Ajzen, 1991).

Moral Norms

Moral norms refer to an individual's perception of the moral correctness or incorrectness of performing a specified behaviour. It refers to the "personal feelings of responsibility to perform or refuse to perform a recommended behaviour" (Ajzen, 1991: 199). Moral norms have been hypothesized to especially influence the performance of behaviours with an ethical or moral dimension, and are considered to work in parallel with attitudes, subjective norms, and perceived behavioural control to influence intentions and behaviour (Conner and Armitage, 1998). Since the discovery of HIV/AIDS, this concept has been associated with "blaming others" and

stigmatizing certain community population groups because of their perceived association with the virus. Because of the blame and stigma historically associated with HIV/AIDS, moral norms were included to the modified TPB model. In addition, subjective norms have been found to be relatively weak predictors of intention and behaviour (Botetzagias *et al.*, 2015; Armitage & Conner, 2001; Manstead, 2000; Sheppard *et al.*, 1988). Given the mixed evidence in support of the inclusion of subjective norms to the TPB – there is a need to consider other normative influences on intention and behaviour such as moral norms.³⁵

3.3.2 Health Belief Model (HBM)

According to Rosenstock (1974a), the health belief model (henceforth HBM) can be traced back to Hochbaum's study of the uptake of TB X-ray screening in the United States in the 1950s. Hochbaum (1958) observed that an individual's perceived susceptibility to TB, perceived severity of TB and their belief that medical screening was beneficial successfully distinguished between individuals who screened for TB and those who did not. Following this seminal study, other researchers confirmed the association between perceived susceptibility, and severity of an illness, health beliefs and differences in health behaviour (see Kegeles, 1963; Rosenstock, 1966; Haefner & Kirscht, 1970).

The HBM (see figure 7) emphasizes two aspects of health behaviour: threat perception and behavioural evaluation (Abraham & Sheeran, 2015). Threat perception is conceptualized as being driven by two key beliefs: *perceived susceptibility* to illness and *perceived severity* of the consequences of illness. Behavioural evaluation also consists of two distinct sets of beliefs: *perceived benefits* of a recommended health behaviour and *perceived barriers* of the recommended health behaviour.

³⁵ Some religions and cultures bestow privileges to men (e.g., polygamy), which may make women vulnerable to STIs (Mswela, 2009). Relatedly, the perception of HIV/AIDS as an STI has been found to have an influence on religious representatives' incentives to critically respond to HIV/AIDS in their communities. For example, the content of health education pertaining to HIV/AIDS was limited to abstinence and fidelity by some community members (proclaiming religion and some sense of morality as their justification), instead of supporting or promoting condom use (Solomon, 1996). Similarly, (Primoratz, 2001) has discussed how the liberal view that valid consent is necessary and sufficient for a sex act to be considered morally permissible is challenged by the Catholic view of sex as being ordained for procreation (and properly confined to marriage), the romantic view of sex as being bound up with love and the feminist analysis of sex as being part and parcel of the domination of women by men.

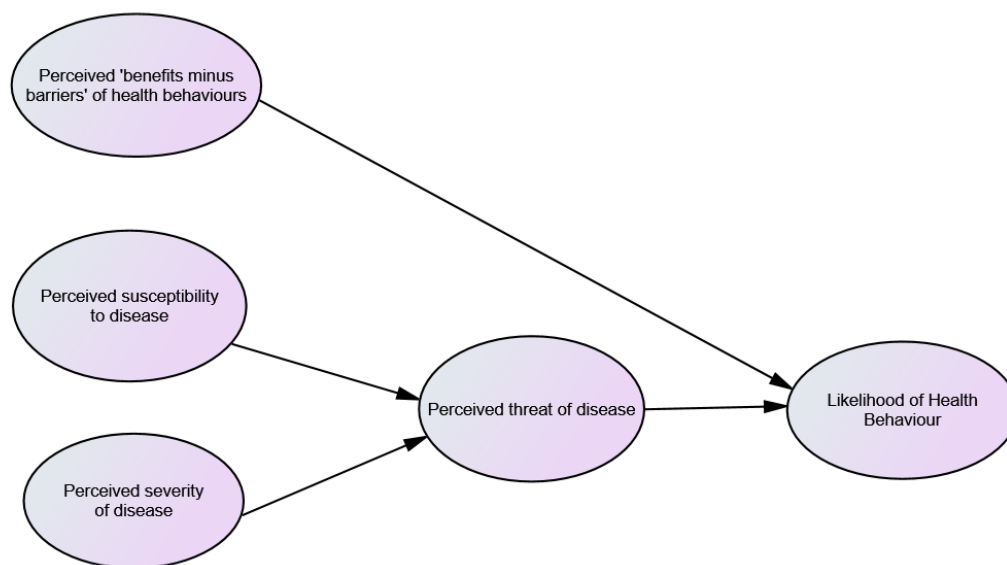


Figure 7 The health belief model

Thus, the HBM posits that a person will perform a recommended health behaviour if they: a) believe that they are susceptible to contracting the disease, b) believe that there are serious consequences of the disease, c) believe that the recommended course of action can reduce the consequences of the disease, and d), believe that the benefits of participating in the recommended course of action outweighs the costs. At the core of the HBM is the recognition that health behaviour is guided by a person's desire to avoid illness (or to get well if already ill) and their belief that a recommended health behaviour will prevent or cure illness (Houlden *et al.*, 2021).

A person may believe that they are susceptible to contracting an illness, however, they may delay action until some catalyst event, trigger, or cue nudges them into action. For this reason, a *cues to action* construct was added to the HBM, depicting the influence of various life events on health behaviour when appropriate beliefs are held (Abraham & Sheeran, 2015). These cues can be internal or external and may include personal experience of disease symptoms, social influence, and health education messages.

The HBM has had moderate success in predicting a range of health behaviours. Moreover, because it was developed by researchers working in public health, many of the constructs possess face validity and are easy to understand. According to Norman & Conner (2017), this face validity partly accounts for the popularity of the HBM. However, compared to the TPB,

the HBM has one fundamental weakness - the way in which the variables interact was not precisely specified in the original formulation of the HBM, and there were no clear guidelines on the association between the key constructs of perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. What was emphasized was that individuals who felt threatened by a disease and those who evaluated the benefits of a recommended health behaviour as outweighing its costs would be more likely to undertake the recommended health behaviour.

Rosenstock (1974a) has shown how the lack of clear guidelines has resulted in different operationalizations of the HBM constructs by various researchers. Indeed, in many of the empirical tests and reviews of the HBM, relevant constructs were frequently tested as independent predictors of health behaviour. On the other hand, some researchers have integrated perceived susceptibility and perceived severity as a single composite variable, representing an aggregate measure of “perceived threat”. Similarly, perceived benefits and barriers have also been integrated into a single composite variable representing an aggregate measure of “perceived benefits minus barriers”. Because of the different operationalizations of the HBM constructs by different researchers, the status of the HBM as a coherent theory of health behaviour is weaker than the TPB as well as other HBT in which the causal ordering of hypothesized constructs are explicitly specified. Another weakness of the HBM is that it does not include constructs such as attitudes, habits (i.e., past behaviour), and intentionality, which have been found to be highly predictive of health behaviours. In addition, it does not consider non-health motivations for behaviour such as normative influences. A further critique of the HBM is that it assumes that individuals have complete access to information and that cues to action are widely prevalent in encouraging people to perform recommended health behaviours (Abraham & Sheeran, 2015; 2005). As a consequence of these weaknesses, the HBM contributes very little to a better understanding of the volitional phase of health behaviours, wherein health behaviour is planned, performed, and maintained (Yastica *et al.*, 2020).

As research on HBM has evolved, scholars have recommended that an individual’s perceptions of control over the performance of a recommended health behaviour (self-efficacy) be included as an extension to the HBM. Studies that have tested an extended HBM including self-efficacy have generally found it to be a useful additional predictor. However, because of the different operationalizations of the HBM, self-efficacy is rarely included in tests and evaluations of the HBM (Carpenter, 2010).

Given the aforementioned weaknesses of the HBM, two versions of the HBM model are empirically tested in this study – the original model and a data driven modified model, which includes cues to actions and perceived control over behaviour (see figure 8).

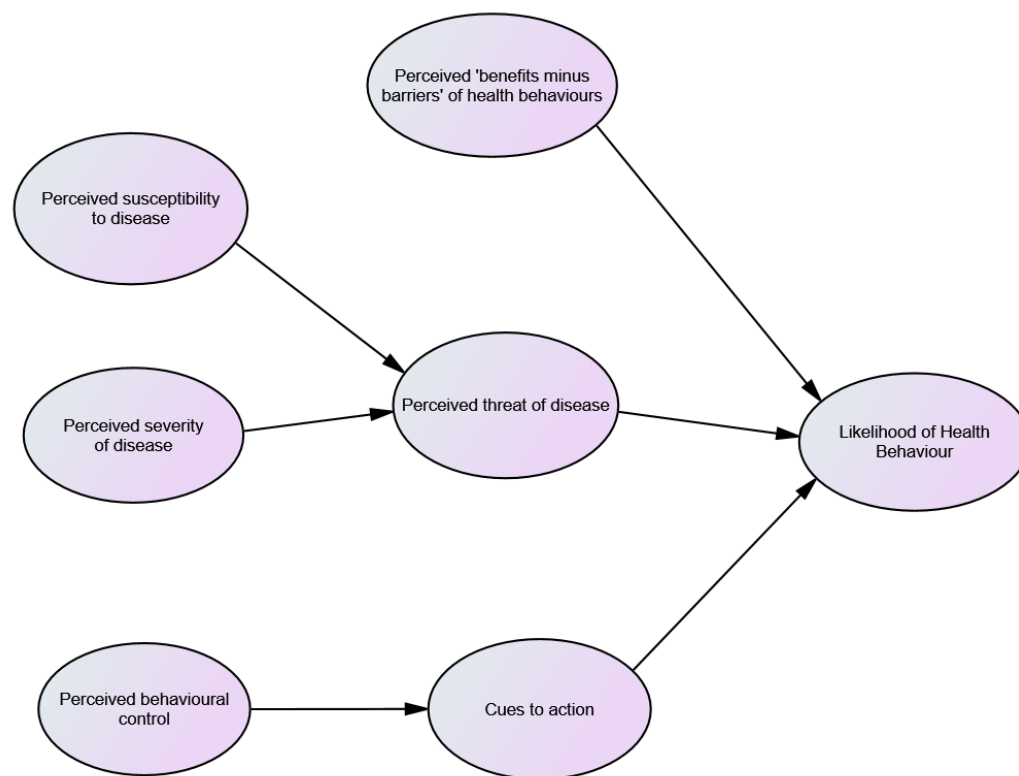


Figure 8 A modified Health belief model

3.4 Empirical support for the TPB & HBM

Both the HBM and the TPB have been successfully used to explain a wide range of health behaviours, including HIV-related health behaviours. Weinstein (1993) has observed that both theories have some validity, and so empirical tests often provide enough evidence to prevent them from being dismissed.

Health behaviour is influenced by an individual's evaluations of behaviour across both theoretical frameworks. In the HBM, it is conceptualized as a 'benefits minus barriers' of the recommended health behaviour, and, in the TPB, it is embodied in attitudinal dispositions and perceived behavioural control. Furthermore, both theories include variables which depict a causal pathway from social influences to behaviour. In the HBM, this construct takes on the

form of cues to action, and, in the TPB, it is conceptualized as a normative influence (e.g., subjective, descriptive, or moral norms) (Conner & Norman, 2017).

Noar and Zimmerman (2005) have emphasized that given the similarities among the constructs in the HBM and the TPB, it is crucial that researchers try and “discover what the best conceptualization of the constructs is and compare theories to discover how different operationalizations of constructs combine and result in the enactment of behaviour” (Noar & Zimmerman, 2005: 282). Other researchers have also argued that comparing these theories to understand how different interpretations of constructs influence our understanding of health behaviour is worthwhile (see Gabriel *et al.*, 2019; Wulfert & Wan, 1995).

In this section, findings from empirical research applying the HBM and the TPB are reviewed, the predictive utility of the constructs explicated in the theories are examined, and key issues are discussed. Before moving on, the following are noteworthy:

1. The TRA/TPB was formulated to predict voting behaviour, and the HBM was the first theoretical model developed exclusively to explain health behaviours. As a result, the evidence for TPB is more varied than HBM. In particular, the TPB has been used to explain a general range of behaviours (e.g., voting behaviour, purchasing decisions) while the HBM has only been used to predict health behaviours.
2. In the HBM, there are no clear guidelines on the operationalization of some of the variables. As a result, different researchers have defined and utilized the various components of the theory differently. This lack of conceptual homogeneity has made it difficult to compile and compare research evidence in support of the HBM. Furthermore, some scholars (e.g., Conner and Norman, 2021; Harrison *et al.*, 1992) have argued that the lack of conceptual homogeneity weakens the status of the HBM as a coherent model of health behaviour.
3. A majority of empirical studies of the HBM and the TPB have been quantitative in nature, and comparison of constructs has been conducted using a variety of correlational and structural equation modelling techniques to assess unique explained variance. Furthermore, most of these studies have used random sampling techniques and cross-sectional designs. They have also employed self-report measures despite evidence that the correlation between self-report and objective measures can be quite low. An implication of this is that most reviews and discussion of evidence in support of the HBM and/or the TPB have been discussed in terms of statistical significance and explained variance.

4. Most of the early studies included in the reviews were conducted in the United States or in Europe, with minimal research outside these locations. Furthermore, the samples comprised of mainly University students.

Overall model evaluation and summary of evidence (TPB)

Besides health behaviours, the TPB has been used to explain a wide range of different behaviours with varying degrees of success, including – voting behaviour (Hansen & Jensen, 2007), social media use (Zoonen *et al.*, 2014), employee behaviour (Huang & Chuang, 2007), gambling (Lee, 2013) and safe-driving (Razmara *et al.*, 2018). McEachan *et al.* (2011), note that the popularity of the TPB is due in part to the fact that it is clearly operationalised with guidelines concerning how to measure its constructs. A consequence of the extensive application of the TPB is that there is on average more evidence in support of it than the HBM.³⁶

In this section, only reviews focusing on the application of the TPB to health behaviours are discussed (McEachan *et al.*, 2011; Albarracin *et al.*, 2001; Sheeran & Taylor, 1999; Godin & Kok, 1996). While the discussion offered is not exhaustive, it provides a representative overview of the empirical evidence on TPB as it has been applied in the health domain.

Godin and Kok (1996), review 58 studies which applied the TPB to health behaviours. These 58 studies were classified into 7 health behaviour categories – addictive behaviours (smoking, alcohol, and drug use); clinical use and health screening behaviours (clinic visits, cancer screening); eating behaviours; exercising behaviours; HIV-related behaviours, oral hygiene behaviours and risky driving behaviours. The review suggests that the TPB performs well in

³⁶ Because of the continued empirical support, Fishbein and Ajzen (2010) have proposed the reasoned action approach (RAA) as a further extension of the TRA. The RAA provides more nuance to the TRA than the TPB. According to Fishbein and Ajzen (2010), empirical differences in the measurement of attitudes, subjective norm and behavioural control suggest that these constructs can be separated into different components with varying influences on intention and behaviour. For example, they observe that attitude can be separated into instrumental (e.g., desirable-undesirable, valuable-worthless) or experiential (e.g., pleasant-unpleasant, interesting-boring) components. *Experiential attitudes* are more strongly correlated with intention and behaviour than are *instrumental attitudes*. Furthermore, because of the existence of impulsive behaviours, experiential attitudes are hypothesized to have a direct effect on behaviour. Fishbein and Ajzen (2010) also distinguish between injunctive norms (i.e., social approval) and descriptive norms (other people's behaviour). While they hypothesize that both norms influence behaviour indirectly through intentions, they propose that descriptive norms may directly influence behaviour. Lastly, the RAA distinguishes between capacity and autonomy. Fishbein and Ajzen (2010) define capacity as "the conviction that one can successfully execute the behaviour required to produce outcomes" while autonomy is defined as "people's beliefs that they have control over the behaviour, and that performance or non-performance of the behaviour is up to them" (cited in Conner *et al.* 2017: 141)

explaining behavioural intention across all categories. Attitude towards the behaviour was determined to be the strongest predictor of intention for addictive, clinical use, health screening, exercising and HIV-related behaviours. For subjective norm, the strong effects were found for risky driving and oral hygiene behaviours; subjective norm was an especially weak predictor of eating and exercising behaviours. Perceived behavioural control was determined to be a strong predictor of oral hygiene behaviours and a weak predictor of HIV-related and eating behaviour.

Most importantly, the Godin and Kok (1996) review indicates that at least a third of the variations in health behaviour can be explained by the combined effect of behavioural intention and perceived behavioural control. Furthermore, behavioural intention was found to be a consistently stronger predictor of behaviour than perceived behavioural control. Godin and Kok (1996) posit that the relatively weak association between perceived behavioural control and behaviour could be a result of discrepancies in the measurement of actual and perceived control in the studies reviewed.³⁷

Some of the studies that were included in Godin and Kok's (1996) review reported the inclusion of additional constructs to the TPB which aided in the explanation of behavioural intentions and health behaviour. Among these additional predictors, *role beliefs* and *moral norms* were identified as two of the most commonly added constructs. Role beliefs refer to "one's perception of how a person like me should behave" (Godin and Kok, 1996: 94). They are the beliefs an individual holds because of their position in the social structure. These beliefs have been hypothesized to be associated with an individual's age, gender, and social status, and have been found to be important in explaining eating and exercising behaviours (Godin and Kok, 1996). On the other hand, moral norms refer to "feelings of personal responsibility regarding the performance or non-performance of a given behaviour" (Godin and Kok, 1996: 94). Moral norms have been found to be important for explaining condom use, smoking, risky driving and exercising. Based on the popularity of these constructs, Godin and Kok (1996) recommend that role beliefs and moral norms be added to the TPB when it is applied to health behaviours.

Sheeran and Taylor (1999) have conducted a meta-analysis of the TRA and TPB as it has been applied to explain intention to use a condom at next sex. The constructs examined in their

³⁷ In particular, they note the variety of methods that have been used to assess perceived behavioural control, sometimes generating confusion in the interpretation of findings, and conclude that in many of the reviewed studies, the measure of perceived behavioural control may not adequately reflect actual control over behaviour (Godin & Kok, 1996).

review include an individual's knowledge about HIV/AIDS, demographic factors (gender, age, number of sexual partners), constructs derived from the HBM³⁸ and the TRA/TPB³⁹, past behaviour (previous condom use) and a personality trait (assertiveness). The Sheeran and Taylor (1999) review suggests that the demographic, personality trait and the HBM constructs generally had weak associations with intentions to use condoms. On the other hand, the TPB constructs were determined to have medium to strong associations with intentions to use condoms. Sheeran and Taylor (1999) also compared the ability of TRA and TPB to explain condom use and found that the TPB provided an overall better explanation of intention to use a condom at next sex than did the TRA. In particular, the variance explained in condom use intention was greater for the TPB than the TRA. Thus, they conclude that the addition of perceived behavioural control to the TRA variables was statistically significant extension to the TRA which resulted in at least a 5% increase in variance explained in intention to use a condom.

Albarracin *et al.* (2001) also reviewed studies which have used the TRA and the TPB to predict condom use. Their review included 42 studies that have empirically tested the TRA, the TPB or both. They conclude that the TRA and TPB provide a plausible conceptual basis for explaining condom use across different populations. While they found that intention to use a condom was associated with actual future condom use, Albarracin *et al.* (2001) note that the effect size was weaker than the effect size observed in the applications of the TPB in the prediction of other behaviours. One possible reason for this weak effect, they argue, is that individuals in general may have less control over condom use than some of the other behaviours that have been included in general reviews of the TRA/TPB, such as voting behaviour or risky driving. Unlike voting behaviour and risky driving which primarily depend on the individual, the sexual act is a relational activity which depends on the behaviour of a sexual partner just as much as it depends on the behaviour of the individual. For instance, gendered power dynamics within a relationship influence condom negotiation and use, much like individual volitions (Harré, 1995).

³⁸ The HBM constructs include perceived susceptibility, worrying about HIV/AIDS, perceived severity, perceived benefits, perceived condom effectiveness, perceived barriers, condom attractiveness, interpersonal consequences of condom use, purchase embarrassment and cues to action (i.e., previous STI and exposure to STI/HIV education).

³⁹ The TRA/TPB constructs examined include attitudes, subjective norms, descriptive norms, sexual partner norms and self-efficacy associated with condom use.

Albarracin *et al.* (2001) also found that the association between intention and behaviour was stronger when condom use was assessed retrospectively. In other words, the association between intention and behaviour was stronger in studies which assessed intentions to use condom and condom use at the same time than in studies which assessed intentions and condom use at different times.

While Sheeran and Taylor (1999) provide a review of the TRA/TPB in explaining intention to use a condom and Albarracin *et al.* (2001) provide a review of the TRA/TPB in explaining condom use, there are intersections between the two reviews worth noting. In both reviews, the association between perceived behavioural control and condom use was weaker than the association between condom use intention and condom use. Condom use intention was also found to be significantly associated with attitudes and subjective norms in both reviews. Albarracin *et al.* (2001) distinguish between longitudinal and cross-sectional studies. As a result, they observed that the association between perceived behavioural control and condom use was stronger when condom use was measured at the same time as perceived behavioural control. Relatedly, they found past condom use to be weakly associated with future condom use. A possible explanation for the weak association between past and future behaviour might be in the fact that the context for condom use is always changing, and so, prevents the habituation of condom use. For example, an individual may have used condoms the last time they had sex, but the circumstances of their next sexual encounter may be entirely different from the previous time.

McEachan *et al.* (2011) present the most comprehensive meta-analysis to date of the TPB as it has been applied to health behaviours.⁴⁰ In their review, they address the limitations of previous meta-analyses by only including prospective studies of behaviour, and so are able to control for the effects of past behaviour on predictions of future behaviour. They also apply random-effect meta-analytic procedures. It has been argued that RE meta-analytic procedures are more appropriate than the fixed effects procedures that were used in many of the previous meta-analyses (Hunter & Schmidt, 2000; Hedges, 1992). They also note that no general meta-analyses of the TPB have corrected for measurement error in addition to sampling error. By correcting for both measurement and sampling error, and hierarchically analysing the effect of

⁴⁰ The most recent meta-analysis is in fact that of McEachan *et al.* (2016), but it reviews the more updated version of the TPB, the Reasoned Action Approach (RAA) and so the constructs discussed are somewhat different to the original TPB constructs measured in this dissertation. It was not included in this review because it is not directly comparable to previous reviews of the TPB.

behaviour type, study sample and methodological moderators, McEachan *et al.* (2011) provide a robust empirical review of the TPB.

McEachan *et al.* (2011) found that the TPB explained 19.3% of the variance in health behaviours and 44.3% of the variance in intention to perform recommended health behaviours across 206 studies. Relatedly, the association between behavioural intention and health behaviour, as well as between perceived behavioural control and health behaviour, was found to be weaker in the McEachan *et al.* (2011) review than in previous reviews. Even though behavioural intentions were found to be overall good predictors of future health behaviour as expected, past behaviour was determined to have a stronger effect on future health behaviour. Specifically, when they included past behaviour in their analyses, 10.9% of explained variance was added to health behaviour and an additional 5% was added to the variance explained in behavioural intention. While the inclusion of past behaviour improves the ability of the TPB to predict future health behaviours, McEachan *et al.* (2011) argue that in an applied setting, it is more useful to explain health behaviours (so that interventions can be developed to change adverse behaviour) than to predict future behaviour. And so, they recommend that the result should not be viewed as evidence that past behaviour is a stronger predictor of future health behaviour than are behavioural intentions - the most proximal determinant of behaviour according to the TPB.

McEachan *et al.* (2011) also observed that the ability of the TPB to predict health behaviour varied according to the type of behaviour. Exercising behaviours and dietary behaviours were generally well explained by the TPB. In contrast, sex-related behaviours, clinic use, and health screening behaviours, risky behaviours and addictive behaviours were less well predicted by the TPB, with on average 8% less variance explained (see Table 2.1). With regards to behavioural intentions, sex-related behaviours and dietary behaviours were best predicted, and addictive behaviours less so.

Behaviour Type	(%) Variance Explained
Risky behaviours	14.8
Clinic use and health screening behaviours	14.5
Physical activity behaviours	23.9
Dietary behaviours	21.2
Sex behaviours	13.8
Addictive behaviours	15.3

Table 2.1: Variance explained by TPB across type of behaviour (see McEachan *et al.*, 2011)

The study temporality was also determined to be an important moderator of the hypothesized relationships in the TPB. In particular, health behaviours measured over a shorter term (less than 5 weeks) were better predicted than health behaviours measured over a longer term (more than 5 weeks). This moderating effect was stronger for clinic use and health screening behaviours and weakest for dietary behaviours. Finally, McEachan et al. (2011) found that studies which made use of self-reported measures of health-related behaviour had a greater share of variance explained in the outcome variable than studies which used objective measures of behaviour.

Overall model evaluation and summary of evidence (HBM)

In general, reviews of the HBM suggest that its constructs (perceived susceptibility, perceived severity, perceived barriers, and perceived benefits) differ in their ability to predict various health behaviours. They also show that, compared to the other HBM constructs, the cue to action construct has been relatively neglected in empirical tests of the HBM.

One of the earliest meta-analysis of the HBM was conducted by Janz and Becker (1984). They synthesized studies published at the height of the popularity of the HBM, that is, between 1974 and 1984, and observed that when the framework was first introduced, it was preferred among scholars interested in examining preventive behaviours (e.g., TB screening; dieting, exercising, alcohol use, polio vaccination). The HBM was also used to explain sick-role behaviours (e.g., adherence to medical regimens for various illnesses) but these were to a lesser degree than preventive behaviours. Of the 46 studies included in the 1984 review, 24 studies examined preventive health behaviours, 19 explored sick-role behaviours and 3 addressed clinic utilization (Janz and Becker, 1984). The pervasive use of the HBM to explain preventive behaviours was found to be consistent with findings from earlier reviews of HBM inspired research (see Becker, 1974; Becker *et al.*, 1977).

It is important to note that, Janz and Becker (1984) use *significance ratios*⁴¹ to show the percentage of times each HBM construct was determined to be statistically significant in the predicted direction. In general, they confirm a predictive role of all the HBM constructs. In particular, they observe the following significance ratios for perceived susceptibility (81%), perceived severity (65%); perceived benefits (78%) and perceived barriers (89%) across the 46

⁴¹ The significance ratio is calculated by dividing the number of positive, statistically significant findings for an HBM construct by the total number of studies reporting significance levels for that construct.

studies. As a result, they concluded that perceived barriers were the most reliable predictors of behaviour in the HBM, followed by perceived susceptibility, perceived benefits, and finally perceived severity. They also calculated separate significance ratios for preventive, sick role, and clinic utilization behaviours (see table 2.2).

	Perceived susceptibility	Perceived Severity	Perceived benefits	Perceived barriers
Preventive Behaviours	86%	50%	74%	93%
Sick-role Behaviours	77%	88%	80%	92%
Clinic utilization	67%	33%	100%	50%

Table 2.2: Significance ratios for HBM constructs (see Janz and Becker, 1984)

Even though the significance ratio for perceived severity was low for preventive behaviours and clinic utilization, it was the second most important predictor of sick-role behaviours. Similarly, perceived barriers were found to be important predictors of sick-role and preventive health behaviours, but they were less important than perceived benefits and perceived susceptibility for explaining clinic utilization. Janz and Becker (1984) have argued that these differences further support the HBM, as it is expected that individuals will behave differently when the effects of an illness are asymptomatic than when they are symptomatic.

There is one important limitation of Janz and Becker's (1984) review. Significance ratios indicate how often an HBM construct was found to be significantly associated with a specified health behaviour, they do not provide any information about the strength (or effect size) of a construct on predicting behaviour. Harrison *et al.* (1992) addressed the inadequacy of the significance ratios used by Janz and Becker (1984) and have provided a review of HBM research which includes an estimate of effect sizes.

In the Harrison *et al.* (1992) review, 234 empirical studies were identified, of which only 16 measured all the relevant HBM constructs. Overall, the effect sizes of the HBM constructs were determined to be weak, accounting for between 0.1% and 9% of the total explained variance in the outcome variable. Consequently, Harrison *et al.* (1992) concluded that although the HBM constructs were empirically determined to be significantly associated with a range of health behaviours, the poor operationalization of the HBM across the 234 studies, and a failure to

check both the reliability and the validity of the measured constructs in much of the literature, is an important drawback which makes it difficult to make any definite conclusions about the predictive validity of the HBM.

What they did note however, was that the effect sizes of the HBM constructs were significantly different in cross-sectional and longitudinal applications. In particular, perceived benefits and barriers were determined to have significantly larger effect sizes in longitudinal studies, whereas perceived severity and perceived susceptibility had significantly larger effect sizes in cross-sectional studies. In the cross-sectional context, change and temporality are not accounted for, whereas in the longitudinal context, temporality is accounted for. And so, an implication of this finding is that when behavioural change is not measured, perceived severity and perceived susceptibility tend to be overestimated.

Unlike the Janz & Becker (1984) and Harrison *et al.* (1992) reviews, Zimmerman and Vernberg (1994) examined the ability of the HBM to predict a range of health behaviours and did not examine the significance ratios or individual effect sizes of constructs. They also compared the HBM to the TRA and found that the HBM as a whole provided a significant explanation of health behaviour. However, they also determined that the prediction of behaviour by the HBM was weaker than the TRA. While the TRA was found to explain 34% of explained variance in health behaviours, the HBM was found to explain 24%. Because of its relatively weak predictability, Zimmerman and Vernberg (1994) concluded that the HBM was “an anachronism, no longer applying well to an understanding of health behaviour” (Zimmerman and Vernberg, 1994: 32).

The most recent meta-analytical review of the HBM was conducted by Carpenter (2010). Carpenter (2010) has expressed strong misgivings about the applicability of the HBM to cross-sectional surveys because of the possible influence of past behaviour on future behaviour.⁴² As a result, only applications of the HBM in longitudinal studies were included in the 2010 review. Carpenter (2010) found higher effect sizes than did Harrison *et al.* (1992) for all the HBM constructs except for perceived susceptibility, and notes that the weaker effect sizes observed by Harrison *et al.* (1992) may have been as a result of their inclusion of cross-sectional applications of the HBM which did not account for temporality. Furthermore, Carpenter (2010)

⁴² “Once an individual has adopted a behaviour, he or she would be likely to change their beliefs to be consistent with that behaviour” (Carpenter 2010: 662). Consequently, Carpenter (2010) posits that the length of time between the measurement of the HBM constructs and the measurement of behavioural outcomes is a critical element, as individual perceptions and beliefs would be likely to change over time.

observed that perceived barriers were the construct with the strongest effect on health behaviour, followed by perceived benefits and then perceived severity. This finding partly concurs with the review by Janz and Becker (1984) who found perceived barriers to be the strongest predictor of health behaviour, followed by perceived susceptibility, perceived benefits, and finally perceived severity. Contrary to the Janz and Becker (1984) review, perceived susceptibility was found to be unrelated to preventive and sick-role behaviour (Carpenter, 2010). The weak predictability for perceived susceptibility aligns with Harrison *et al.* (1992), who noted that perceived susceptibility had a weak effect size on health behaviour. The four empirical meta-reviews provide evidence that the theoretical constructs explicated in the HBM are significantly associated with a range of health behaviours, and as a result have some utility in explaining health behaviours. Even so, it is important to note that the HBM explained a smaller proportion of explained variance when it was compared to the TRA (Zimmerman & Vernberg, 1994).

3.4.1 The case for Theory Integration

Theory provides an organized framework for explaining and predicting health behaviour in a systematic manner. Theory allows researchers to identify relevant factors, measure them and understand how they are causally sequenced. Theory is also useful in formulating research questions and providing specific hypotheses to be tested. Empirical testing of health behaviour theory is considered as fundamental to understanding health behaviour. In the previous section, independent reviews of the empirical literature on the HBM and the TPB suggest that both theories have been successfully applied to predict a wide range of health behaviours, however, the explanatory power and the significance of the constructs vary according to the context and health behaviour.

There are few studies that have directly compared the HBM and the TPB as a basis for designing health behaviour change interventions in South Africa. If we are to develop a cumulative science of health behaviour theory, it will be essential to compare the components of different theories in order to determine which constructs are more successful at explaining behaviour and eliciting behaviour change (George *et al.*, 2021; Noar & Zimmerman, 2005; Weinstein, 1993). The ability to explain health behaviour is a necessary first step in the development of behaviour change interventions. While there is slightly more evidence in support of the TPB than the HBM, in general, there is ample empirical evidence in support of the validity of constructs from both the HBM and the TPB, as well as the hypothesized

relationships which they postulate. A key strength of the HBM is in the fact that it was developed by researchers working directly with health behaviours, and so it is intuitive and easily understood by those working in health behaviour (Conner & Norman, 2021).

Even though the HBM has provided a useful framework for identifying key health beliefs associated with a range of health behaviours, when compared to the TPB, it suffers from a number of weaknesses. One limitation is in the poor definition of the constructs explicated, and the imprecise specification of the way in which the constructs influence behaviour. Thus, it is important to further elaborate on the operationalization of the HBM constructs in future research.

Another weakness of the HBM is its exclusion of constructs which have been found to be highly predictive of behaviour, in particular behavioural intentions. Abraham and Sheeran (2015) have argued that an implication of this is that the HBM “portrays individuals as asocial, economic decision makers...and therefore fails to account for behaviour under social and affective control” (Abraham & Sheeran, 2015 :57). Recognizing the limitations of the HBM, some scholars have suggested that the HBM should be considered as more descriptive than explanatory. In particular the HBM should be viewed as a good description of the motivations underpinning health behaviour, and as a result should be integrated with theories which critically consider the causal path between motivations and behaviour.

For example, because the TRA/TPB emphasizes intentions, King (1982), has integrated constructs from the HBM with the TRA and attribution theory, and proposed a new model that simultaneously explores the relationship between health beliefs and motivations, behavioural intentions, and actual behaviour. Similarly, Abraham *et al.* (1999) have noted that including HBM constructs (i.e., perceived susceptibility and perceived severity) in the TPB provides more explained variance in behavioural intention than the TPB alone. More recently, Abraham and Sheeran (2015) have formulated an explanatory model of health behaviours which maps HBM constructs onto the attitude, subjective norm, and perceived behavioural control constructs in the TPB.

Relatedly, Michie *et al.* (2014) have reviewed the global literature on health behaviours and noted that many studies contain constructs that are similar (or identical), but make use of different terminology, and as a consequence have created an illusion that they were distinct. Being able to recognize the similarities between theories would enhance the ability of researchers to synthesize knowledge. Regarding this, several researchers have made the case for empirical comparison of theory and the integration of theory (An *et al.*, 2021; Yastica *et al.*, 2020; Orlowski & Hallam, 2008; Noar & Zimmerman, 2005).

Before theory is integrated however, there is a need for rigorous theory testing as well as a change in the ways in which we assess the evidence in support of a theory. Unlike contexts where there is a gold standard methodology, no gold standard exists for testing health behaviour theory. Theory testing has historically included inter alia, correlational (cross-sectional and longitudinal) survey research designs, randomized lab and field experiments, mediation analysis and meta-analysis (Noar & Mehrotra, 2011). Because no single methodology can provide all the necessary data to fully evaluate a theory, the results of theory testing should be interpreted as producing evidence that may be necessary, but not sufficient to provide a full evaluation of theory. Moreover, given that the weaknesses of one methodology can be offset by the strengths of another, where possible multiple methodologies should be used for theory testing.

A critique of health behaviour literature is the relative lack of studies empirically testing theories against one another (de Vries, 2017; Noar & Zimmerman, 2005). Even though the HBM and TPB have been routinely tested against each other in different contexts and settings (Huang *et al.*, 2020; Chin & Mansori, 2019; Gerend & Shepherd, 2012), the present study is the first to test these theories in the context of HIV-related health behaviours in a male-only South African sample.

4 METHODOLOGY

4.1 Research Study Design

This study used a cross-sectional survey research design (Wang & Cheng, 2020; Creswell, 2009) for theory testing, and to examine the relationship between HIV-related health behaviours and other variables of interest among a sample of construction workers in Western Cape, South Africa.

The main strengths of a cross-sectional research design are that it is inexpensive to conduct, and it is relatively easy to use for generating hypotheses (Wang & Cheng, 2020). Limitations include a potential susceptibility to sampling bias and an inability to investigate temporal hypotheses (Wang & Cheng, 2020). The study was approved by the institutional review board in the faculty of Engineering at the University of Cape Town.

4.2 Survey Administration and Fieldwork

Fieldwork was conducted over a four-month period, from mid-March to June 2019. Due to the fragmented and informal nature of South Africa's construction industry (Meintjes *et al.*, 2007; CIDB, 2003), it was difficult to determine a parameter representative of a population of construction workers. As a result, purposive sampling was used to select construction companies and participants for the study. A purposive sample is a non-random sample whose characteristics are defined for a purpose that is relevant to the study. In purposive sampling, the researcher applies discretion to select respondents who will best provide answers relevant to the stated research objective (Creswell, 2009).

42 construction companies that had participated in a previous HIV/AIDS research project in the Western Cape were initially approached. It is important to note that the companies were selected based on their prior involvement in an HIV/AIDS research project (see Bowen *et al.*, 2010). And so, all the companies approached were somewhat similar in that they had already engaged with the issue of HIV/AIDS. Leveraging existing relationships saves time and resources. However, such an approach is susceptible to homogeneity, and so the study sample may not be representative of the broader population of construction companies in the Western Cape.

7 out of the 42 companies approached agreed to participate in the study. The reasons for refusing to participate can be broadly described as logistical; and included concerns about tight schedules as well as a lack of personnel and time to dedicate to the research process. Given

this, it is crucial to note that the companies that agreed to participate differed systematically from those that did not in that they could accommodate the burden of the research process. Furthermore, the participating companies were generally larger in scale than the companies that refused to participate, and had a significant number of employees, substantial revenue, and extensive operations on a provincial and national level.

In total, permission was granted to collect data from male employees across 18 construction sites in the Western Cape. In conducting the fieldwork, the primary objective was to amass a comprehensive dataset that reflects the individual characteristics, attitudes and HIV-related health behaviours of the study participants. It is essential to note that site-level variations, including geographic location, the specific nature of construction activities, demographic compositions of the workforce at different sites, and the distinctions among worker types, are not focal points and as a result were not included in the analysis. Relatedly, company level differences were not included in the analysis. This methodological choice aligns with the scope of the study and prioritizes the individual as the unit of observation, thereby allowing for a robust test of theory and a more nuanced understanding of the personal attributes, experiences and behaviours of a community population of males at an increased risk of HIV/AIDS in South Africa. That said, it is important to note that such an approach is limited in that it does not consider the confounding effects that site and company-level heterogeneity could introduce at the individual level.

The sampling frame consisted of all male employees who were on site at the time and date that the participating companies had scheduled their field research visits. Potential respondents were first briefed about the study, after which they were assured of the voluntary, anonymous, and confidential nature of the questionnaire. If a worker was willing to participate in the study, they were provided with a consent form before the questionnaire was administered. Participants completed the questionnaire in site offices equipped with tables and chairs. Experienced field researchers, fluent in the three predominantly spoken languages in the Western Cape (Afrikaans, English and IsiXhosa) assisted at each site to clarify the meaning of a question if required but refrained from providing or prompting responses.

4.3 Study Questionnaire

The primary data collection tool was a survey questionnaire. The questionnaire collected data about a respondent's demographic and general health characteristics; their condom use; HIV testing behaviour; alcohol and drug use; engagement in risky sexual relationships,

and perceptions and attitudes about HIV/AIDS. The questionnaire items were sourced from existing measurement scales that had been applied to similar research (see Table 4.1). To ensure the accuracy and cultural relevance of the survey items, a rigorous translation process was employed. The original survey items, developed in English, were translated into Afrikaans and IsiXhosa by professional translators who were fluent in both English and the target language. Following the initial translation, a back-translation process was conducted. This involved a different set of bilingual experts who translated the survey items back into English. The back-translated version was then compared with the original English version to identify and resolve any discrepancies or ambiguities, ensuring that the meaning of the items was preserved across languages. Furthermore, the translated survey items were piloted with a subset of the target population, comprising of male construction workers similar to those who would participate in the main study. The pilot aimed to evaluate the clarity, relevance, and cultural appropriateness of the survey items (Creswell, 2009). Feedback from the participants in the pilot study was gathered through informal interviews and discussions. This feedback was used to refine the survey items, ensuring they were easily understood and accurately captured the intended constructs. Feedback received indicated that the items were clear to comprehend and likely to elicit valid answers during fieldwork. It took respondents 60 – 75 minutes to complete the questionnaire.

Table 4.1 Overview of questionnaire items

Constructs and Items	Sample items	Response options	Source
1. Demographic characteristics			
Age	-	Years	
Relationship status	-	Divorced, separated, widowed or never married=0; Married or living with a partner=1	
Work status	-	Casual=1; Contract=2; Permanent=3	
Education	-	No formal school education=0; Completed primary school=1; Attended high school but did not complete matric=2; Completed matric=3; Attended university or college, but did not graduate=4; Graduated from university or college=5	
Ethnicity	-	‘Black’ African=1; ‘Other’=2	
Years worked in industry	-	Years	
2. General Health characteristics			
Do you have TB at the moment?	-	No=0; Yes=1	
Have you ever had TB in the past?	-	No=0; Yes=1	
Have you ever had an STI?	-	Previously had an STI? No=0; Yes=1	

3.HIV Testing			
History of HIV testing	-	Number of times tested: 0,1,2.....more than 10 times	
Attitude towards HIV testing	<i>'My friends would support my decision to get an HIV test'</i> [Q52a]	'Strongly disagree'=1 to 'Strongly agree'=5	Peltzer, K., & Mpofu, E. (2002). The factor structure of the HIV antibody testing attitude scale in four African Countries. <i>Eastern Journal of Medicine</i> , 7(2), 27-30.
4. Attitude towards PLHIV	<i>'I think less of someone because they have HIV'</i> [Q35e] <i>'I feel uncomfortable around people with HIV'</i> [Q35g]	'Strongly disagree'=0 to 'Strongly agree'=1	Visser, M. J., Kershaw, T., Makin, J. D., & Forsyth, B. W. (2008). Development of parallel scales to measure HIV-related stigma. <i>AIDS Behavior</i> , 12(5), 759-771. Smith, E. A., Miller, J. A., Newsome, V., Sofolahan, Y. A., & Airhihenbuwa, C. O. (2014). Measuring HIV and AIDS related stigma across South Africa: a versatile and multidimensional scale. <i>Health Educ Behavior</i> , 41(4), 387-391.
5.Alcohol Use Disorders Identification Test (AUDIT)	<i>How often do you have a drink containing alcohol?</i> [Q12]	'Never' = 0 to '4 or more times a week' =4	Saunders, J. B., Aasland, O. G., Babor, T. F., de la Fuente, J. R., & Grant, M. (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption. <i>Addiction (Abingdon, England)</i> , 88(6), 791-804.
6.Drug Use Disorders Identification Test (DUDIT)	<i>'How often are you influenced heavily by drugs?'</i>	'Never' = 0 to 'Daily or almost every day' =4	Hildebrand M. (2015). The Psychometric Properties of the Drug Use Disorders Identification Test (DUDIT): A Review of Recent Research. <i>Journal of substance abuse treatment</i> , 53, 52-59.
7. Scientific knowledge about HIV/AIDS	<i>'A person can get HIV by touching someone who has HIV'</i> [Q32a]	'True'=0; 'Don't know'=0; 'False'=1	Carey, M. P., & Schroder, K. E. (2002). Development and psychometric evaluation of the brief HIV knowledge questionnaire (HIV-KQ-18). <i>AIDS Education and Prevention</i> , 14, 174-184.
8. Endorsement of non-scientific beliefs about HIV/AIDS	<i>'Spirits or supernatural forces cause AIDS'</i> [Q33a]	'False'=0; 'Don't know'=0; True'=1	Kalichman, S. C., & Simbayi, L. C. (2003). HIV testing attitudes, AIDS Stigma, and voluntary HIV counselling and testing in a black township in Cape Town, South Africa. <i>Sex Transm Infect</i> , 79, 442-447. Govender R, Bowen P, Edwards P, Cattell K. AIDS-related knowledge, stigma and customary beliefs of South African construction workers. <i>AIDS Care</i> . 2017;29(6):711-717.
9.Feelings in the past week	<i>'During the past week, I felt hopeless about the future'</i> <i>'During the past week, my sleep was restless'</i>	'Rarely' = 1 to 'all of the time'=4	Radloff, L. The CES-D Scale: A Self-Report Depression Scale for Research in the General Population. <i>Applied Psychological Measurement</i> . 1977;1(3):385-401. Björgvinsson, T., Kertz, S.J., Bigda-Peyton, J.S., McCoy, K.L., Aderka, I.M. (2013). Psychometric properties of the CES-D-10 in a psychiatric sample. <i>Assessment</i> , 20, 429-436.
10.Knowledge of ARV and available	<i>'Do you know where you can get ARV'</i>	No=0; Yes=1	Hornschuh, S., Dietrich, J. J., Tshabalala, C., & Laher, F. (2017).

treatment	<i>medication?’</i>		Antiretroviral Treatment Adherence: Knowledge and Experiences among Adolescents and Young Adults in Soweto, South Africa. AIDS research and treatment, 2017, 5192516.
	<i>‘When you feel better, you can stop taking your medication’</i>	‘False’=0; ‘Don’t know’=1; ‘True’=2	Nelsen, A., Trautner, B. W., Petersen, N. J., Gupta, S., Rodriguez-Barradas, M., Giordano, T. P., & Naik, A. D. (2012). Development and validation of a measure for intention to adhere to HIV treatment. AIDS patient care and STDs, 26(6), 329–334.
11. Risky sexual behaviour	<i>‘Have you had sexual relationships with more than one person at the same time?’ [Q44d]</i> <i>‘How often have you [your partner] used both alcohol and drugs before or during sex?’ [Q44l and Q44o]</i>	‘Never’=1 to ‘Always’=5	Mattson, C. L., Campbell, D., Karabatsos, G., Agot, K., Ndinya Achola, J. O., Moses, S., & Bailey, R. C. (2010). Scaling Sexual behaviour or "sexual risk propensity" among men at risk for HIV in Kisumu, Kenya. AIDS Behav., 14(1), 162-172. Turchik, J. A., & Garske, J. P. (2008). Measurement of Sexual Risk Taking Among College Students. Archives of Sex Behavior.
12. Condom Use History of condom use	<i>‘In the last 3 months, how often did you use a condom?’</i> <i>‘Did you use a condom the last time you had sex?’</i>	‘Never’=1 to ‘Always’=5	
Intention to use condom	<i>‘The next time you have sex, how likely is it that you will use a condom?’</i>	‘Never’=1 to ‘Always’=5	Roy, T., Anderson, C., Evans, C., Rahman, M. S., & Rahman, M. (2013). Cross-cultural adaptation of the short-form condom attitude scale: validity assessment in a sub-sample of rural to urban migrant workers in Bangladesh. BMC Public Health, 13(240).
Attitude towards condom use	<i>‘Condoms are uncomfortable’ [Q36a]</i> <i>‘Condoms are the best way to protect myself from HIV’ [Q36i]</i>	‘Strongly disagree’=1 to ‘Strongly agree’=5	
13. Perceptions about getting infected with HIV/AIDS	<i>‘Getting HIV is something II’ [Q48]</i>	‘Not concerned about’=1 to ‘Extremely concerned about’=5	Napper, L. E., Fisher, D. G., & Reynolds, G. L. (2012). Development of the Perceived Risk of HIV Scale. AIDS Behavior., 16, 1075-1083.

4.4 Theory Testing

The study employed a diverse array of statistical techniques for theory testing. These range from frequencies at the univariable level, tests of difference at the bivariable level, hierarchical linear regression, and path analysis at the multivariable level.⁴³ Exploratory and confirmatory factor analysis were also used to examine the construct validity of and reliability of latent variables. All statistical analyses were conducted with IBM SPSS (ver 28). Unless otherwise stated, a p-value < 0.050 is considered to be statistically significant.

Brief descriptions of the statistical techniques used are presented below:

4.4.1 Tests of Difference

A t-test is a statistical test which compares two categories of the independent variable in terms of the mean of the dependent variable.

In this study, independent sample t-tests were used to determine whether the mean of the composite variables computed to test the HBM and the TPB significantly differed across socio-demographic and experiential categories. Consequently, all the socio-demographic and experiential variables were dichotomized. While the analytical strategy required a simple categorization of socio-demographic variables (e.g., education, marital status) and experiential variables (e.g., do you know a PLHIV) for ease of analysis and interpretation within the scope of the study - it is acknowledged that the relationship between socio-demographic, experiential variables and HIV-related health behaviours is complex and multifaceted. Future research should use more robust analytical methods to examine the effect of the socio-demographic and experiential variables on HIV testing and condom use; and also consider a more nuanced categorization so as to capture differences accurately and to ensure that the analysis reflects the true impact of non-individual level factors on HIV-related health behaviours. This could for example involve a more detailed classification of education levels or exploring interaction effects

⁴³ According to Kalan *et al.*, (2021), many researchers are not attentive of the distinction between the two statistical terms - *multivariate* and *multivariable*, and so, they are repeatedly and interchangeably used in the literature, when in fact they stand for two distinct methodological approaches. Multivariate analysis refers to statistical models that have 2 or more dependent variables (e.g., repeated measures derived from longitudinal studies) and multiple independent variables whilst multivariable analysis refers to statistical models with one dependent variable and multiple independent variables (see also Hidalgo & Goodman, 2013).

between marital status and other variables.

In conducting the independent t-tests, significance levels were not adjusted to control for the familywise error rate. Future research should employ methods such as the Bonferroni correction or False Discovery Rate (FDR) to address the potential for increased Type I errors due to multiple comparisons

4.4.2 Hierarchical Linear Regression (HLR)

Tests of difference are limited for theory testing because they only consider the statistical relationship between two variables. The relationship between a dependent variable and multiple independent variables can be analysed using linear regression equations. The estimates generated by these equations are coefficients (β (Beta)) ranging between -1 and +1, which are interpreted as the unique, linear effect of each independent variable on the dependent variable, while controlling for the effects of the other predictors in the equation (Pedhazur, 1997).

In this study, hierarchical linear regression (henceforth HLR) is used for theory testing. HLR is a type of regression technique in which the independent variables are entered in blocks, with each block representing a theoretical model or hypothesis. HLR provides a useful framework for model comparison in the sequencing of independent variables, which allows one to determine whether newly added variables show a significant improvement in R^2 (the proportion of explained variance in the dependent variable). It is important to note that HLR is based on an a priori assumption that the independent variables have a linear and direct relationship with the dependent variable (Byrne, 2016), and so, it is of limited use in situations where it may be incorrect to assume a linear or a direct relationship between variables.⁴⁴

With such an approach, the consistency of condom use in the past three months and the number of HIV tests in a person's lifetime were treated as continuous variables. This decision was based on the nature of the data, which can take on a wide range of values, thus approximating continuous distributions. As such, Ordinary Least Squares (OLS) regression was employed to model these outcomes. OLS is well-suited for continuous data and provides a straightforward

⁴⁴ HLR is also limited in its specification of only one dependent variable per regression equation, and the determination of variables as either independent or dependent, not both. A further limitation of HLR is the poor specification of the relationships between independent variables, reflected in the assumption that the variance in the dependent variable is constant for each value of the independent variable and the assumption that independent variables are not highly correlated with one another (Hair *et al.*, 2010).

interpretation of the relationships between the predictor variables and these health behaviours. Furthermore, OLS was employed as a preliminary step for path analysis, as it uses a linear function to directly model the relationship between predictors and the dependent variable, and as a result provides initial insights into the strength and direction of hypothesized relationships.

4.4.3 Structural Equation Modelling (Path Analysis)

Path analysis is particularly useful for theory testing because, unlike HLR, it allows for the determination and testing of simultaneous relations among multiple independent and dependent variables (see figure 9).

The visual presentation of variables in a path diagram shows the hypothesized causal pathways through which independent variables produce both direct and indirect effects on a series of dependent variables.⁴⁵ By convention, independent variables are represented in the left part of the path diagram and the dependent variables are depicted on the right. The lines in figure 9 with the single arrowheads ($\rightarrow$), represent the direct effects of the independent variable on the dependent variable. For example, the line that points from A to C, and B to D represent the corresponding direct effect of A on C and B on D. Statistical estimates of the direct effect are path coefficients, which are interpreted in the same manner as regression coefficients in MLR (Byrne, 2016).

Variables A and B are exogenous variables because their antecedent causes are not depicted in the path diagram. In contrast, variables C, D, E and F are endogenous because they have independent variables shown in the path diagram. Each endogenous variable has a disturbance, representing its unexplained variance. A disturbance is a latent construct that represents all unmeasured causes of the corresponding endogenous variable. In figure 9, the disturbance is illustrated by an error (residual) term designated as eC, eD, eE, and eF respectively.⁴⁶

The pathway between variable A and B, represents the hypothesis of correlated causes. In other words, it posits that A and B covary. However, given that they are exogenous variables, the path diagram gives no account about why A and B covary. Accordingly, the curved line with two

⁴⁵ Typically, ellipses represent unobserved (latent) variables, rectangles represent observed variables, single headed arrows represent the effect of one variable on another variable, and double headed arrows represent covariance between variables.

⁴⁶ Because the nature and number of disturbances is unknown, disturbances can be viewed as unmeasured latent variables and so are represented by ellipses - the convention for unobserved variables.

arrowheads represents an unanalysed covariance between the two exogenous variables A and B. The path coefficients for the direct effect of A on C ($A \rightarrow C$), ac , and the direct effect of B on E ($B \rightarrow E$), be , are each estimated controlling for the covariation between A and B.

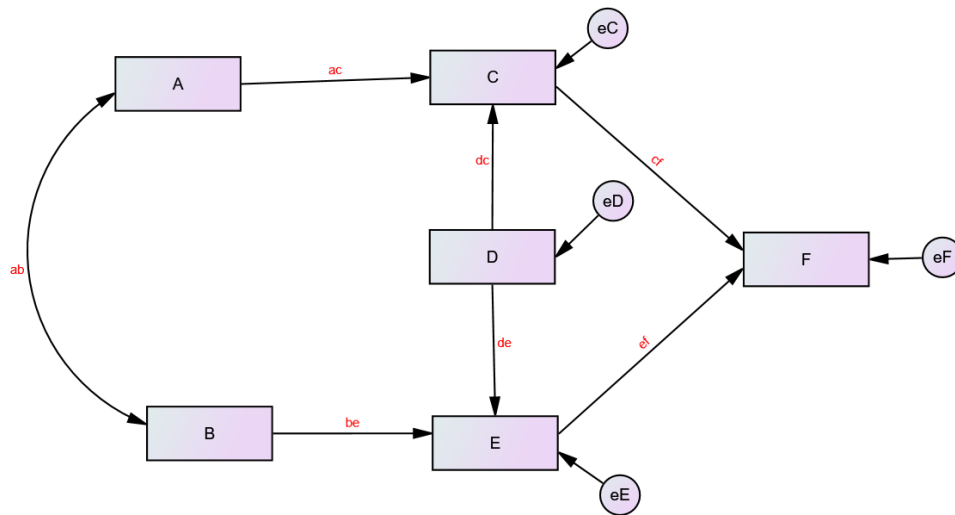


Figure 9 A path diagram of a hypothetical causal structure of six variables

There are two direct effects on the endogenous variable F in figure 9. They are $C \rightarrow F$, cf , and $E \rightarrow F$, ef . However, both C and E have a dual role, as independent variables of F, and as dependent variables for A and D; and B and D respectively. In path analysis, a variable which has a dual role is described as an intervening variable. Furthermore, the estimation of indirect effects involves one or more intervening variables presumed to transmit some of the effects of antecedent variables. In Figure 9, variable A has a direct effect on C and an indirect effect on F. Similarly, variable B has a direct effect on E and an indirect effect on F. Variable D has a direct effect on C and E, and an indirect effect on F.

Given the advantage of path analysis over difference testing and HLR, it is the most robust statistical technique employed in this thesis. Path analysis was conducted using a maximum likelihood fit function of the multivariate normal distribution. The base statistic for estimating model fit was the χ^2 statistic, which evaluates the difference between the observed covariance matrix and the predicted covariance matrix (Kline, 2011), that is, the difference between the input structural model and the estimated model. The distribution of the χ^2 statistic is sensitive to sample size and the number of variables in the hypothesized model. Consequently, larger samples and

complex theories, with high numbers of associated variables are likely to provide an unreliable χ^2 statistic. For this reason, an array of alternative measures of fit have been developed (Kline, 2011).

In this study, four of the most commonly used alternative fit measures are used to estimate model fit. These are: χ^2/df ratio, the comparative fit index (CFI); the root-mean-square error of approximation (RMSEA) and Hoelter's Critical N (CN) index (Byrne, 2016; Kline, 2011). These measures are described below:

1. **χ^2/df** - the lower the χ^2/df ratio, the better the model fit. Hu and Bentler (1999) have recommended that χ^2/df values between 2 and 3 be taken as an indication of an acceptable level of model fit, and values between 1 and 2 be taken as an indication of a good model fit. Schumacker and Lomax (2004) deem this threshold to be too strict and have recommended a threshold of ≤ 5 .
2. **CFI values** ≥ 0.90 are taken as an indication of adequate fit and values ≥ 0.95 indication of a good fit (Fan *et al.*, 1999; Hu & Bentler, 1999).
3. **RMSEA** - A model is considered to have a good fit if the RMSEA value is ≤ 0.06 (Hu & Bentler, 1999). Browne and Cudeck (1993) have used RMSEA values of ≤ 0.01 ; ≤ 0.05 ; ≤ 0.08 to indicate excellent, good, and acceptable fit respectively. MacCallum *et al.* (1996) use the same criteria.
4. **Hoelter's CN** - Hoelter (1983) proposed the CN as a means "to estimate the size that a sample must reach in order to accept the fit of a given model on a statistical basis" (Hoelter, 1983:330) and has suggested a CN criterion of ≥ 200 .

Taken together, the aforementioned fit measures are used to estimate the fit of structural models in this dissertation.

Table 4.2 Measures used to estimate model fit	
Measure	Threshold
χ^2/df	≤ 5
CFI	≥ 0.900
RMSEA	≤ 0.060
Hoelter's CN	≥ 200

The measures of fit described above are not absolute, and so should be interpreted cautiously. Furthermore, in cases where a model could be improved with theoretically sensible

modifications, these modifications were pursued iteratively until there was no evidence of alternative models that had a superior fit.

All the models in this study are statistically overidentified. Overidentification occurs when the number of observed data points exceeds the number of estimated parameters in the model. This is generally a desirable property in SEM as it allows for the testing of the model's fit to the data. The overidentification of the models enables the use of fit indices to assess how well the proposed model represents the observed data. However, it also means that there are more degrees of freedom, which can sometimes lead to challenges in achieving an optimal fit. Overidentification can indicate that the model is complex and may not fully capture all the nuances of the underlying data structure, potentially impacting the robustness of the findings.

To address the issue of overidentification, the model was iteratively refined using modification indices and theoretical justifications to improve fit.

4.5 Psychometric Validation of Latent Variables

Construct validity refers to the extent in which a variable measures the intended construct. Establishing construct validity is crucial for evaluating the overall validity of the theoretical constructs and their hypothesized relationships.

Broadly stated, there are two factor analysis techniques used for assessing construct validity – Exploratory Factor Analysis (henceforth EFA) and Confirmatory Factor Analysis (henceforth CFA). EFA is a technique that uses *eigenvalues* to explore the factorability of a set of indicators by “finding the smallest number of interpretable factors that can parsimoniously explain the covariation among a set of indicators” (Watkins, 2018: 219). EFA is exploratory in the sense that it does not start with a hypothesis, rather it is used to determine the number of factors that may represent a set of indicators. On the other hand, CFA is a technique which tests whether a construct influences a group of indicators in a predicted way. CFA provides a measurement model of hypothesized relations between factors and indicators (Byrne, 2016; Fornell & Larcker, 1981). It is confirmatory in the sense that the researcher begins with a hypothesis about how many factors there are, and which indicators load onto which factors.

In this study, a combination of EFA and CFA was used to investigate the relationship between questionnaire items and the theoretical constructs that they were intended to measure. Specifically, EFA was first conducted to determine the number of potential factors that underlie a set of questionnaire items. Thereafter CFA was used to produce a measurement model which confirmed or rejected the underlying factor structure. Just as with the path analysis model, the

measurement model was assessed using the four fit indices previously described, that is the χ^2/df ratio, the comparative fit index (CFI), the root-mean-square error of approximation (RMSEA) and Hoelter's Critical N (CN) index (Byrne, 2016; Kline, 2011).

Prior to EFA, the correlation between questionnaire items was assessed to verify that they were empirically associated to justify factor analysis. Unless otherwise stated the Pearson correlation coefficient (r) was used. Bartlett's (1954) test of sphericity (henceforth BToS), which tests the null hypothesis that the correlation matrix is an identity matrix was used as an objective test of the factorability of the correlation matrix. BToS is sensitive to sample size, so it was complemented with the Kaiser-Meyer-Olkin measure of sampling adequacy (henceforth KMO). The KMO examines the strength of partial correlations shared across all variables (Kaiser, 1974). KMO values were computed for the total correlation matrix as well as for each indicator. KMO values greater than 0.700 were desired, while values less than 0.500 were deemed unacceptable (see Tabachnick and Fidell, 2007).

In constructing the composite measures, an unweighted approach was preferred due to its simplicity, transparency, and robustness. This method ensures that each item contributes equally, facilitating easier interpretation and replication of results. Furthermore, given the objectives of this study, the unweighted composite measures align well with our analytical strategy and provide a clear, straightforward summary of the constructs under investigation.

4.5.1 Reliability Analysis

Reliability, that is the degree to which indicators consistently measure the latent variable which they are intended to measure, was assessed using Cronbach's alpha (α) (Cronbach, 1951). The resulting α score typically ranges from 0 to 1 and the higher the α score, the better the internal consistency of the set of items. Streiner (2003) has argued that although a high α is desirable, extremely high values may indicate unnecessary repetition, overlap and redundancy of items.

Kline (2011) has proposed that as a general rule of thumb, $\alpha \geq 0.700$ should be taken to indicate acceptable internal consistency; $\alpha \geq 0.800$ an indication of good internal consistency and $\alpha \geq 0.900$ an indication of excellent internal consistency. On the other hand, Cho and Kim (2015), as well as Streiner (2003), have argued that the idea that α should be greater than 0.700 is a common misconception, and advice against mechanistically applying this threshold. Taking this into account, for this study, α values below 0.500 were deemed unreliable, α values reasonably close to 0.700 were considered to be internally consistent and values higher than 0.950 were deemed to be redundant.

4.6 Missing Data

Missing data are a rule rather than an exception in quantitative research (Dong & Peng, 2013). The challenge with missing data lies in the fact that most standard statistical techniques were designed to operate on complete datasets. Therefore, not properly addressing missing data can make subsequent statistical analyses susceptible to violations of assumptions or introduce potential bias in estimates (Schafer & Graham, 2002).

Because of the threat of missing data to inferential statistics, various principled methods have been proposed to deal with missing data such as listwise deletion, pairwise deletion and mean substitution. Graham (2012) distinguishes the aforementioned methods from more modern methods such as the multiple-imputation method, the full information maximum likelihood method, and the expectation-maximization method.⁴⁷

Extent of Missing Data:

A total of 574 respondents completed the questionnaire. On average, it was determined that each variable had at least 45 missing values (approximately 8%). After further review however, a count of 69 or less missing values (12%) was chosen as a threshold so as to allow for the inclusion of the widest possible range of variables. Consequently, all variables with missing values greater than 12% were deemed unreliable and excluded from further analysis (See Table 4.3). On a case level, all cases with one or more missing values were excluded from further analysis as per listwise deletion. After these revisions, the dataset was reduced from a total of 574 cases with some missing values to 310 total cases with no missing values. While this reduction represents a 46% loss in sample size, the revised sub-sample nevertheless satisfies the sample size requirement for structural equation modelling ($n \geq 200$). As an initial assessment of the 310-case dataset, normality was assessed. Given that skewness and kurtosis estimates were found to be within the range of ± 2 and ± 3 (Garson, 2012) and the standard scores (z) for most variables were in the range of ± 4 , it was concluded that most of the variables were normally distributed, and that there were no significant outliers in the dataset.

⁴⁷ These methods take into consideration the conditions under which missing data occur and provide imputations for the missing data. Graham (2012) has argued that the full information maximum likelihood and expectation-maximization methods approach 90% of the way to the “hypothetical ideal” for hypothesis testing (Graham, 2012).

Handling of Missing Data:

Given the purposive sampling approach adopted, and the fact that the study data was not collected to be representative of a population listwise deletion was used to deal with missing data at a variable and case level. Listwise deletion, also known as *complete case analysis*, is an approach where only cases for which there are no missing values on any of the variables are retained in a dataset. One concern about listwise deletion is that it can drastically reduce the number of usable cases in a dataset. That said, there is no established threshold in the literature regarding what an acceptable proportion of missing data ought to be. For example, Schafer (1999) has suggested a threshold of 5%, while Bennet (2001) has advocated for a rate of 10%. On the other hand, Enders (2003) recommends a rate between 15% and 20%.

Table 4.3: List of variables excluded (12% or more non-response rate)

Item	Non-response	
	Count	Rate
Q10. How many years (in total) have you worked in the construction industry?	131	23%
Q42. At what age did you have any form of sex for the first time?	133	23%
Q43. What is the age of your regular sex partner?	148	26%
Q45. Total number of sex partners in the past 6 months?	234	41%
Q31a. I was bothered by the things that usually don't bother me.	70	12%
Q31b. I had trouble keeping my mind on what I was doing.	80	14%
Q31c. I felt depressed	79	14%
Q31d. I felt that everything I did was an effort	80	14%
Q31e. I felt hopeless about the future	87	15%
Q31f. I felt fearful.	95	17%
Q31g. My sleep was restless.	82	14%
Q31h. I was unhappy.	75	13%
Q31i. I felt lonely	90	16%
Q31j. I could not "get going"	83	14%
Q51. Getting HIV is something I have *	75	13%

* 'never thought about', 'rarely thought about', 'thought about some of the time', 'thought about often' and 'thought about all the time'.

4.6.1 Cause of Missingness

Missing data can typically be grouped into three categories: missing completely at random (MCAR), missing at random (MAR), and missing not at random (MNAR) (Rubin, 1976). When

data are MCAR, then missingness is independent of observed and unobserved data. When data are MAR, missingness is systematically related to the observed data. For example, if the probability of a respondent completing the questionnaire is found to be related to their level of education (an observed variable) then missingness may be regarded as MAR. Finally, when data are MNAR, missingness is systematically related to unobserved data, that is, events or factors which are not directly measured by the researcher. For example, the probability of a respondent completing the questionnaire could be related to illness on the day of data collection (an unobserved variable).

While MCAR is a type of missingness which does not introduce bias, it is generally regarded as a strong and unrealistic assumption which rarely applies to the real world. On the other hand, MAR and MNAR may introduce bias under listwise deletion. As a consequence, Little's MCAR test was used to examine the plausibility of the MCAR assumption in the study. Based on the outcome of Little's MCAR test ($\chi^2 = 24404.23$; $df = 21869$; $p = 0.000$), it was concluded that it was not tenable to assume that missingness was completely at random in the dataset.

The cause of missingness is said to be *ignorable* if data are found to be MCAR or MAR and *nonignorable* if data are found to be MNAR (Dong & Peng, 2013). If missingness is ignorable, recommended approaches include weighing the data as per population parameters and/or replacing the missing values with imputations. In the case of MNAR, the bias in sample estimates has to be explicitly acknowledged, and, if possible measured and incorporated into the substantive analysis (Graham, 2012).

Because of the purposive sampling approach adopted, the question of whether the underlying cause of missing data was ignorable or nonignorable was not deemed as a concern. Consequently, the condition of MAR was not evaluated, and missingness was not explicitly modelled under conditions of MNAR (Schafer & Graham, 2002). This approach was deemed appropriate for this study due to the specific analytical goals and the nature of the data collected. While it is acknowledged that listwise deletion can lead to a reduction in sample size and potential biases, the final sample size remained sufficient for the planned statistical analyses, and the patterns of missingness did not indicate systematic bias that would invalidate the study's conclusions.

5 DEFINITION & MEASUREMENT OF VARIABLES

The selection of variables was guided by the objectives of the study and the review of existing literature. It is essential to precisely identify the variables under investigation. By doing so, researchers can ensure that their measurements are valid, and that their findings reliably represent the subject of study (Creswell, 2009).

In this study, the term observed variable typically refers to the individual questionnaire item and latent variable refers to a composite variable, that is, a variable computed by transforming two or more observed variables (questionnaire items).

This section presents the conceptual definition and measurement operationalization of the study variables as applied in the different analyses.

5.1 Socio-demographic Variables

Socio-demographics are statistics that describe populations in terms of socially stratified characteristics. Given the complex array of multi-level factors hypothesized to influence HIV-related health behaviours, socio-demographic variables were instrumentally used as indicators of structural-level factors in this study.

The socio-demographic variables included in the study are age cohort, education, marital status, home province, and employment status.

5.1.1 Age

Individual level health behaviours have been linked to the biological and social processes of aging, including physiological changes and the accumulation of social experiences (Reither *et al.*, 2009). In the context of HIV/AIDS, empirical evidence suggests that behaviours which increase an individual's risk, including inconsistent and non-condom use, varies across a person's lifespan, and follows an inverted U-pattern, with younger persons on average more likely to engage in risky behaviours than older persons (Duell *et al.*, 2018; Rolison *et al.*, 2013).

In this study, age was gauged using a cohort effect, wherein participants belonging to pre-defined age ranges are assumed to share features that differentiate them from other groups (Keyes *et al.*, 2010). Statistics South Africa (Stats SA) defines youth in South Africa as all persons between

the ages of 15 and 34 years.⁴⁸ Based on this definition, a binary variable distinguishing between participants under 35 years, and participants who were 36 years and older was computed to estimate the unique effect of aging on HIV-related health behaviours.

5.1.2 Education

Education has been viewed as a tool to challenge indigenous representations of illness which discount scientific explanations and influence people's health behaviours (Liddell *et al.*, 2005). In recognition of the effect of education on health behaviour, the life orientation (LO) curriculum was developed to provide sexual and reproductive health education and promote protective health behaviours among youth attending secondary schools in South Africa (Magetle, 2008). In 2010, the Department of Basic Education (DBE) assessed the LO curriculum and determined that while it had proven to be effective, it was not being implemented uniformly across the country. To address this, the DBE, with support from United States Agency for International Development (USAID) and PEPFAR, developed scripted lesson plans (SLPs) to strengthen the sexual and reproductive health content and standardize implementation of the LO curriculum. The SLPs included active lessons focusing on six core messages: saying no to sex, recognizing the right to say no, using condoms, being faithful to one partner, getting tested for HIV and other STIs, and recognizing shared responsibility for preventing pregnancy, HIV, and other STIs. The SLPs were integrated into the LO program and offered across secondary schools (Speizer *et al.*, 2020). Given this backdrop, a binary variable distinguishing between participants with a secondary school education and those without secondary school education was computed to estimate the structural and contextual effect of education on HIV-related health behaviours in this study.

5.1.3 Marital Status

The relationship between marital status and HIV is complex, and contradictory findings have been reported in South Africa (Maharaj & Cleland, 2005). While Shisana *et al.* (2004) found that the risk of HIV infection⁴⁹ did not differ significantly between married and unmarried people

⁴⁸ See <http://www.statssa.gov.za/publications/03-00-15/03-00-152020.pdf>

⁴⁹ "Risk of HIV infection" refers to behaviours and circumstances that increase the likelihood of contracting HIV. In the context of this study, it refers to non-condom use, not using condoms consistently, having multiple and concurrent sexual partners, the use of intravenous drugs and shared needles, the use of alcohol and drugs before sex and engaging in unprotected sex with partners of unknown HIV status.

when age, sex, socio-economic status, race, type of locality and diagnosis of STI were controlled for, they observed that the risk of HIV infection was higher among unmarried people when only sex behaviours were controlled for. Relatedly, Tlou (2019) observed a protective effect of marriage in a hyperendemic region, determining that the risk of HIV infection was approximately two times higher in persons who were single and had never been married as compared to married people. Similarly, they found that persons who were single, but had been previously married were also more at risk of HIV infection than were married persons.

Given these empirical findings, a binary variable was used to distinguish between participants who were married or cohabiting and participants who indicated that they were single, widowed, separated, or divorced in this study.

5.1.4 Home Province

In South Africa, HIV/AIDS has been associated with the movement of populations, including temporary, circular movements between rural and urban areas and movements across borders (de Gruchy & Vearey, 2020; Vearey, 2012; Coffee *et al.*, 2007; Crush *et al.*, 2005).

Furthermore, given that the construction industry attracts a significant amount of international and domestic migrants (Araia *et al.*, 2010; Meintjes *et al.*, 2007), a binary variable distinguishing between participants who indicated that the Western Cape was their home province and participants from other provinces was computed to estimate the effect of migration on HIV-related health behaviours in this study.

5.1.5 Employment Status

Much of the empirical research on HIV/AIDS in the construction industry has typically included an indicator of the employment status. For example, Bowen *et al.* (2018; 2008) observed that workers employed on a non-permanent basis were more at risk of HIV infection than permanently employed workers. Similarly, non-permanently employed workers have been found to be more likely to not have tested for HIV/AIDS and to test less frequently as compared to permanently employed workers (Bowen *et al.*, 2014).

Given these empirical findings, a binary variable distinguishing between participants employed on a casual or on a contract basis and participants employed on a permanent basis was computed to estimate the effect of employment status on HIV-related health behaviours in this study.

5.2 Experiential Variables

In this study, experiential variables refer to statistics that describe the changing social context of HIV prevention and treatment in South Africa, stemming from in particular, increased ART coverage and the scaling up of PHIs.

The following binary variables (1 = yes and 0 = no) were included in the study to reflect the lived experiences associated with the changing social context of HIV prevention and treatment.

5.2.1 History of STI

Previous diagnosis with a sexually transmitted infection (henceforth STI) other than HIV has been identified as an HIV risk factor (Truong *et al.*, 2015; Kalichman *et al.*, 2011; Hayes *et al.* 2010). Furthermore, presumptive testing and treatment of STI's have been recommended as a critical part of comprehensive HIV prevention and treatment programmes for populations at increased risk (Jones *et al.*, 2020). Given this background, the study distinguished between respondents who indicated that they had previously contracted an STI (other than HIV) and those who had never been diagnosed with an STI.

5.2.2 Do you know a PLHIV?

South Africa has one of the largest HIV burdens in the world with a prevalence rate of about 13% in the entire population, or 20.6% among those aged 15 to 49 years (HSRC, 2018). Given the relatively high prevalence of HIV in the country, the study distinguished between respondents who indicated that they knew a PLHIV and those who did not know a PLHIV.

5.2.3 Do you know where to access ARV medication?

Since 2008, ART coverage in South Africa has significantly improved (van Schalkwyk *et al.*, 2021). However, higher rates of attrition have been observed among males as compared to females (Cassidy *et al.*, 2023). Given the local context of ART coverage, the study distinguished between respondents who indicated that they knew where to access ART in their community and those who did not know where to access such services.

5.2.4 Do you know anyone currently on ARV medication?

Given the use of ARV medication both as treatment for persons with HIV and as a pre-exposure prophylaxis (PrEP), the study distinguished between respondents who knew someone currently on ARV medication and those who did not know anyone currently on ARV medication.

5.2.5 Do you know someone who has died because of AIDS?

Given the relatively high HIV incidence in the country, the study distinguished between respondents who knew someone who had died from AIDS and those who did not know anyone who had died from AIDS.

5.3 Dependent Variables

Three core dependent variables are used to examine condom use and HIV testing behaviour in the study.

5.3.1 Consistent Condom Use

Empirical evidence suggests that condom use is greater within new and casual sexual relationships than within long-term and primary relationships. Consequently, a distinction is drawn between condom use with regular sex partners, casual sex partners and sex workers in this study. The distinction between different types of sexual partners presumably reflects contextual factors within intimate and sexual relationships that may potentially influence condom use (Williams *et al.*, 2001).

Consistent condom use is defined as the number of times a condom is used in a specified period. It is measured retrospectively in the questionnaire by a series of items which asked respondents to report how often they used condoms in the last 3 months with either and/or a regular sex partner, a casual sex partner and/or a sex worker. While this measure is susceptible to recall bias, it captures a broader range of behaviour over a longer period, providing more detailed information than the alternative item in the questionnaire asking respondents whether they used a condom at last sex. For all the items, responses were scored on frequency scale, with higher values indicating more consistent condom use in the last 3 months.

5.3.2 Frequency of HIV Testing

Frequency of HIV testing is defined as the number of times a person has had an HIV test in a specified period. Like condom use, it is measured retrospectively by an item in the questionnaire which asked respondents to indicate the number of times they had an HIV test in their lifetime. While this measure provides a comprehensive view of an individual's HIV testing history, and is useful for understanding their long-term behaviour, it may suffer from recall bias and lack of relevance to current trends in HIV prevention such as UTT and SDI. Responses were scored on frequency scale, with higher values indicating more frequent HIV testing in a participants lifetime.

5.3.3 Condom Use Intention

Behavioural intention is defined as “an individual’s subjective probability that they will perform some behaviour” (Fishbein and Ajzen, 1975: 289). Condom use intention was measured in the questionnaire using a series of items which asked respondents to report on how likely they were to use a condom the next time that they have sex with either and/or a regular sex partner, a casual sex partner and/or a sex worker.

Responses were scored on a 5-point likert scale, with 1 indicating ‘extremely unlikely’ and 5 indicating ‘very likely’. And so, higher scores indicate greater levels of intention to use a condom at next sex.

5.4 Independent Variables in the HBM and the TPB

The HBM variable set

The independent variables used to test the HBM as an explanatory model for consistent condom use (figure 10) and HIV testing (figure 11) are shown below. All the variables are latent, and so were computed using factor analytic methods.

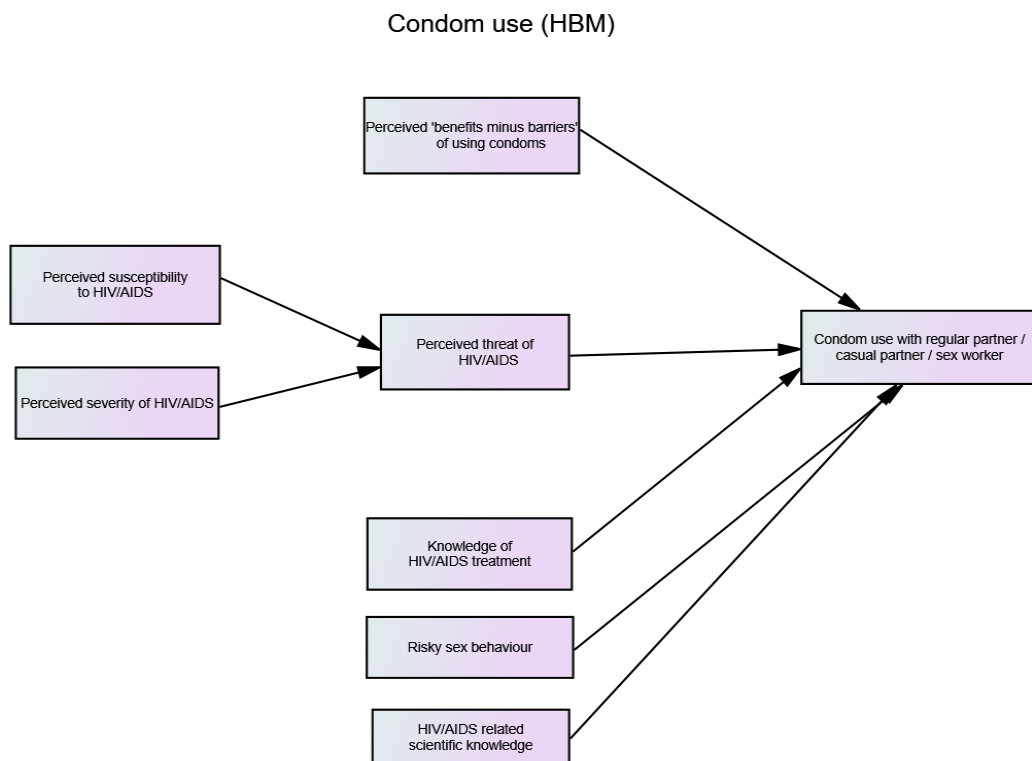


Figure 10 Path diagram of the HBM (condom use)

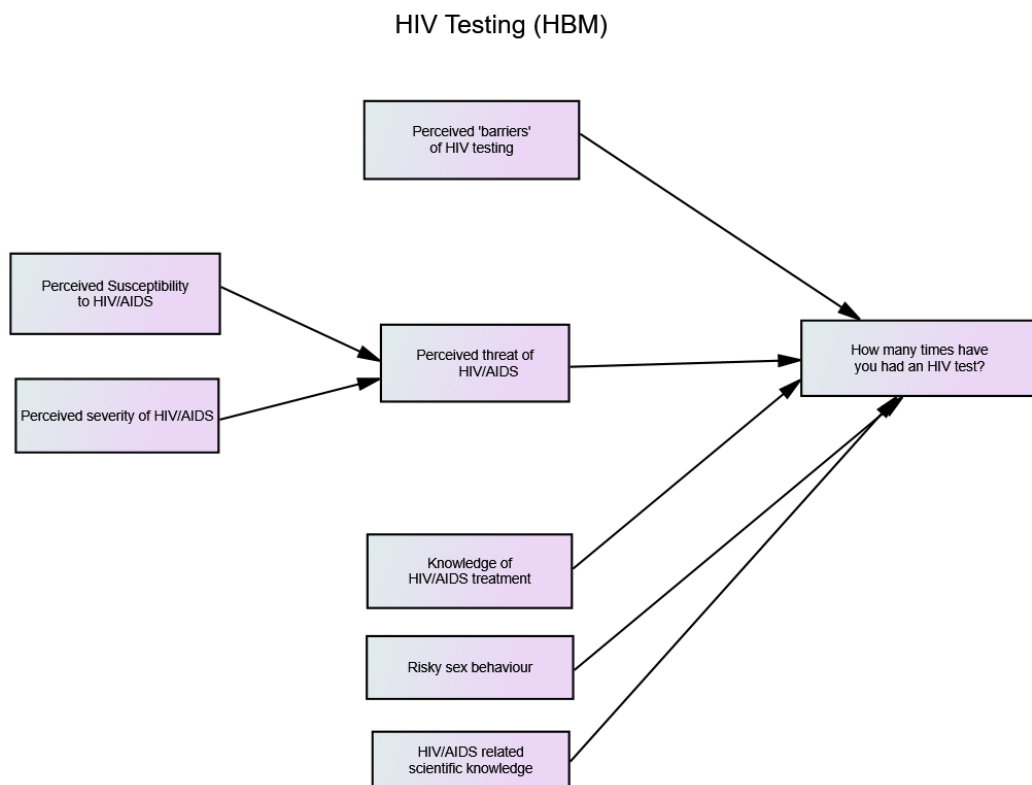


Figure 11 Path diagram of the HBM (HIV testing)

In total, 8 independent variables were computed to empirically test the hypothesized pathways in the HBM. In the remainder of this section, the independent variables are defined, and their measurement and psychometric properties are reported. Further details about the EFA and CFA are shown in the appendix.

5.4.1 HIV/AIDS-related Scientific Knowledge

HIV/AIDS-related scientific knowledge is defined as the level of scientific information that a person possesses about HIV/AIDS. Twelve items from the HIV Knowledge Questionnaire (HIV-KQ) (Carey and Schroder, 2002; Carey *et al.*, 1997) were included in the questionnaire to assess HIV/AIDS-related knowledge.

The HIV-KQ comprises of statements about HIV/AIDS, for which the respondent indicates whether they think a statement is true or false, or they indicate that they ‘don’t know’.

The inter-item correlations between all 12 items were assessed, and both the BToS ($\chi^2=576.6$, $p < 0.001$) and KMO (0.681) confirmed that the items, as a group, were amenable to factor analysis. Maximum likelihood estimation and direct oblimin rotation yielded a possible four-factor solution as per the Guttman-Kaiser criterion (Kaiser, 1992), however for purposes of parsimony, the factor with the highest number of items loading onto it was retained for further analysis.

A CFA was conducted to further confirm this result, resulting in the following model indices confirming excellent fit to the data: χ^2/df ratio = 1.561; CFI = 0.987; RMSEA = 0.043 and a Hoelter’s CN = 598.

An unweighted composite variable was computed by summing the number of items correctly answered. Higher scores indicate greater levels of HIV/AIDS related knowledge. It is important to note that in the creation of the HIV knowledge score, 'don't know' responses were categorized as incorrect. This approach was intended to highlight potential knowledge gaps that could impact HIV-related behaviours. However, it is acknowledged that this might be an oversimplification. Future research should consider alternative methods for handling 'don't know' responses to provide a more nuanced analysis. The computed variable was found to have acceptable internal consistency ($\alpha = 0.661$, CR = 0.665).

5.4.2 Knowledge of HIV/AIDS Treatment

Knowledge of HIV/AIDS treatment is defined as the level of correct information that a person possesses about ART. Six items, comprising of statements about ART, for which the respondent indicates whether a statement is true or false (or don't know) was included in the questionnaire for the purposes of measuring knowledge of HIV/AIDS treatment.

The inter-item correlations between all 6 items were assessed, and both the BToS ($\chi^2=494.702$, $p < 0.001$) and KMO (0.668) confirmed that the items, as a group, were amenable to factor analysis. Based on the Guttman-Kaiser criterion (Kaiser, 1992), factors with an eigenvalue greater than one were retained for subsequent rotation. Maximum likelihood estimation and direct oblimin rotation yielded a single factor explaining 30% of the total shared variance, with four items with factor loadings greater than 0.300.

A CFA was conducted to further confirm this result, resulting in the following model indices confirming excellent fit to the data: χ^2/df ratio = 1.740; CFI = 0.995; RMSEA = 0.049 and a Hoelter's CN = 818.

An unweighted composite variable was computed by summing the number of items correctly answered ('don't' know' responses were scored as incorrect). Higher scores indicate greater levels of knowledge of HIV/AIDS treatment.

The computed variable was found to be internally consistent ($\alpha = 0.752$, CR = 0.756).

5.4.3 Risky Sex Behaviour

Risky sex behaviour is defined as the number of times a person has engaged in activity which increases their likelihood of acquiring a sexually transmitted infection in the 6 months prior to the study. Ten items from a sexual risk survey (Turchik *et al.*, 2010; Turchik & Garske, 2008) were included in the questionnaire to assess a variety of risky sex behaviours. Each item was rated on a frequency scale, where higher values indicate higher levels of engagement in risky sex behaviour in the last 6 months.

The inter-item correlations between the 10 items were assessed, and both the BToS ($\chi^2=1256.872$, $p < 0.001$) and KMO (0.872) confirmed that the items, as a group, were amenable to factor analysis. Maximum likelihood estimation and direct oblimin rotation yielded a two-factor solution as per the Guttman-Kaiser criterion (Kaiser, 1992).

If items were found to be cross loaded, the item was retained on the factor with the highest loading. Factor 1 contained 8 items that described the participant's frequency of engagement in risky sex behaviours in the last 6 months, while factor 2 contained two items which described

their use of drugs and alcohol before sex. Given the broad definition of risky sex behaviour, factor 1 was selected for further analysis.

A CFA was used to examine factor 1, resulting in the following model indices, confirming an excellent fit to the data: χ^2/df ratio = 2.700; CFI = 0.962; RMSEA = 0.074 and a Hoelter's CN = 215.

An unweighted composite variable was computed to measure a participant's engagement in risky sex behaviour by summing the items. Higher scores indicate more frequent engagement in risky sex behaviour in the 6 months prior to the study.

The computed variable was found to have very good internal consistency (α = 0.862; CR = 0.864).

5.4.4 Perceived Severity of HIV

According to Visser *et al.* (2008), "expected stigma is the subjective fear that people will discriminate against an individual, if it is known that they are HIV positive and is not necessarily related to actual stigma" (Visser *et al.* 2008: 11). In this study, perceived severity of HIV is defined as the level of expected stigma attributed to HIV infection. Thus, it is measured using the attributed stigma scale (Visser *et al.*, 2008), which comprises of items examining the generalized perception of how people in a community feel and respond towards those with HIV using a 5-point likert scale.

Specifically, twelve items from the attributed stigma scale (Visser *et al.*, 2008) were included in the questionnaire to measure the perceived severity of HIV. The inter-item correlations between the 12 items were assessed, and both the BToS ($\chi^2=2120.31$, $p < 0.001$) and KMO (0.907) confirmed that the items, as a group, were amenable to factor analysis. Maximum likelihood estimation and direct oblimin rotation yielded a two-factor solution. All item loadings were greater than 0.300 and loaded on one of the two factors as expected (Visser *et al.*, 2008).⁵⁰

A CFA was conducted to further confirm this result, resulting in the following model indices confirming excellent fit to the data: χ^2/df ratio = 1.108; CFI = 0.999; RMSEA = 0.019 and a Hoelter's CN = 736. Results for the EFA and CFA are shown in the appendix. An unweighted composite variable was computed to measure perceived severity of HIV. Higher scores indicate

⁵⁰ Visser *et al.* (2008) have recommended that one factor be interpreted as *blame and moral judgement stigma*, and the other, interpreted as the level of *expected stigma* as a consequence of HIV infection. Both factors are used in this study. Factor 1 is used as an indicator of moral norm and factor 2 is used to measure the perceived severity of HIV/AIDS.

higher levels of perceived severity. The composite variable was determined to have a very good reliability ($\alpha = 0.892$; CR = 0.895).

5.4.5 Perceived ‘Benefits minus Barriers’ of Condom Use

The HBM posits that if an individual’s perceived benefits of condom use outweigh the perceived barriers of condom use, then they will be more likely to use a condom. Six items from the short-form attitude towards condoms scale (ATCS) (Roy *et al.*, 2013) were used to measure perceived ‘benefits minus barriers’ of condom use in this study. The ATCS was particularly useful, because it measures positive and negative attitudes associated with condom use on a five-point likert scale.

The inter-item correlations between the 6 items were assessed, and both the BToS ($\chi^2=533.573$, $p < 0.001$) and KMO (0.604) confirmed that the items, as a group, were amenable to factor analysis. Maximum likelihood estimation and direct oblimin rotation yielded a two-factor solution differentiating between positive (factor 1) and negative (factor 2) attitudes towards condoms. All item loadings were greater than 0.300.

A CFA was conducted to further confirm this result, resulting in the following model indices confirming excellent fit to the data: χ^2/df ratio = 2.541; CFI = 0.976; RMSEA = 0.071 and a Hoelter’s CN = 306.

The respective items were summed to create an unweighted composite variable representing an overall measure of perceived ‘benefits minus barriers’ of condom use.

Unless otherwise stated, higher scores indicate higher perceived benefits of using condoms.

The computed variable was found to have an acceptable internal consistency ($\alpha = 0.680$; CR = 0.593).

5.4.6 Perceived Susceptibility to, and Threat of HIV/AIDS

Perceived susceptibility to HIV/AIDS is defined as a person’s subjective assessment of their risk of contracting HIV/AIDS. Past research has found that individuals who believe that undesirable outcomes are more likely to occur (e.g., HIV/AIDS infection) tend to have higher levels of worry than do individuals who believe that undesirable outcomes are less likely to occur (Berenbaum *et al.*, 2007). For this reason, in this study, perceived threat is defined as an individual’s level of worry about HIV/AIDS.

Eight items from the perceived risk of HIV infection scale (PRHS) (Napper *et al.*, 2012) were used to measure perceived susceptibility to, and threat of HIV/AIDS. The inter-item correlations between the 8 items were assessed and both the BToS ($\chi^2=633.530$, $p < 0.001$) and KMO (0.683) confirmed that the items as a group, were amenable to factor analysis. Maximum likelihood estimation and direct oblimin rotation yielded a two-factor solution as per the Guttman-Kaiser criterion (Kaiser, 1992). All item loadings were determined to be higher than 0.300. One factor contained items describing perceived susceptibility to HIV/AIDS and the other factor contained items describing perceived threat of HIV/AIDS.

A CFA was conducted to further confirm this result, resulting in the following model indices confirming excellent fit to the data: χ^2/df ratio = 2.634; CFI = 0.960; RMSEA = 0.073 and a Hoelter's CN = 240.

Consequently, the respective items were summed to create two unweighted composite variables for factor 1 (perceived susceptibility to HIV/AIDS) and factor 2 (perceived threat of HIV/AIDS). Higher scores indicate higher levels of perceived susceptibility to HIV/AIDS and perceived threat of HIV/AIDS.

Furthermore, the computed variables were found to be internally consistent – perceived susceptibility to HIV/AIDS ($\alpha = 0.700$, CR = 0.671); perceived threat of HIV/AIDS ($\alpha = 0.718$, CR = 0.709).

5.4.7 Perceived Barriers of HIV testing

Perceived barriers of HIV testing refer to biases that an individual may have about HIV testing. These biases interrupt the way individuals process information about the benefits of HIV testing and reduce their likelihood of undertaking an HIV test.

The questionnaire includes seven items drawn from the HIV antibody testing scale (HTAS) (Peltzer & Mpofu, 2002; Boshamer & Bruce, 1999) which were used to measure perceived barriers of HIV testing. The inter-item correlations between the 7 items were assessed, and both the BToS ($\chi^2=1084.823$, $p < 0.001$) and KMO (0.878) confirmed that the items as a group, were amenable to factor analysis. Maximum likelihood estimation and direct oblimin rotation yielded a one factor solution, and all item loadings were greater than 0.300.

A CFA was conducted to further investigate the EFA results and test if the hypothesized measurement model was an appropriate fit to the data. The CFA resulted in the following model indices, confirming excellent fit to the data: χ^2/df ratio = 1.490; CFI = 0.995; RMSEA = 0.040

and a Hoelter's CN = 467.

The respective items were summed to create an unweighted composite variable measuring a participants' perceived barriers to HIV testing. Unless otherwise stated, higher scores indicate higher perceived barriers of HIV testing. The computed variable was found to have a very good internal consistency ($\alpha = 0.886$; CR = 0.884).

The TPB variable set

The independent variables used to test the TPB as an explanatory model for condom use intention (figure 12) and HIV testing (figure 13) are indicated below. All the variables are latent, and so were computed using factor analytic methods.

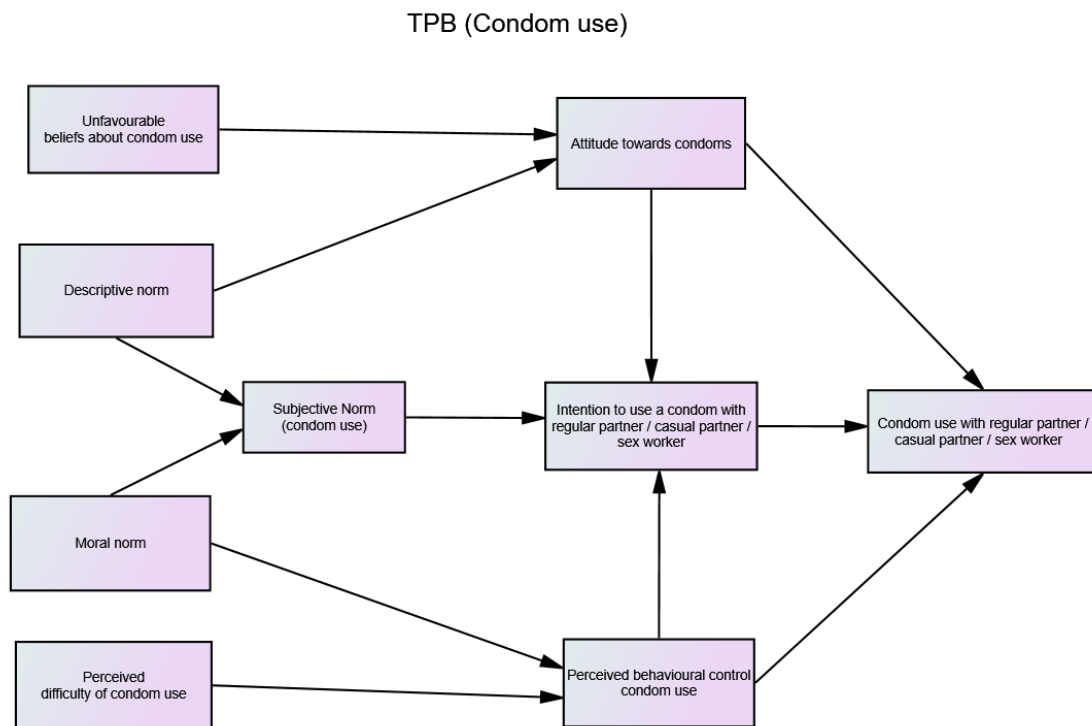


Figure 12 Path diagram of the TPB (condom use)

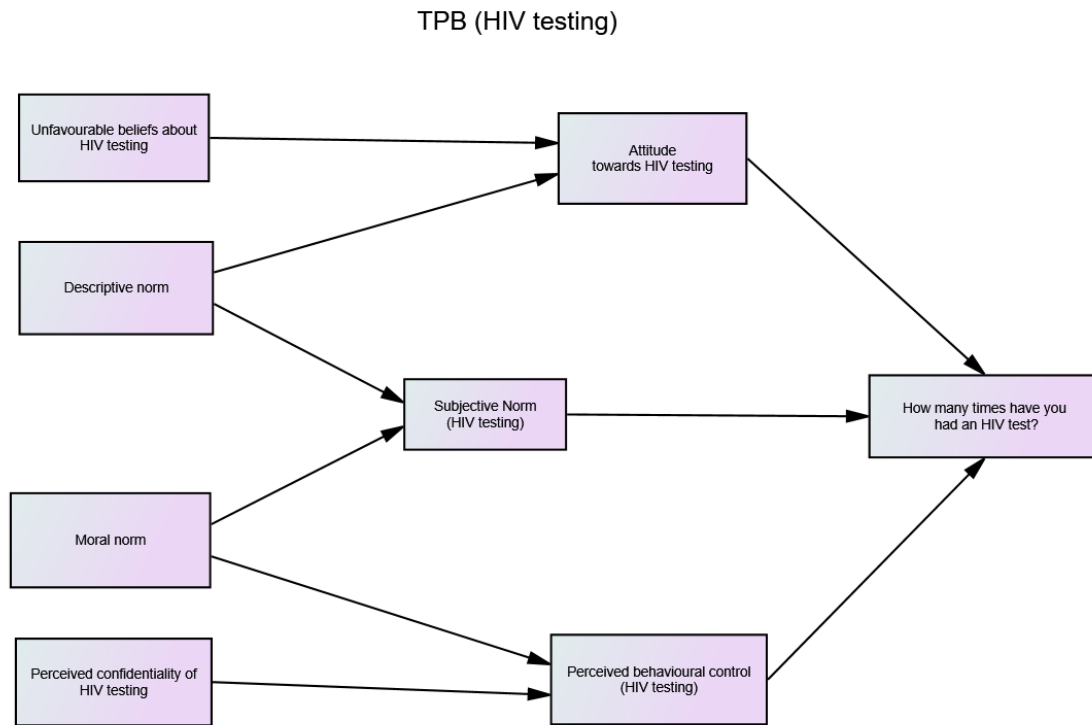


Figure 13 Path diagram of the TPB (HIV testing)

In total 12 independent variables were computed to test the hypothesized pathways in the TPB. In the remainder of this chapter, these independent variables are defined, and their measurement and psychometric properties reported. Further details about the EFA and CFA are shown in the appendix.

5.4.8 Descriptive Norm

Descriptive norm refers to an individual's perception of how the typical person in their community behaves. If a descriptive norm is dominant, an individual may disregard their own opinion or perception in order to fit in with the descriptive norm (Carey *et al.*, 2011).

The historical context of uncertain information and fear associated with HIV/AIDS has led to a proliferation of conspiracy and non-scientific beliefs. Treichler (1999) has influentially located non-scientific beliefs associated with HIV/AIDS within a cultural process in which people generate, reproduce, and perform meanings in an attempt to “understand, however imperfectly, the complex phenomenon of AIDS” (Treichler, 1999: 15).

Using Treichler (1999) as a backdrop, descriptive norm in this study refers to non-scientific

beliefs associated with HIV/AIDS. The questionnaire includes ten items adapted from Govender *et al.* (2017) which assessed non-scientific beliefs about HIV/AIDS among workers in the South African construction industry.

The inter-item correlations between the 10 items were assessed, and the BToS ($\chi^2=1023.544$, $p < 0.001$) and KMO (0.831) confirmed that the items as a group, were amenable to factor analysis. Maximum likelihood estimation and direct oblimin rotation yielded a two-factor solution. However, for purposes of parsimony, one factor was extracted. All but one item had a factor loading lower than 0.300.

A CFA was conducted to further investigate the EFA results and test if the hypothesized measurement model was an appropriate fit to the data. The CFA resulted in the following model indices, confirming excellent fit to the data: χ^2/df ratio = 2.544; CFI = 0.962; RMSEA = 0.071 and a Hoelter's CN = 220.

The respective items were summed to create an unweighted composite variable. Higher scores indicate higher levels of endorsement of non-scientific beliefs about HIV/AIDS.

The computed variable was found to have a very good internal consistency ($\alpha = 0.817$; CR = 0.811).

5.4.9 Moral Norm

Moral norm is measured using the blame and judgement stigma scale (Visser *et al.*, 2008), which comprises of items examining the moral dimension of HIV-related stigma using a 5-point likert scale. The inter-item correlations between the items were assessed and both the BToS ($\chi^2=2120.31$, $p < 0.001$) and KMO (0.907) confirmed that the items as a group, were amenable to factor analysis. Maximum likelihood estimation and direct oblimin rotation yielded a two-factor solution as expected (Visser *et al.* 2008). All item loadings were greater than 0.300.

As per Visser *et al.* (2008), one factor was interpreted as an affective measure of blame and judgement stigma associated with HIV/AIDS and was used as an indicator for moral norm.⁵¹

Consequently, a CFA was performed to corroborate the EFA results, and test if the hypothesized measurement model was an appropriate fit to the data. The CFA resulted in the following model indices, confirming excellent fit to the data: χ^2/df ratio = 2.524; CFI = 0.990; RMSEA = 0.070 and a Hoelter's CN = 564.

⁵¹ The other factor relates to the level of expected stigma associated with HIV/AIDS and was used as an indicator for perceived severity of HIV/AIDS in the HBM.

The respective items were summed to create an unweighted composite variable measuring moral norm. Unless otherwise stated, higher scores indicate higher levels of associating HIV/AIDS with immoral behaviour and religious punishment.

The computed variable was found to be internally consistent ($\alpha = 0.747$; CR = 0.748).

5.4.10 Subjective Norm about Condom Use

In this study, subjective norm about condom use refers to an individual's perception of whether condom use is approved or disapproved by their sex partner, and the motivation of the individual to comply with their partner's views (see Ajzen, 1991).

The questionnaire included a single 5-point likert item, asking respondents to specify their level of agreement or disagreement with the statement that: "men who use condoms show concern and responsibility to their partner".

This item was used as an indicator of subjective norm about condom use in this study. Higher scores indicate agreement with the statement and so, higher perceived approval of condom use by the partner of the respondent.

5.4.11 Subjective Norm about HIV Testing

In this study, subjective norm about HIV testing refers to an individual's perception of whether their friends and family would be supportive of HIV testing, and the motivation of the individual to comply with the views of their friends and family.

The questionnaire included five items adapted from the HTAS (Peltzer & Mpofu, 2002; Boshamer & Bruce, 1999) which were used to measure subjective norm about HIV testing. The inter-item correlations between the 5 items were assessed, and both the BToS ($\chi^2=1227.972$, $p < 0.001$) and KMO (0.893) confirmed that the items as a group, were amenable to factor analysis. Maximum likelihood estimation and direct oblimin rotation yielded a one factor solution and all item loadings were greater than 0.300.

A CFA was conducted to further investigate the EFA results and test if the hypothesized measurement model was an appropriate fit to the data. The CFA resulted in the following model indices, confirming good fit to the data: χ^2/df ratio = 3.936; CFI = 0.988; RMSEA = 0.097 and a Hoelter's CN = 237.

The respective items were summed to create an unweighted composite variable measuring a participant's subjective norm about HIV testing. Higher scores indicate higher perceived support

of HIV testing by family and friends.

The computed variable was found to have excellent internal consistency ($\alpha = 0.929$; CR = 0.930).

5.4.12 Unfavourable Beliefs about Condom Use

Unfavourable beliefs about condom use refer to misconceptions and beliefs about condoms which contribute to inconsistent condom use.

The questionnaire included four items adapted from the ATCS (Roy *et al.* 2013) which were used to measure unfavourable beliefs about condom use. The inter-item correlations between the 4 items were assessed, and both the BToS ($\chi^2=340.741$, $p < 0.001$) and KMO (0.761) confirmed that the items as a group, were amenable to factor analysis. Maximum likelihood estimation and direct oblimin rotation yielded a one factor solution and all item loadings were greater than 0.300. A CFA was conducted to further investigate the EFA results and test if the hypothesized measurement model was an appropriate fit to the data. The CFA resulted in the following model indices, confirming an excellent fit to the data: χ^2/df ratio = 1.415; CFI = 0.998; RMSEA = 0.037 and a Hoelter's CN = 1006.

The respective items were summed to create an unweighted composite variable measuring a participant's strength of endorsement of unfavourable beliefs about condom use. Higher scores indicate more endorsement of unfavourable beliefs about condom use.

The computed variable was found to have good internal consistency ($\alpha = 0.772$; CR = 0.780).

5.4.13 Unfavourable beliefs about HIV testing

Unfavourable beliefs about HIV testing refer to misconceptions and beliefs about HIV testing which discourage HIV testing.

The questionnaire included six items drawn from the HTAS (Peltzer & Mpofu, 2002) which were used to measure unfavourable beliefs about HIV testing. The inter-item correlations between the 6 items were assessed, and both the BToS ($\chi^2=689.028$, $p < 0.001$) and KMO (0.759) confirmed that the items as a group, were amenable to factor analysis. Maximum likelihood estimation and direct oblimin rotation yielded a one factor solution and all item loadings were greater than 0.300. A CFA was conducted to further investigate the EFA results and test if the hypothesized measurement model was an appropriate fit to the data. The CFA resulted in the following model indices, confirming an excellent fit to the data: χ^2/df ratio = 1.319; CFI = 0.997; RMSEA = 0.032

and a Hoelter's CN = 657.

The respective items were summed to create an unweighted composite variable measuring a participant's strength of endorsement of unfavourable beliefs about HIV testing. Unless otherwise stated, higher scores indicate more endorsement of unfavourable beliefs about HIV testing.

The computed variable was found to have a good internal consistency ($\alpha = 0.788$; CR = 0.770).

5.4.14 Perceived Ease of Condom Use

In this study, perceived ease of condom use is defined as a person's subjective assessment of the relative ease of navigating condom use.

The questionnaire included a single 5-point likert item, asking respondents to specify their level of agreement or disagreement with the statement that: "making sure that I use a condom every time I have sex is beyond my control", which was used as an indicator of perceived ease of condom use in this study.

The variable was reverse scored so that higher scores indicated disagreement with the statement and higher perceived ease of condom use.

5.4.15 Perceived Confidentiality of HIV Testing

In this study, perceived confidentiality of HIV testing is defined as a person's subjective assessment of the confidentiality of HIV testing.

The questionnaire included a single 5-point likert item, asking respondents to specify their level of agreement or disagreement with the statement that: "I trust the HIV counsellors and nurses to keep my information confidential", which was used as an indicator of perceived confidentiality of HIV testing in the study.

Higher scores indicate agreement with the statement and higher perceived confidentiality of HIV testing.

5.4.16 Perceived Control over Condom Use

Perceived control over condom use refers to the degree of control which an individual believes they have in regard to condom use. All else equal, a high level of perceived control over condom use should strengthen a person's intention to use a condom and increase their effort and perseverance towards this action (Ajzen, 2002).

The questionnaire included five items drawn from the condom use self-efficacy scale (Baele *et al.*, 2001), which were used to measure perceived control over condom use. The inter-item correlations between all 5 items were assessed, and both the BToS ($\chi^2=921.678$, $p < 0.001$) and KMO (0.794) confirmed that the items as a group, were amenable to factor analysis. Based on the Guttman-Kaiser criterion (Kaiser, 1992), one factor was extracted. Maximum likelihood estimation and direct oblimin rotation yielded a single factor explaining 58% of the total shared variance. Only items with factor loadings greater than 0.300 were retained.

A CFA was conducted to further investigate the EFA results and test if the hypothesized measurement model was an appropriate fit to the data. The CFA resulted in the following model indices, confirming good fit to the data: χ^2/df ratio = 3.486; CFI = 0.997; RMSEA = 0.090 and a Hoelter's CN = 589.

The respective items were summed to create an unweighted composite variable measuring a respondents perceived control over condom use. Unless otherwise stated, higher scores indicate higher perceived control. The computed variable was found to have excellent internal consistency ($\alpha = 0.909$; CR = 0.906).

5.4.17 Perceived Control over HIV Testing

Perceived control over HIV testing refers to the degree of control which an individual believes he or she has in regard to HIV testing.

The questionnaire included a single 5-point likert item, asking respondents to specify their level of agreement or disagreement with the statement that: "It would not bother me if someone I know sees me going to get an HIV test", which was used as an indicator of perceived control over HIV testing in the study. Higher scores indicate agreement with the statement and higher perceived control over HIV testing.

5.4.18 Positive Attitude Toward Condom Use

Positive attitude toward condom use is defined as an attitudinal disposition which encourages condom use. If an individual has a positive attitude toward condom use, then they are deemed as being likely to use a condom.

Three items from the ATCS (Roy *et al.*, 2013) were used to measure positive attitude toward condom use. The inter-item correlations between the 3 items were assessed, and both the BToS ($\chi^2=533.573$, $p < 0.001$) and KMO (0.604) confirmed that the items, as a group, were amenable

to factor analysis. Maximum likelihood estimation and direct oblimin rotation yielded a two-factor solution. All item loadings were greater than 0.300. A CFA was conducted to further confirm this result, resulting in the following model indices confirming excellent fit to the data: χ^2/df ratio = 2.541; CFI = 0.976; RMSEA = 0.071 and a Hoelter's CN = 306. The respective items were summed to create an unweighted composite variable representing an overall measure of positive attitude toward condom use. Unless otherwise stated, higher scores indicate more positive attitude toward condom use.

The computed variable was found to have acceptable internal consistency ($\alpha = 0.680$; CR = 0.593).

5.4.19 Negative Attitude Toward HIV Testing

Negative attitude toward HIV testing is defined as an attitudinal disposition which discourages HIV testing.

The questionnaire included seven items drawn from the HTAS (Peltzer & Mpofu, 2002) which are used to measure negative attitude toward HIV testing.

The inter-item correlations between the 7 items were assessed, and both the BToS ($\chi^2=1084.823$, $p < 0.001$) and KMO (0.878) confirmed that the items as a group, were amenable to factor analysis. Maximum likelihood estimation and direct oblimin rotation yielded a one factor solution, and all item loadings were greater than 0.300.

A CFA was conducted to further investigate the EFA results and test if the hypothesized measurement model was an appropriate fit to the data. The CFA resulted in the following model indices, confirming excellent fit to the data: χ^2/df ratio = 1.490; CFI = 0.995; RMSEA = 0.040 and a Hoelter's CN = 467. The respective items were summed to create an unweighted composite variable measuring negative attitude toward HIV testing. Unless otherwise stated, higher scores indicate more negative attitude toward HIV testing. The computed variable was found to have a very good internal consistency ($\alpha = 0.886$; CR = 0.884).

6 SAMPLE DESCRIPTION & PRELIMINARY THEORY TESTING

Fried (2020a) has suggested that it is necessary to draw a distinction between *phenomena* and *theory* as a best practice in theory testing, because they are often conflated. In this study, *theory* refers to sets of axioms or assumptions that help explain, predict, and control *phenomena*. Specifically, it refers to the hypothesized pathways in the HBM and the TPB, which explain and predict the phenomena of condom use and HIV testing in the study sample.

A good theory provides an abductive explanation of the phenomenon under investigation (DeYoung & Kreuger, 2020). The search for abductive explanations is the dominant approach to theory testing in the social sciences (Ward *et al.*, 2016). In such an approach, the importance of data lies in the fact that it provides an observational prediction of theory, and by so doing provides empirical evidence of how best the theory explains the phenomenon under investigation. In the abductive approach, if a prediction is supported by the data, then the results are considered to confirm theory. Likewise, if the predictions are not borne out by data, then the theory is not confirmed.

The abductive approach to theory testing (Ward *et al.*, 2016) is adopted in this study and so theory is linked to data and tested using *statistical models* that impose assumptions on the data. Statistical models are useful but imperfect abstractions which break down phenomena into relevant parts, characterize their properties, their interconnections, and the evolution of their changes over time. They help elucidate patterns found in data and are advantageous for testing theories because of their simplicity. However, when employing statistical models for theory testing, it is crucial to remember that theories are meant to explain phenomena, not just the data (Smaldino, 2020).

This chapter begins with a brief overview of the key sample characteristics, and then proceeds to analyse differences among these sample characteristics using a test of difference. Specifically, *t-tests* were used to compare the mean scores on the respective variables computed to test the HBM and TPB across key socio-demographic, experiential and behavioural characteristics of the study participants.

After the *t-tests*, regression modelling was used to investigate the relationship between the hypothesized predictors and outcome variables. Specifically, HLR was used to examine the proportion of variance in consistent condom use, condom use intention and HIV testing explained by the independent variables as specified in the HBM and the TPB.

6.1 Socio-demographic, Experiential, and Behavioural Characteristics of Participants

All the study participants were male, with their ages ranging between 18 and 63 years ($m = 34.9$), of which there were slightly more participants under 35 years ($n = 175$; 56.5%). About half of the participants reported that they had completed secondary school ($n = 140$; 45.2%) and that they were single ($n = 156$; 50.3%). A majority of the study participants reported that the Western Cape was their home province ($n = 193$; 62.3%) and that they were employed as either casual or contract staff ($n = 161$; 51.9%) (see Table 6.1).

Table 6.1 Socio-demographic characteristics of study participants ($n=310$)

Demographic groups	Total 310	%
Age		
Under 35	175	56.5
36 and older	135	43.5
Marital status		
Single	156	50.3
Married / Cohabiting	154	49.7
Education		
Did not complete secondary school	170	54.8
Completed secondary school	140	45.2
Work Status		
Casual or Contract	161	51.9
Permanent	149	48.1
Home Province		
Western Cape	193	62.3
Other	117	37.7

The behavioural variables reported in the study (see Table 6.2) are a participants' history of HIV testing and condom use with different types of partners. A minority ($n = 93$; 30.0%) of participants had never had an HIV test, and slightly more than half ($n = 162$; 52.3%) did not use a condom at last sex with a regular sex partner. About two thirds ($n = 132$; 68.8%) of participants who indicated that they had engaged in sex with a casual sex partner used a condom, and 4 out of 10 of participants (37.8%) who indicated that they had engaged in sex with a sex worker did not use a condom at last sex.

Table 6.2 Behavioural characteristics of study participants (n=310)

Behavioural categories	Total 310	%
<i>HIV testing history</i>		
Never been tested	93	30.0
Previously been tested	217	70.0
<i>Condom use (last time you had sex with regular partner)</i>		
Yes	148	47.7
No	162	52.3
<i>Condom use (last time you had sex with someone you don't know very well)*</i>		
Yes	132	68.8
No	60	31.2
<i>Condom use (last time you had sex with a sex worker)+</i>		
Yes	97	62.2
No	59	37.8

⁺(n =156); ^{*}(n = 192)

The connection between STI's and HIV has been referred to as “epidemiological synergy” by Wasserheit (1992), who notes that both ulcerative and nonulcerative STI's increase the risk of HIV transmission. Given this fundamental association, previous STI was included in the study as an experiential variable. A majority of the study participants indicated that they had never contracted an STI in their lifetime ($n = 275$; 88.7%).

Progressive national health policies (such as UTT and SDI), and PHIs, especially the introduction of PrEP – has not occurred without controversy (Langwenya *et al.* 2018; Mei *et al.*, 2011; Grulich & Wilson, 2010). For instance, concern has been raised that PrEP may lull people into a false sense of confidence and to think that they no longer need preventive measures such as condoms (Freeborn & Portillo, 2018; Baeten *et al.*, 2012; Crepaz *et al.*, 2004). Given the possible impact of PHIs such as PrEP on risk behaviour, participants were differentiated according to whether they knew a person currently taking ARV medication or not; and whether they knew where to obtain ARV medication and treatment in their community or not.

More than half of study participants ($n = 180$; 58.1%) indicated that they did not know anyone currently taking ARV medication. Despite this, a majority of the participants ($n = 207$; 66.8%) indicated that they knew where to obtain ARV medication and treatment in their community if they ever required it. Knowing someone who has died from AIDS was included as an experiential proxy of the severity of HIV/AIDS. Slightly more than half of the respondents ($n = 169$; 54.5%) indicated that they knew someone who had died because of HIV/AIDS (see Table 6.3).

Table 6.3 Experiential characteristics of study participants (n=310)

Experiential categories	Total 310	%
<i>History of STI</i>		
Yes	35	11.3
No	275	88.7
<i>Do you know anyone currently taking ARV medication?</i>		
Yes	130	41.9
No	180	58.1
<i>Do you know where to obtain ARV medication?</i>		
Yes	207	66.8
No	103	33.2
<i>Do you know someone who has died because of AIDS?</i>		
Yes	169	54.5
No	141	45.5
<i>Do you know a person living with HIV?</i>		
Yes	158	51
No	152	49

6.2 Pre-Path Analysis Assessment of the HBM Constructs

In this section, tests of difference were used to examine the empirical relationship between the different predictors of health behaviour hypothesized in the HBM and the socio-demographic and experiential characteristics of respondents. Thereafter HLR was used to examine the linear and direct associations between the HBM variables and the dependent variables.

6.2.1 Socio-demographic Groups & Independent Variables in the HBM

Independent sample t-tests were conducted to compare the mean scores on the respective variables computed to test the HBM across socio-demographic categories. Statistically significant differences in scores of the HBM variables were observed for all the socio-demographic categories except for work status.

In other words, whether a participant was permanently employed or not, was not found to be statistically significant in differentiating between the mean scores of any of the independent variables computed to test the HBM (see Table 6.4).

Table 6.4 T-tests (Socio-demographic characteristics and mean scores of independent variables in the HBM)

	Perceived Susceptibility to HIV/AIDS	Perceived threat of HIV/AIDS	HIV/AIDS related scientific knowledge	Knowledge of HIV treatment	Risky sex behaviour	Perceived severity of HIV	Perceived benefits minus barriers of using condoms	Perceived barriers of HIV testing
Age								
Under 35	2.801	9.051	6.497	4.200	1.561	1.607	3.533	2.086
36 and older	2.900	9.482	6.044	4.193	1.427	1.794	3.603	2.205
(t)	(-1.399)	(-0.926)	(1.480)	(0.068)	(1.986)*	(-2.151)*	(-0.950)	(-1.155)
Marital status								
Single	2.925	9.635	6.109	4.218	1.631	1.638	3.599	2.070
Married / Long-term relationship	2.763	8.838	6.494	4.175	1.373	1.739	3.527	2.207
(t)	(2.324)*	(1.785)	(-1.267)	(0.393)	(3.925)*	(-1.168)	(1.002)	(-1.338)
Education								
Did not complete secondary school	2.882	9.453	5.629	4.171	1.449	1.761	3.434	2.188
Completed secondary school	2.798	8.979	7.114	4.229	1.569	1.600	3.720	2.077
(t)	(1.182)	(1.054)	(-5.161)*	(-0.532)	(-1.778)	(1.851)	(-4.042)*	(1.110)
Work Status								
Casual or Contract	2.808	9.509	6.298	4.193	1.554	1.733	3.574	2.147
Permanent	2.884	8.946	6.302	4.201	1.448	1.640	3.553	2.128
(t)	(-1.097)	(1.257)	(-0.013)	(-0.081)	(1.576)	(1.079)	(0.289)	(0.194)
Home province								
Western Cape	2.786	8.689	6.342	4.306	1.468	1.686	3.522	2.151
Other	2.940	10.145	6.231	4.017	1.560	1.692	3.633	2.116
(t)	(-2.144)*	(-3.198)*	(0.379)	(2.607)*	(-1.316)	(-0.074)	(-1.493)	(0.330)

*t-values in brackets; * $p < 0.050$*

Age

There was a statistically significant difference in risky sex behaviours ($t(308) = 1.986, p = 0.048$) across the two age cohorts, with respondents under 35 years more likely to engage in risky sex behaviours compared to those 36 years and older. This finding aligns with the hypothesis that older persons are less inclined to take risks that concern their health status (Duell *et al.*, 2018; Rolison *et al.*, 2013). In contrast, respondents 36 years and older scored higher on the perceived severity of HIV/AIDS variable than their younger counterparts ($t(308) = -2.151, p = 0.032$). This may reflect the greater responsibilities carried by older workers and their concerns about the impact of HIV/AIDS on their ability to fulfil such responsibilities. Naugle *et al.* (2019), for example, have noted that some men remain reluctant to get an HIV test because they view the possibility of an HIV-positive result as a direct threat to their agency in terms of family obligations, work, and financial success.

Marital status

There was a statistically significant difference in risky sex behaviours ($t(304) = 3.925, p < 0.001$) and perceived susceptibility to HIV/AIDS ($t(294) = 2.324, p = 0.021$) across marital status. Specifically, single respondents were more likely to engage in risky sex behaviours compared to respondents who were married or in a long-term relationship. This finding aligns with Tlou (2019), who found that the risk of HIV infection for single, divorced, or widowed persons in South Africa was twice as high as the risk for married persons.

Single respondents were also found to be more likely to perceive themselves as being susceptible to HIV/AIDS as compared to married respondents. This corroborates with Shisana *et al.*, (2004), who found a statistically significant association between marital status and HIV risk perceptions in a South African sample.

Education

There was a statistically significant difference in HIV/AIDS related scientific knowledge across the two education categories ($t(308) = -5.161, p < 0.001$), with participants who completed secondary school more likely to have higher levels of HIV/AIDS related scientific knowledge compared to those who had not completed secondary school. This finding aligns with the literature which suggests that education may address misinformation or non-scientific beliefs about HIV/AIDS by building in individuals the capacity to process and understand risks related to HIV/AIDS (Speizer *et al.*, 2020; Zimmerman & Woolf, 2014).

Relatedly, education was found to be significantly associated with perceived ‘benefits minus barriers’ of using condoms ($t(308) = -4.042, p < 0.001$), with participants who had completed secondary school more likely to appreciate the benefits of using condoms than participants who had not completed secondary school. The association between education and condom use as well as education and HIV/AIDS knowledge aligns with the literature on HIV-related health behaviours of workers in the South African construction industry (see Bowen *et al.*, 2017; Bowen *et al.*, 2016).

Home Province

There was a statistically significant difference in perceived susceptibility to HIV/AIDS ($t(308) = -2.144, p = 0.033$), and perceived threat of HIV/AIDS ($t(308) = -3.198, p = 0.002$) across home province, with respondents from provinces other than the Western Cape more likely to perceive themselves as being susceptible to HIV/AIDS, and more likely to view HIV/AIDS as a threat to their well-being, as compared to respondents from the Western Cape.

The association between risk perceptions and migration is complex. For many migrants, relocation involves uncertainty and an acceptance of risk associated with a new physical and socio-economic environment, including HIV/AIDS. It is also possible that respondents from Western Cape perceive themselves to be at lower risk because HIV prevalence has been consistently lower in the Western Cape than in the other provinces (HSRC, 2023; 2018).

Furthermore, respondents from Western Cape were more likely to have higher knowledge about HIV/AIDS treatment services available in the province than respondents from other provinces ($t(308) = 2.607, p = 0.010$). This finding is expected and aligns with studies which have found the migratory experience to be associated with difficulties in accessing social and health services (Vearey, 2018).

6.2.2 Experiential Categories & Independent Variables in the HBM

Independent sample t-tests were conducted to compare the mean scores on the respective HBM independent variables across experiential categories (see Table 6.5). Statistically significant differences in scores of the HBM variables were observed for all the experiential categories.

Table 6.5 T-tests (Experiential categories and mean scores of independent variables in the HBM)

	Perceived Susceptibility to HIV/AIDS	Perceived threat of HIV/AIDS	HIV/AIDS related scientific knowledge	Knowledge of HIV treatment	Risky sex behaviour	Perceived severity of HIV	Perceived benefits minus barriers of using condoms	Perceived barriers of HIV testing
<i>History of STI</i>								
Yes	2.871	10.514	7.171	4.371	1.754	1.781	3.657	2.102
No	2.841	9.076	6.189	4.175	1.471	1.676	3.552	2.142
	(0.276)	(2.042)*	(2.057)*	(0.838)	(2.324)*	(0.762)	(0.927)	(-0.248)
<i>Do you know anyone currently taking ARV medication?</i>								
Yes	2.887	9.954	6.315	4.231	1.519	1.478	3.639	2.020
No	2.814	8.722	6.289	4.172	1.491	1.840	3.509	2.230
	(1.025)	(2.742)*	(0.086)	(0.533)	(0.412)	(-4.402)*	(1.727)	(-1.961)
<i>Do you know where to obtain ARV medication?</i>								
Yes	2.853	9.701	6.416	4.213	1.528	1.573	3.598	2.048
No	2.828	8.311	6.068	4.165	1.452	1.919	3.494	2.318
	(0.336)	(2.959)*	(1.078)	(0.481)	(1.074)	(-3.546)*	(1.369)	(-2.490)*
<i>Do you know someone who has died because of AIDS?</i>								
Yes	2.825	9.633	6.396	4.243	1.535	1.569	3.618	1.997
No	2.867	8.766	6.184	4.142	1.465	1.831	3.498	2.307
	(-0.591)	(1.936)	(0.694)	(0.926)	(1.036)	(-3.045)*	(1.698)	(-3.049)*
<i>Do you know a person living with HIV?</i>								
Yes	2.892	9.943	6.589	4.298	1.551	1.562	3.642	2.004
No	2.794	8.507	6.000	4.092	1.452	1.819	3.481	2.277
	(1.402)	(3.255)*	(1.945)	(1.912)	(1.471)	(-2.997)*	(2.247)*	(-2.690)*

t-values in brackets * $p < 0.050$

History of STI

There was a statistically significant difference in perceived threat of HIV/AIDS ($t(308) = 2.042$, $p = 0.042$) across the two categories of the history of STI variable, with respondents who indicated that they had previously contracted an STI more likely to perceive HIV/AIDS as a threat to their health compared to those who indicated that they had never been diagnosed with an STI. This finding aligns with the hypothesis that past behaviour has an effect on future behavioural decisions (Albarracin & Wyer, 2000). Relatedly, respondents who indicated that they had previously contracted an STI were more likely to have higher levels of HIV/AIDS-related scientific knowledge than those who indicated that they had never been diagnosed with

an STI ($t(308) = 2.057, p = 0.041$). Given that HIV is sexually transmitted, it is probable that a previous STI diagnosis exposes an individual to more knowledge about STI's in general, including HIV/AIDS.

Furthermore, respondents who indicated that they had previously contracted an STI were more likely to have engaged in risky sex behaviours than those who indicated that they had never been diagnosed with an STI ($t(40) = 2.324, p = 0.025$). This association between history of STI and risky sex behaviour concurs with studies which have identified history of STI as a marker of risky sex behaviour (Cohen *et al.*, 2019).

Do you know anyone currently taking ARV medication?

While the relationship between perceived threat of HIV/AIDS and ARV medication is complex (Pike *et al.*, 2023), it is possible that an individual's perception of the threat posed by HIV is influenced by the behaviour of others around them as well as the broader socio-economic and cultural context (Eisenberg, 1977). There was a statistically significant difference in perceived threat of HIV/AIDS ($t(308) = 2.742, p = 0.006$), with respondents who indicated that they know someone currently taking ARV medication more likely to perceive HIV/AIDS as a threat to their health compared to those who indicated that they did not know someone currently taking ARV medication.

In contrast, respondents who indicated that they know someone currently taking ARV medication were found to be less likely to perceive HIV as being severe as compared to those who indicated that they did not know someone currently taking ARV medication ($t(307) = -4.402, p < 0.001$). ARV medication may modify risk perceptions by showing an individual how an HIV-positive diagnosis can be managed chronically (Doyle *et al.*, 2014).

Do you know where to obtain ARV medication?

There was a statistically significant difference in perceived threat of HIV/AIDS ($t(308) = 2.959, p = 0.003$), with respondents who indicated that they knew where to obtain ARV medication more likely to perceive HIV/AIDS as a threat to their health than those who indicated that they did not know where to obtain ARV medication. In contrast, there was a statistically significant difference in perceived severity of HIV ($t(167) = -3.546, p < 0.001$), with respondents who indicated that they knew where to obtain ARV medication less likely to perceive HIV as being severe as compared to those who did not know where to obtain ARV medication.

Furthermore, respondents who did not know where to obtain ARV medication were more likely to perceive barriers preventing them from getting an HIV test than those who indicated that

they knew where to obtain ARV medication ($t(308) = -2.490, p = 0.013$). Given that HIV testing is an entry point for the initiation of ART, and most of the hospitals (including mobile clinics) offer HIV testing and counselling services in addition to the provision of ARV's, this association is expected. Thus, this association suggests that knowledge of where to obtain ARV medication in the community may be an indicator of an individuals' awareness of the other available HIV/AIDS services including HIV testing, counselling, and treatment in their community.

Do you know a PLHIV?

There was a statistically significant difference in perceived threat of HIV/AIDS ($t(308) = 3.255, p = 0.001$), with respondents who indicated that they know a PLHIV more likely to perceive HIV/AIDS as a threat to their health compared to those who indicated that they did not know a PLHIV. Similarly, respondents who indicated that they know a PLHIV were more likely to appreciate the benefits of using condoms than respondents who did not know a PLHIV ($t(308) = 2.247, p = 0.025$).

Viewed together, these findings suggest that knowing a PLHIV may increase an individual's threat perception as well as their perception of the benefits of condom use. In contrast, respondents who indicated that they know a PLHIV were less likely to perceive HIV as being severe compared to those who did not know a PLHIV ($t(308) = -2.997, p = 0.003$). They were also less likely to perceive barriers preventing them from getting an HIV test ($t(308) = -2.690, p = 0.008$).

The implication of this finding is that respondents who do not know a PLHIV have overall more negative perceptions about HIV testing, as well as the severity of HIV. It is probable that knowing a PLHIV increases an individual's perceived risk of contracting HIV and as a result encourages preventive action, including condom use and HIV testing. It may also provide a lived experience of how an HIV positive diagnosis may be managed chronically, and thus explain why respondents who do not know a PLHIV perceive HIV as being more severe than respondents who do know a PLHIV.

Do you know someone who has died because of AIDS?

There was a statistically significant difference in barriers of HIV testing ($t(308) = -3.049, p = 0.002$), with respondents who indicated that they knew someone who had died from AIDS less likely to perceive barriers preventing them from getting an HIV test compared to those who did not know someone who had died from AIDS. This finding confirms the hypothesized

association between cues and preventive health action as postulated in the HBM. From the HBM, it is expected that a cue to action such as the death of a person in an individuals' network will encourage preventive health action such as HIV testing.

Relatedly, there was a statistically significant difference in perceived severity of HIV ($t(308) = -3.045, p = 0.003$), with respondents who indicated that they knew someone who had died from AIDS less likely to perceive HIV as severe compared to those who did not know someone who had died from AIDS. AIDS is the last stage of HIV infection that occurs when the body's immune system is badly damaged by HIV, but a lack of information combined with outdated beliefs may lead people to conflate HIV with AIDS. This finding suggests that knowing someone who has died from AIDS may help individuals draw a distinction between HIV and AIDS in terms of severity.

6.2.3 Regression Analyses of the HBM Variables

The HBM variables were entered into an HLR model as predictors of a) consistent condom use (across different partner types) and b) frequency of HIV testing. The sequencing of the predictors was determined by the relationships postulated in the HBM. In particular, the antecedent variables – that is, those variables hypothesized to have an indirect relationship with the outcome variable were considered as one block (model 1). In model 2, the variables hypothesized to have a direct relationship with the outcome variable were included. Through this sequencing approach, the unique effects of the constructs hypothesized to be indirectly and directly related to the outcome variable were empirically estimated (see Table 6.6).

Table 6.6: Hierarchical linear regression analyses assessing the relationship between HBM constructs and condom use and HIV testing

	Condom use with regular sex partner ^a		Condom use with someone you don't know very well ^b		Condom use with a sex worker ^c		HIV testing	
	N = 310		N = 180		N = 152		N = 310	
	Standardized β	Sig.	Standardized β	Sig.	Standardized β	Sig.	Standardized β	Sig.
Antecedent Variables (Model 1)								
Perceived susceptibility to HIV/AIDS	0.068	0.230	-0.063	0.404	-0.026	0.755	-0.008	0.887
Perceived severity of HIV	-0.111	0.051	-0.028	0.705	0.048	0.561	-0.088	0.123
R²	0.016	0.078	0.005	0.646	0.003	0.808	0.008	0.299
R² change	0.016	0.078	0.005	0.646	0.003	0.808	0.008	0.299
Model 2								
Perceived susceptibility to HIV/AIDS	0.016	0.782	-0.116	0.094	-0.073	0.341	-0.036	0.536
Perceived severity of HIV	-0.101	0.070	-0.047	0.476	0.014	0.848	-0.060	0.293
Perceived threat of HIV/AIDS	0.185	0.002*	0.182	0.000*	0.162	0.040*	0.153	0.011*
Knowledge of HIV/AIDS treatment	0.043	0.445	0.133	0.047*	0.111	0.148	0.107	0.054
Risky sex Behaviour	0.052	0.365	0.152	0.025*	0.217	0.005*	-0.116	0.041*
HIV/AIDS related scientific knowledge	0.130	0.025*	0.165	0.016*	0.163	0.039*	0.217	0.000*
Perceived benefits minus barriers of condoms	0.096	0.099	0.317	0.000*	0.225	0.004*		
Perceived barriers of HIV testing							-0.094	0.105
R²	0.092	0.000*	0.270	0.000*	0.228	0.000*	0.103	0.000*
R² change	0.076	0.000*	0.265	0.000*	0.225	0.000*	0.095	0.000*

Dependent variable: In the last 3 months, how often did you use a condom with a, b, c; How many times have you had an HIV test?

* $p < 0.050$

Overall, the results showed that the antecedent variables were not statistically significant predictors of condom use with a regular sex partner ($F(2,307) = 2.573, p = 0.078, R^2 = 0.016$); condom use with a casual sex partner ($F(2,177) = 0.437, p = 0.646, R^2 = 0.005$); condom use with a sex worker ($F(2,149) = 0.214, p = 0.808, R^2 = 0.003$) and HIV testing ($F(2,307) = 1.211, p = 0.299, R^2 = 0.008$). This result suggests that perceived susceptibility to HIV/AIDS and perceived severity of HIV do not provide a good explanation for consistent condom use or frequency of HIV testing without the inclusion of other HBM variables.

Model 2 showed significant improvement in proportion of variance explained.⁵² When the HBM variables hypothesized to have a direct relationship were included, the model accounted for 9.2% of the variance explained in consistent condom use with a regular partner; 27% of the variance explained in consistent condom use with a casual sex partner; 22.8% of the variance explained in consistent condom use with a sex worker and 10.3 % of the variance explained in frequency of HIV testing. It is important to note that none of the antecedent variables were found to be statistically significant in Model 2. However, this may be a result of the assumption of linear and direct relationships between each independent variable and the outcome variable assumed in HLR.

The results of the HLR are reported in more detail below:

Consistent condom use:

For condom use with a regular sex partner, perceived threat of HIV/AIDS ($\beta = 0.185, p = 0.002$) and HIV/AIDS-related scientific knowledge ($\beta = 0.130, p = 0.025$) variables were found to be statistically significant. Specifically, respondents who perceived HIV/AIDS to be a threat to their health and those who had higher levels of HIV/AIDS-related scientific knowledge were found to be more likely to have consistently used a condom with a regular sex partner in the last 3 months.

For condom use with a casual sex partner, perceived threat of HIV/AIDS ($\beta = 0.182, p < 0.001$), knowledge of HIV/AIDS treatment ($\beta = 0.133, p = 0.047$), risky sex behaviour ($\beta = 0.152, p = 0.025$), HIV/AIDS-related scientific knowledge ($\beta = 0.165, p = 0.016$), and perceived benefits minus barriers of using condoms ($\beta = 0.317, p < 0.001$) variables were found to be statistically significant. Respondents who perceived HIV/AIDS to be a threat to their health, those who had

⁵² condom use with regular sex partner ($F(7,302) = 4.345, p = 0.000, R^2 = 0.092$); condom use with a casual sex partner ($F(7,172) = 9.077, p = 0.000, R^2 = 0.270$); condom use with a sex worker ($F(7,144) = 6.069, p = 0.000, R^2 = 0.228$); HIV testing ($F(7,302) = 4.943, p = 0.000, R^2 = 0.103$)

more information about HIV/AIDS treatment services in their community, those who engaged more frequently in risky sex behaviours, those with higher levels of HIV/AIDS-related scientific knowledge and those who perceived the benefits of using condoms as outweighing its risks, were more likely to have used condoms consistently with a casual sex partner in the last 3 months.

For condom use with a sex worker, perceived threat of HIV/AIDS ($\beta = 0.162, p = 0.040$), risky sex behaviour ($\beta = 0.217, p = 0.005$), HIV/AIDS-related scientific knowledge ($\beta = 0.163, p = 0.039$), and perceived benefits minus barriers of using condoms ($\beta = 0.225, p = 0.004$) variables were found to be statistically significant. Thus, respondents who perceived HIV/AIDS to be a threat to their health, those who engaged more frequently in risky sex behaviours, those with higher levels of HIV/AIDS-related scientific knowledge and those who perceived the benefits of using condoms as outweighing the risks, were more likely to have consistently used a condom with a sex worker in the last 3 months.

HIV testing:

For HIV testing, perceived threat of HIV/AIDS ($\beta = 0.153, p = 0.011$), HIV/AIDS-related scientific knowledge ($\beta = 0.217, p < 0.001$), and risky sex behaviour ($\beta = -0.116, p = 0.041$) variables were found to be statistically significant. Respondents who perceived HIV/AIDS to be a threat to their health, those who had higher levels of HIV/AIDS-related scientific knowledge, and those who engaged in risky sex behaviours less frequently were determined to be more likely to have been tested for HIV.

6.3 Pre-Path Analysis Assessment of the TPB Constructs

As a complement to the pre-path analysis assessment of the HBM, independent sample t-tests and HLR were also used to examine the relationship between the different predictors of health behaviour hypothesized in the TPB and the socio-demographic, behavioural and experiential characteristics of respondents.

6.3.1 Socio-demographic Groups & Independent Variables in the TPB

In this section, the results of independent sample t-tests comparing the mean scores on the respective variables computed to test the TPB across socio-demographic categories are reported. Statistically significant differences in constructs were observed for all the socio-demographic groupings except for age and marital status (see Table 6.7).

Table 6.7 T-tests (Socio-demographic groups and mean scores of independent variables in the TPB)

	Moral norm	Descriptive norm	Subjective norm about condom use	Perceived difficulty of condom use	Unfavourable beliefs about condom use	Unfavourable beliefs about HIV testing	Perceived control over condom use	Perceived confidentiality of HIV testing	Perceived control over HIV testing	Subjective norm about HIV testing	Positive attitude toward condom use	Negative attitude toward HIV testing
Age												
Under 35	1.929	1.937	3.650	2.660	2.389	3.271	2.074	3.350	3.600	3.547	3.533	2.086
36 and older	2.057	1.852	3.430	2.690	2.509	3.246	2.144	3.480	3.560	3.453	3.603	2.205
(t)	(-1.360)	(0.261)	(1.373)	(-0.196)	(-1.066)	(0.174)	(-0.756)	(-0.798)	(0.279)	(0.702)	(-0.950)	(-1.155)
Marital status												
Single	2.045	2.103	3.560	2.790	2.389	3.268	2.072	3.310	3.490	3.385	3.599	2.070
Married / Long-term relationship	1.924	1.695	3.550	2.550	2.494	3.253	2.139	3.510	3.670	3.630	3.527	2.207
(t)	(1.307)	(1.264)	(0.036)	(1.556)	(-0.926)	(0.101)	(-0.727)	(-1.205)	(-1.110)	(-1.854)	(1.002)	(-1.338)
Education												
Did not complete secondary school	2.066	2.500	3.270	2.660	2.515	2.178	2.925	3.200	3.320	3.235	3.434	2.188
Completed secondary school	1.886	1.171	3.900	2.690	2.352	2.017	3.668	3.660	3.900	3.836	3.720	2.077
(t)	(1.992)*	(4.428)*	(-4.066)*	(-0.166)	(1.446)	(1.799)	(-5.508)*	(-2.821)*	(-3.858)*	(-4.783)*	(-4.042)*	(1.110)
Work Status												
Casual or Contract	2.089	2.354	3.520	2.760	2.439	3.258	2.136	3.310	3.500	3.447	3.574	2.147
Permanent	1.873	1.409	3.600	2.570	2.443	3.263	2.072	3.510	3.670	3.571	3.553	2.128
(t)	(2.359)*	(2.993)*	(-0.509)	(1.204)	(-0.031)	(-0.040)	(0.702)	(-1.208)	(-1.103)	(-0.928)	(0.289)	(0.194)
Home province												
Western Cape	1.930	1.404	3.680	2.530	2.525	2.111	3.238	3.630	3.640	3.619	3.522	2.151
Other	2.075	2.718	3.340	2.910	2.303	2.094	3.297	3.040	3.480	3.321	3.633	2.116
(t)	(-1.515)	(-3.860)*	(1.995)*	(-2.293)*	(1.917)	(0.183)	(-0.386)	(3.391)*	(0.975)	(2.117)*	(-1.493)	(0.330)

t-values in brackets; * $p < 0.050$

Education

There was a statistically significant difference in moral norm across the two education categories ($t(307) = 1.992, p = 0.047$), with respondents who did not complete secondary school more likely to endorse beliefs which associate HIV/AIDS with immoral behaviour and religious punishment than those who had completed secondary school. Similarly, respondents who did not complete secondary school were found to be more likely to endorse non-scientific beliefs associated with HIV/AIDS (descriptive norm) ($t(272) = 4.428, p < 0.001$) compared to those who had completed secondary school.

In contrast, respondents who had completed secondary school reported higher levels of approval of condom use ($t(308) = -4.066, p < 0.001$) and HIV testing ($t(305) = -4.783, p < 0.001$) by important referent others as compared to respondents who did not complete secondary school. They were also more likely to have a positive attitude toward condom use ($t(308) = -4.402, p < 0.001$), more likely to perceive HIV testing as confidential ($t(307) = -2.821, p = 0.005$), and more likely to perceive themselves as being in control of their HIV testing behaviour ($t(304) = -3.858, p < 0.001$) than respondents who did not complete secondary school.

Respondents who completed secondary school were also found to be more likely to perceive themselves as being in control over condom use ($t(308) = -5.508, p < 0.001$) than respondents who did not complete secondary school.

Viewed together, these findings align with the hypothesis that education is important in navigating health care and making choices about lifestyle and personal health behaviours (Zimmerman & Woolf, 2014).

Work status

There was a statistically significant difference in moral norm ($t(305) = 2.359, p = 0.019$) and descriptive norm ($t(295) = 2.993, p = 0.003$) across the two categories of work status. Specifically, temporarily employed respondents were more likely than permanently employed respondents to endorse beliefs which associate HIV/AIDS with immoral behaviour and religious punishment, and more likely to endorse non-scientific beliefs associated with HIV/AIDS. Given that the results are in the same direction as education, they confirm the plausibility of the hypothesis that in the construction industry, work status is positively correlated with a workers' education level (Edwards & Bowen, 2019).

Home Province

There was a statistically significant difference in descriptive norm across home province ($t(210) = -3.860, p < 0.001$), with respondents from other provinces more likely to endorse non-scientific beliefs associated with HIV/AIDS compared to those from Western Cape. Similarly, respondents from other provinces were more likely to perceive a condom as being difficult to use ($t(308) = -2.293, p = 0.023$) than respondents from Western Cape. In contrast, respondents from Western Cape were more likely to experience higher levels of approval of condom use ($t(214) = 1.995, p = 0.047$) and HIV testing ($t(221) = 2.117, p = 0.035$) from important referent others than those from other provinces. They were also more likely to perceive HIV testing as confidential than respondents from other provinces ($t(222) = 3.391, p < 0.001$).

While there may be various explanations for the observed results, these findings confirm the inter-provincial and regional differences of HIV incidence in southern Africa, and its impact on beliefs, attitudes, and behaviours at the individual level (Johnson *et al.*, 2017).

6.3.2 Experiential Categories and Independent Variables in the TPB

Independent sample t-tests were conducted to compare the mean scores on the respective independent variables computed to test the TPB across the experiential categories (see Table 6.8).

Table 6.8 T-tests (Experiential categories and mean scores of independent variables in the TPB)

	Moral norm	Descriptive norm	Subjective norm about condom use	Perceived difficulty of condom use	Unfavourable beliefs about condom use	Perceived control over condom use	Unfavourable beliefs about HIV testing	Perceived confidentiality of HIV testing	Perceived control over HIV testing	Subjective norm about HIV testing	Positive attitude toward condom use	Negative attitude toward HIV testing
<i>History of STI</i>												
Yes	1.889	1.571	3.940	2.970	2.343	3.750	2.186	3.430	4.000	3.811	3.657	2.102
No	1.997	1.942	3.510	2.630	2.454	3.198	2.095	3.400	3.530	3.468	3.552	2.142
(t)	(-0.760)	(-0.726)	(1.731)	(1.197)	(-0.624)	(2.468)*	(0.627)	(0.095)	(2.168)*	(1.643)	(0.927)	(-0.248)
<i>Do you know anyone currently taking ARV medication?</i>												
Yes	1.906	1.492	3.440	2.580	2.239	3.240	2.001	3.170	3.650	3.539	3.639	2.020
No	2.042	2.194	3.640	2.730	2.588	3.275	2.180	3.580	3.530	3.483	3.509	2.230
(t)	(-1.448)	(-2.255)*	(-1.199)	(-0.913)	(-3.109)*	(-0.239)	(-1.922)	(-2.410)*	(0.704)	(0.409)	(1.727)	(-1.961)
<i>Do you know where to obtain ARV medication?</i>												
Yes	1.874	1.701	3.530	2.650	2.332	3.338	2.024	3.430	3.710	3.610	3.598	2.048
No	2.206	2.301	3.600	2.720	2.660	3.104	2.267	3.370	3.330	3.299	3.494	2.318
(t)	(-3.427)*	(-1.758)	(-0.434)	(-0.416)	(-2.781)*	(1.547)	(-2.508)*	(0.320)	(2.253)*	(2.218)*	(1.369)	(-2.490)*
<i>Do you know someone who has died because of HIV/AIDS?</i>												
Yes	1.994	1.728	3.580	2.660	2.308	3.302	2.021	3.300	3.570	3.542	3.618	1.997
No	1.973	2.106	3.520	2.690	2.601	3.211	2.206	3.540	3.600	3.464	3.498	2.307
(t)	(0.222)	(-1.169)	(0.341)	(-0.193)	(-2.625)*	(0.633)	(-2.012)*	(-1.486)	(-0.174)	(0.586)	(1.698)	(-3.049)*
<i>Do you know a person living with HIV?</i>												
Yes	1.967	1.728	3.620	2.620	2.359	3.378	2.039	3.350	3.560	3.533	3.642	2.004
No	2.003	2.079	3.490	2.720	2.526	3.138	2.173	3.470	3.600	3.479	3.481	2.277
(t)	(-0.393)	(-1.088)	(0.831)	(-0.643)	(-1.490)	(1.687)	(-1.462)	(-0.720)	(-0.224)	(0.406)	(2.247)*	(-2.690)*

t-values in brackets; * $p < 0.050$

History of STI

There was a statistically significant difference in perceived control over condom use ($t(308) = 2.468, p = 0.014$) and perceived control over HIV testing ($t(47) = 2.168, p = 0.035$) across the two categories of the history of STI variable, with respondents who had previously contracted an STI more likely to perceive themselves as being in control over condom use and HIV testing than respondents who had never been diagnosed with an STI.

This finding aligns with the hypothesis that past behaviour has an effect on future behavioural decisions (Albarracin & Wyer, 2000).

Do you know anyone currently taking ARV medication?

There was a statistically significant difference in perceived confidentiality of HIV testing ($t(255) = -2.410, p = 0.017$), with respondents who indicated that they knew someone currently taking ARV medication more likely to perceive HIV testing as not being confidential compared to those who indicated that they did not know someone currently taking ARV medication. While the relationship between knowing someone currently taking ARV medication and perception of HIV testing confidentiality is complex, this result might be an indication that respondents who know someone taking ARV medication have a level of mistrust in HTS, specifically mistrust in the clinic staff and the counsellors to keep patient information confidential.

Respondents who indicated that they did not know someone currently taking ARV medication were found to be more likely to endorse non-scientific beliefs about HIV/AIDS ($t(307) = -2.255, p = 0.025$) and more likely to have unfavourable beliefs about condom use ($t(257) = -3.109, p = 0.003$) than those who indicated that they know someone currently taking ARV medication. When viewed together, these two findings suggest that an individual's beliefs about HIV-related health behaviour is partly influenced by the behaviours of others around them and their lived experience (Eisenberg, 1977).

Do you know where to obtain ARV medication?

There was a statistically significant difference in perceived control over HIV testing ($t(308) = 2.253, p = 0.025$), with respondents who knew where to obtain ARV medication more likely to perceive themselves as being in control of their HIV testing behaviour than those who did not know where to obtain ARV medication.

Given that HIV testing is an entry point for the initiation of ART, and most of the hospitals (including mobile clinics) in South Africa offer HTS in addition to treatment, this finding aligns

with the literature that has identified a lack of awareness of HTS as an important barrier to HIV testing (Matseke *et al.*, 2016).

Similarly, respondents who indicated that they knew where to obtain ARV medication were more likely to experience higher levels of approval of HIV testing from important referent others than respondents who did not know where to obtain ARV medication ($t(308) = 2.218, p = 0.027$).

In contrast, respondents who did not know where to obtain ARV medication were more likely to endorse beliefs which associate HIV/AIDS with immoral behaviour and religious punishment ($t(308) = -3.427, p < 0.001$) than those who knew where to obtain ARV medication. They were also more likely to have higher levels of negative attitude toward HIV testing ($t(308) = -2.490, p = 0.013$), unfavourable beliefs about condom use ($t(308) = -2.781, p = 0.006$) and unfavourable beliefs about HIV testing ($t(255) = -2.508, p = 0.013$).

While there is still a lot of work to do regarding the national response to HIV/AIDS, these findings suggest that the national context of increased availability of ARV medication, UTT and SDI in particular, may have had positive effects by reducing stigma towards PLHIV, while simultaneously encouraging preventive health action in the form of condom use as well as HIV testing uptake.

Do you know a PLHIV?

There was a statistically significant difference in positive attitude toward condom use ($t(308) = 2.247, p = 0.025$), with respondents who indicated that they knew a PLHIV more likely to have a positive attitude toward condom use than respondents who did not know a PLHIV. Relatedly, respondents who indicated that they know a PLHIV were less likely to have a negative attitude toward HIV testing ($t(308) = -2.690, p = 0.008$) than those who did not know a PLHIV.

The implication of the aforementioned findings is that respondents who do not know a PLHIV have over all more negative attitudes about condom use and HIV testing than those who do. While the relationship between HIV-related health behaviours and whether a person knows a PLHIV or not is complex, it is probable that knowing a PLHIV makes the individuals' self-assessment of their chances of getting HIV/AIDS more real, and as a result encourages preventive health action, including condom use and HIV testing.

Do you know someone who has died because of HIV/AIDS?

Respondents who did not know someone who had died because of HIV/AIDS were more likely to have unfavourable beliefs about condom use ($t(308) = -2.625, p = 0.009$) and unfavourable beliefs about HIV testing ($t(308) = -2.012, p = 0.045$) than respondents who indicated that they knew someone who had died because of HIV/AIDS. They were also more likely to have a negative attitude toward HIV testing ($t(308) = -3.049, p = 0.002$) than those who knew someone who had died because of HIV/AIDS.

These findings can be taken as an indication of how the death of a person from AIDS or HIV-related complications may encourage condom use and HIV testing. They also align with research supporting the use of messaging which appeals to fear as a means of promoting health behaviour (Moussaoui *et al.*, 2021; Simpson, 2017).

6.3.3 Regression Analyses of the TPB variables

The TPB variables were entered into an HLR model as predictors of condom use (across different partner types) and HIV testing behaviour. The sequencing of the predictors was determined by the relationships postulated in the TPB. In particular, the antecedent variables – that is, those variables hypothesized to have an indirect relationship with the outcome variable were considered as one block (model 1). In model 2, the variables hypothesized to have a direct relationship with the outcome variable were included. Through this sequencing approach, the unique effects of the constructs hypothesized to be indirectly and directly related to the outcome variable were empirically estimated (see Table 6.9).

Table 6.9: Hierarchical linear regression analyses assessing the relationship between TPB constructs and condom use and HIV testing

	Condom use with regular sex partner ^a		Condom use with someone you don't know very well ^b		Condom use with a sex worker ^c		HIV testing	
	N = 310		N = 180		N = 152		N = 310	
	Standardized β	Sig.	Standardized β	Sig.	Standardized β	Sig.	Standardized β	Sig.
Antecedent Variables (Model 1)								
Perceived ease of condom use	0.238	0.000*	0.250	0.001*	0.237	0.004*		
Unfavourable beliefs about condom use	-0.126	0.024*	-0.120	0.113	0.006	0.946		
Unfavourable beliefs about HIV testing							-0.117	0.039*
Perceived confidentiality of HIV testing							0.209	0.000*
R²	0.066	0.000*	0.063	0.003*	0.057	0.013*	0.049	0.000*
R² change	0.066	0.000*	0.063	0.003*	0.057	0.013*	0.049	0.000*
Model 2								
Perceived ease of condom use	0.077	0.237	0.041	0.627	0.012	0.906		
Unfavourable beliefs about condom use	-0.129	0.044*	-0.081	0.306	0.050	0.567		
Unfavourable beliefs about HIV testing							0.145	0.112
Perceived confidentiality of HIV testing							0.041	0.530
Moral norm	0.069	0.228	0.083	0.262	0.127	0.146	-0.077	0.168
Descriptive norm	0.003	0.959	-0.037	0.598	-0.129	0.132	-0.073	0.195
Perceived control over HIV testing							0.155	0.090
Subjective norm about condom use	0.086	0.202	0.110	0.180	0.014	0.884		
Subjective norm about HIV testing							0.169	0.080
Perceived control over condom use	0.292	0.000*	0.278	0.003*	0.282	0.009*		
Positive attitude toward condom use	-0.044	0.515	0.204	0.013*	0.174	0.064		
Negative attitude toward HIV testing							-0.283	0.002*
R²	0.145	0.000*	0.255	0.000*	0.203	0.000*	0.150	0.000*
R² change	0.079	0.000*	0.192	0.000*	0.146	0.000*	0.101	0.000*

Dependent variable: In the last 3 months, how often did you use a condom with a, b, c; How many times have you had an HIV test?

* $p < 0.050$

Consistent condom use:

In model 1, perceived ease of condom use was found to be a statistically significant predictor of consistent condom use across all three types of sexual partnerships: regular sex partner ($\beta = 0.238, p = 0.000$); casual sex partner ($\beta = 0.250, p = 0.001$) and sex worker ($\beta = 0.237, p = 0.004$).

From the TPB, it is expected that respondents who do not perceive condoms as being difficult to use will be more likely to use a condom and so this result confirms the hypothesized relationship in the TPB. On the other hand, unfavourable beliefs about condom use were found to be a statistically significant predictor of consistent condom use for regular sex partners only ($\beta = -0.126, p = 0.024$). In particular, participants with unfavourable beliefs about condom use were determined to be less likely to have used a condom consistently with a regular sex partner in the last 3 months.

Model 1 only accounts for the antecedent variables related to the outcome as per the TPB, and so it is susceptible to specification error. Specification error refers to bias in estimates as a result of omitted predictors that account for a unique proportion of variance in the outcome variable. Because model 2 includes variables hypothesized to be directly related to condom use, it is less susceptible to specification error. This is confirmed by the statistically significant increase in shared variance explained across partner type, accounting for 7.9% increase in condom use with a regular sex partner ($\Delta R^2 = 0.079, p < 0.001$); 19.2% increase in condom use with a casual sex partner ($\Delta R^2 = 0.192, p < 0.001$) and a 14.6% increase in condom use with a sex worker ($\Delta R^2 = 0.146, p < 0.001$).

In model 2, perceived control over condom use was found to be a statistically significant predictor of consistent condom use across all three types of sexual partnerships (regular sex partner ($\beta = 0.292, p = 0.000$); casual sex partner ($\beta = 0.278, p = 0.003$) and sex worker ($\beta = 0.282, p = 0.009$). Unfavourable beliefs about condom use were found to be a statistically significant predictor of consistent condom use with a regular sex partner ($\beta = -0.129, p = 0.044$) but not the other sex partnerships. Positive attitude toward condom use was also determined to have a statistically significant influence on consistent condom use with a casual sex partner ($\beta = 0.204, p = 0.013$) but not the other sex partnerships.

HIV testing:

In model 1, perceived confidentiality of HIV testing ($\beta = 0.209, p = 0.000$) and unfavourable beliefs about HIV testing ($\beta = -0.117, p = 0.039$) were found to be statistically significant predictors of HIV testing. This finding aligns with the hypothesized relationship in the TPB.

In particular, respondents who had more unfavourable beliefs about HIV testing were found to be less likely to have been tested and those who perceived HIV testing as confidential were more likely to have tested. Model 1 only accounts for the antecedent variables related to HIV testing as per the TPB, and so it is susceptible to specification error. This is confirmed in the greater proportion of shared variance explained in HIV testing for model 2 as compared to model 1 ($\Delta R^2 = 0.101$, $p < 0.001$).

In model 2, negative attitude toward HIV testing was found to be a statistically significant predictor of HIV testing ($\beta = -0.283$, $p = 0.002$). None of the other variables hypothesized to have a direct relationship with HIV testing were found to be statistically significant.

Condom use intention:

Because of the critical role of behavioural intentions hypothesized in the TPB (Kalolo & Kibusi, 2015; Ajzen, 1985) as well as the proposed extension of the TPB with past behaviour (Conner & Armitage, 1998; Ouellette & Wood, 1998; Sutton, 1994), condom use intention was used as an outcome variable in an additional HLR (see Table 6.10).

Specifically, the outcome variable for consistent condom use (Table 6.9) was used as a predictor to estimate the association between past behaviour (i.e., retrospective recall of condom use in the last 3 months) and condom use intention (see Table 6.10).

Table 6.10 Hierarchical linear regression analyses assessing the relationship between the TPB constructs and condom use intention

	Regular sex partner ^a		Someone you don't know very well ^b		Sex worker ^c	
	N = 310		N = 180		N = 152	
	Standardized β	Sig.	Standardized β	Sig.	Standardized β	Sig.
Antecedent variables (Model 1)						
Perceived ease of condom use	0.190	0.000*	0.181	0.019*	0.198	0.018*
Unfavourable beliefs about condom use	-0.166	0.003*	-0.086	0.262	-0.921	0.359
R²	0.057	0.000*	0.033	0.054	0.038	0.056
R² change	0.057	0.000*	0.033	0.054	0.038	0.056
Model 2						
Perceived ease of condom use	0.049	0.443	-0.081	0.343	-0.079	0.422
Unfavourable beliefs about condom use	-0.165	0.009*	-0.011	0.893	-0.032	0.710
Moral norm	0.021	0.707	-0.033	0.657	0.015	0.864
Descriptive norm	0.090	0.105	-0.076	0.284	-0.092	0.276
Subjective norm about condom use	0.173	0.010*	0.079	0.335	0.055	0.551
Perceived control over condom use	0.233	0.001*	0.403	0.000*	0.418	0.000*
Positive attitude toward condom use	0.032	0.634	0.164	0.044*	0.092	0.317
R²	0.165	0.000*	0.260	0.000*	0.220	0.000*
R² change	0.108	0.000*	0.227	0.000*	0.182	0.000*
Model 3 (condom use in the last 3 months included)						
Perceived ease of condom use	0.000	0.993	-0.104	0.146	-0.087	0.267
Unfavourable beliefs about condom use	-0.083	0.087	0.034	0.607	-0.063	0.358
Moral norm	-0.023	0.604	-0.078	0.205	-0.063	0.357
Descriptive norm	0.088	0.039*	-0.055	0.350	-0.013	0.845
Subjective norm about condom use	0.188	0.021*	0.018	0.792	0.047	0.521
Perceived control over condom use	0.048	0.392	0.250	0.002*	0.245	0.005*
Positive attitude toward condom use	0.059	0.244	0.052	0.453	-0.014	0.851
In the last 3 months, how often did you use a condom with ^{a b c}	0.635	0.000*	0.551	0.000*	0.612	0.000*
R²	0.510	0.000*	0.486	0.000*	0.519	0.000*
R² change	0.345	0.000*	0.226	0.000*	0.299	0.000*

Dependent variable: The next time you have sex, how likely is it that you will use a condom with a, b, c

* $p < 0.050$

Overall, the results showed that the antecedent variables (model 1) were statistically significant predictors of condom use intention across all three partner types, explaining 5.7% of the total shared variance with a regular sex partner ($F(2, 307) = 9.219, p < 0.001, R^2 = 0.057$); 3.3% with a casual sex partner ($F(2, 177) = 2.976, p = 0.054, R^2 = 0.033$); and 3.8% with a sex worker ($F(2, 149) = 2.937, p = 0.056, R^2 = 0.038$).

Model 2 showed significant improvement in proportion of shared variance explained across all three partner types, accounting for 16.5% with a regular sex partner ($F(5, 302) = 8.523, p < 0.001, R^2 = 0.0165$); 26% with a casual sex partner ($F(7, 172) = 8.627, p < 0.001, R^2 = 0.260$); and 22% with a sex worker ($F(7, 144) = 5.806, p = 0.000, R^2 = 0.220$). This finding suggests that perceived ease of condom use and unfavourable beliefs about condom use (model 1) provide a satisfactory explanation of condom use intention which can be further improved with the inclusion of the other TPB variables (model 2).

When past behaviour (i.e., condom use in the last 3 months) was included as a predictor in model 3, further significant improvement in the proportion of total variance explained in condom use intention across all three partner types was observed. Model 3 accounted for 51% of explained variance in condom use intention with a regular sex partner ($F(1, 301) = 39.149, p < 0.001, R^2 = 0.510$); 48.6% with a casual sex partner ($F(8, 171) = 20.234, p < 0.001, R^2 = 0.486$); and 51.9% with a sex worker ($F(8, 143) = 19.272, p < 0.001, R^2 = 0.519$). This finding can be taken as an indication that past behaviour, when added in model 3 explains condom use intention above and beyond the variables in model 2 and model 1.

The results of the HLR (model 3) are reported in more detail below:

Condom use intention with a regular sex partner:

Descriptive norm ($\beta = 0.088, p = 0.039$), subjective norm about condom use ($\beta = 0.188, p = 0.021$) and condom use in the last 3 months (henceforth retrospective recall of condom use) ($\beta = 0.635, p < 0.001$) were determined to be statistically significant predictors of condom use intention with a regular sex partner.

In other words, participants who endorsed non-scientific beliefs associated with HIV/AIDS (descriptive norm), participants who experienced higher levels of approval of condom use from important referent others, and participants who consistently used condoms with their regular partner in the last 3 months were determined to be more likely to intend to use a condom at next sex with a regular sex partner. While the positive association between non-scientific beliefs and intention to use a condom at next sex with a regular sex partner is odd, it is important

to note that compared to the other variables it has the weakest effect. And so, it is possible that this finding is due to specification or measurement error and should be cautiously interpreted.

Condom use intention with a casual sex partner:

Perceived control over condom use ($\beta = 0.250, p = 0.002$) and retrospective recall of condom use ($\beta = 0.551, p < 0.001$) were determined to be statistically significant predictors of condom use intention with a casual sex partner.

In other words, participants who perceived themselves as being in control over condom use and participants who consistently used condoms with a casual sex partner in the last 3 months were determined to be more likely to intend use a condom at next sex with a casual sex partner.

Condom use intention with a sex worker:

Perceived control over condom use ($\beta = 0.245, p = 0.005$) and retrospective recall of condom use ($\beta = 0.612, p < 0.001$) were determined to be statistically significant predictors of condom use intention with a sex worker.

In other words, participants who perceived themselves as being in control over condom use and participants who consistently used condoms with a sex worker in the last 3 months were determined to be more likely to intend use a condom at next sex with a sex worker.

6.4 Summary of Results

In the preceding section, independent sample t-tests were used to compare the mean score of variables computed to test the HBM and TPB across socio-demographic and experiential groups of study participants (see Table 6.11).

Table 6.11: Summary of the relationship between socio-demographic categories, the HBM and the TPB		
<i>Socio-demographic group</i>	<i>HBM</i>	<i>TPB</i>
Age cohort	Statistically supported	Not statistically supported
Marital status	Statistically supported	Not statistically supported
Education*	Statistically supported	Statistically supported
Work status	Not statistically supported	Statistically supported
Home Province*	Statistically supported	Statistically supported

*Mean score significantly differs across the HBM and TPB

There was a statistically significant difference in the mean score of two or more HBM variables across age, marital status, education, and home province. Work status, that is whether a participant was permanently employed or not was not found to differentiate the mean score of any of the variables computed to empirically test the HBM.

In contrast, the mean score of two or more TPB variables significantly differed across work status, home province and education variables. For the TPB, age and marital status were not determined to differentiate between the mean scores of any of the variables.

All of the experiential categories significantly differentiated between the mean scores of two or more variables computed to empirically test the HBM and the TPB (see Table 6.12).

Table 6.12: Summary of the relationship between experiential categories, the HBM and the TPB		
<i>Experiential category</i>	<i>HBM</i>	<i>TPB</i>
History of STI*	Statistically supported	Statistically supported
Do you know anyone on ARV medication? *	Statistically supported	Statistically supported
Do you know where to obtain ARV medication? *	Statistically supported	Statistically supported
Do you know a PLHIV? *	Statistically supported	Statistically supported
Do you know someone who has died because of AIDS? *	Statistically supported	Statistically supported

* Mean score significantly differs across the HBM and TPB

That there was a statistically significant difference in mean score across all the experiential categories but not all the socio-demographic categories can be taken as an indication of how categorical variables based on lived experiences and life events are overall better predictors of

HIV-related health behaviour as described by the HBM and the TPB, than are socio-demographic groupings which are popularly used in research.

The finding that categories based on lived experiences provide good predictions of health behaviour aligns with the literature which emphasizes the impact of life events and social networks on health attitudes and behaviours (Reid *et al.*, 2015; Adimora & Schoenbach, 2005; Andersson & Stanich, 1996).

Moreover, among the socio-demographic categories, only education and home province were determined to be statistically significant predictors of two or more variables across the HBM and TPB. Following the t-tests, regression analyses were conducted as a preliminary test of the hypothesized pathways. Specifically, HLR was used to estimate the proportion of explained variance in consistent condom use and HIV testing accounted for by the HBM and TPB.

HLR was also used to estimate the proportion of explained variance in condom use intention accounted for by the TPB.

Regression Analysis of the HBM constructs:

For the HBM, it was observed that the variables hypothesized to have an indirect relationship, do not account for a statistically significant proportion of explained variance in consistent condom use and HIV testing without the inclusion of the variables hypothesized to have a direct relationship.

In particular, perceived susceptibility to HIV/AIDS and perceived severity of HIV were not found to be statistically significant predictors of consistent condom use (with any type of partner) or frequency of HIV testing. Even when they were included in a model with the other HBM variables hypothesized to have a direct effect, they were still not found to be statistically significant.

Moreover, when all the HBM variables were included in a model, 9.2% of variance was explained in consistent condom use with a regular sex partner; 27% of variance was explained in consistent condom use with a casual sex partner; 22.8% of variance was explained in condom use with a sex worker and 10.3% of variance was explained in HIV testing. This result suggests that the HBM as a whole provides a better explanation of consistent condom use than frequency of HIV testing among study participants. One possible reason for this result is the wording of the items measuring the outcomes. While both items follow a retrospective recall approach (Bornstein *et al.*, 2020; Howard, 2011), the item measuring condom use was specific, and included a time period (*In the last 3 months, how often did you use a condom with a... 'regular sex partner'/'casual sex partner'/'sex worker'*), and the item measuring HIV testing was

vague and ambiguous (*How many times have you been tested for HIV?*). Specific, definitive, and self-explanatory questionnaire items are easier to understand and provide more reliable responses than ambiguous items (Zeglovits & Schwarzer, 2016).

In line with the postulated pathways in the HBM, participants who perceived HIV/AIDS to be a threat to their health, and participants who had higher levels of HIV/AIDS-related scientific knowledge were found to be more likely to have consistently used condoms across all three partner types in the last 3 months and to be more likely to have had an HIV test.

Regression Analysis of the TPB constructs:

Because of the critical role played by behavioural intentions in the TPB, two HLR models were estimated to empirically test the TPB. In the first model, the outcome variables were consistent condom use (in the last 3 months) and frequency of HIV testing, and in the second model, the outcome variable was condom use intention (*The next time you have sex, how likely is it that you will use a condom with a 'regular sex partner' / 'casual sex partner' / 'sex worker'*).

In the first test of the TPB, perceived control over condom use was found to be a statistically significant predictor of consistent condom use across all three types of sexual partnerships. In other words, participants who perceived themselves as having control over condom use were found to be more likely to have consistently used a condom in the last 3 months across all three types of sexual partnership. In contrast, participants with unfavourable beliefs about condom use were determined to be less likely to have consistently used a condom with a regular sex partner in the last 3 months. Unfavourable beliefs about condom use were not statistically associated with condom use with a casual sex partner or a sex worker.

Relatedly, participants with a positive attitude toward condom use were found to be more likely to have consistently used a condom with a casual sex partner in the last 3 months. Positive attitude toward condom use was not found to be statistically associated with consistent condom use with either a regular sex partner or a sex worker.

For HIV testing, negative attitude toward HIV testing was determined to be a statistically significant predictor of HIV testing. In particular, participants who held a negative attitude toward HIV testing were found to be less likely to have tested for HIV in their lifetime. The other TPB variables postulated to be directly associated with HIV testing, i.e., subjective norms about HIV/AIDS and perceived control over HIV testing, were not determined to be statistically significant. When all the TPB variables were included in a model, 14.5% of variance was explained in consistent condom use with a regular sex partner; 19.2% with a casual sex partner; 14.6% with a sex worker and 10.1% of variance was explained in HIV

testing. Just as with the HBM, this result suggests that the TPB as a whole is a better predictor of consistent condom use than HIV testing among study participants.

In the second test of the TPB, participants who consistently used condoms in the last 3 months were determined to be more likely to intend to use a condom at next sex, across all sex partnerships. Participants who perceived themselves as having control over condom use were determined to be more likely to intend to use a condom at next sex with a casual sex partner and a sex worker, but not with a regular sex partner. For regular sex partnerships, participants who endorsed non-scientific beliefs associated with HIV/AIDS were determined to be less likely to intend to use a condom at next sex. Participants who experienced higher levels of condom use approval from important referent others were determined to be more likely to intend to use a condom at next sex with a regular sex partner, but not with a casual sex partner or a sex worker.

Overall, the results of the HLR provide empirical support for the pathways postulated in the HBM and TPB, however the TPB was determined to account for a greater proportion of explained variance across all the outcomes. Moreover, a greater proportion of explained variance was observed for condom use in both the HBM and TPB. The relatively poor specificity of the HIV testing variable might be the reason for why a greater proportion of explained variance was observed for condom use in both the HBM and TPB. Consequently, future studies should include a more specific and definitive measure of HIV testing.

The HLR approach to theory testing is limited in that, it assumes that there is a linear relationship between the predictors and the outcome variable, which is an untenable assumption for the HBM and TPB, which include non-linear, mediating, and moderating relationships between variables. Because of this, the postulated pathways in the HBM and TPB were further tested using structural equation modelling and path analysis.

The decision to employ independent t-tests, HLR, and structural equation modelling was driven by a general analytic approach which aimed to consider factors associated with HIV-related health behaviours across the individual-structural spectrum in addition to a test of hypothesized pathways in the HBM and the TPB. Specifically:

- **Independent t-Tests:** Independent t-tests were used to test the association between constructs in the HBM and the TPB with non-individual level factors hypothesized to influence HIV-related health behaviour. This method allows for the examination of the relationship between HBM and TPB constructs and socio-demographic and experiential variables, providing a straightforward, albeit simplistic approach to identifying significant associations at a non-individual level.

- **Hierarchical Linear Regression (HLR):** HLR was used as a preliminary test of associations between HBM and TPB variables. Specifically, variables indirectly associated with the outcome were entered into block 1 (antecedent variables) and variables directly associated with the outcome (proximal variables) were entered into block 2. This distinction between antecedent and proximal variables constituted a simple approach to theory testing and was used to identify significant predictors before conducting more complex modelling such as SEM which allows for the evaluation of multiple dependent variables and mediating variables, and for the testing of both direct and indirect effects within a single model.
- **Structural Equation Modelling (SEM):** SEM, and particularly path analysis, was employed to test the HBM and TPB, which express behaviour in terms of individual-level factors (such as perceived behavioural control and the benefits minus barriers of health behaviour). SEM's ability to model complex relationships and test overall model fit made it an ideal choice for examining these theoretical frameworks in detail. Furthermore, unlike HLR, path analysis allows for the explicit specification of the directionality of effects.

7 THEORY TESTING USING PATH ANALYSIS

In the previous chapter HLR was used to empirically test explanations of HIV testing and condom use behaviour on the basis of a set of independent variables hypothesised by the HBM and the TPB. HLR, however, assumes that there is a linear association between the predictor and the outcome variable, and so it is not the most appropriate statistical model for testing the HBM and the TPB, both of which include non-linear associations.

A linear association describes a relation between two distinct variables, x , and y in the form of a straight line. Using a straight line to estimate the relationship between two variables is useful in explaining hypotheses where the two variables have a direct relationship. When the relevant variables have an indirect relationship, linear association is untenable.

The HBM and the TPB include direct and indirect relationships between variables. For example, in the HBM, perceived severity of HIV/AIDS (x) is postulated to affect condom use (y) through a mediating variable, perceived threat of HIV/AIDS (z). Given the aforementioned and other indirect relationships between the variables, path analysis, was used as a further test of the HBM and TPB.

7.1 The General Analytic Approach

The general analytic approach is as follows: first, a *base model* was specified and estimated. The specification of the base model was theory driven, in the sense that it replicates the postulated relationships in the HBM and the TPB and does not consider the underlying observed covariance between the variables in the dataset. Thereafter, the fit of the base model was evaluated in an absolute sense (does the base model fit the study data?) using four of the most commonly reported fit indices: the χ^2/df ratio, CFI, RMSEA and Hoelter's Critical N (Byrne, 2016). These fit indices provided an indication on whether the base model should be rejected, modified, or not rejected in the context of the study sample.

It is important to recognize that there are dozens of fit indices for assessing model and data correspondence, and new measures are being developed all the time (Byrne, 2016). As a result, it can be difficult for a researcher to decide on which particular fit statistic to report. There is also the possibility of selective reporting of favourable fit indices. Kline (2011) has observed that there is unlikely to be a 'gold standard' for assessing the fit of a model to data, because all statistical models are imperfect approximations of a complex reality and so are wrong to some extent. This fact looms over the conclusions that are drawn about good-fitting models in this

study, and so the aforementioned fit statistics are not the sole criteria for assessing model and data correspondence. In addition to fit statistics, the structural model was closely inspected, and other information such as whether the estimates in the model align with theory were critically considered. This perspective corroborates with Kline (2011) who has observed that, “the decision on whether a model fits data is ultimately a qualitative judgement that is based on the researcher’s domain knowledge, and a reflection of the researcher’s personal values and societal concerns” (Kline, 2011: 191).

In contrast with the base model, the specification of the *modified model* is data driven, in the sense that modification indices (MI) were used to identify sources of misfit between the data and the hypothesized model. MI reflect the improvement in model fit if a parameter were to be removed from a hypothesized model. However, because this process is data-driven it is inherently susceptible to idiosyncratic characteristics of the data (MacCallum *et al.*, 1992). For this reason, MI were judiciously used, and the base model was only modified if there was a valid theoretical reason for doing so.

The process of modifying the SEM models involved both theoretical and empirical considerations. While the initial models were based on established theoretical frameworks, modifications were made to improve model fit and capture the complexity of the data. Modification indices provided by SEM software were reviewed to identify potential improvements in model fit. However, not all suggested modifications were adopted; only those that made theoretical sense were considered. Below are the steps taken to ensure a systematic approach to model modifications:

1. **Literature Review:** Comprehensive literature reviews were conducted to identify commonly reported relationships between constructs. This informed the initial model and subsequent modifications.
2. **Model Fit Indices:** Model fit indices (e.g., CFI, RMSEA) were carefully considered to evaluate the base models as well as potential modifications. Paths that significantly improved model fit while maintaining theoretical coherence were retained.
3. **Iterative testing:** To ensure consistency, each modification was iteratively tested and validated before finalizing the model.

IBM SPSS Amos 26.0[®] was used to evaluate the fit of HBM and TPB to the study data using the sample covariance matrix as input, and a maximum likelihood estimation strategy. The structural models were statistically overidentified. Although most constructs were measured using aggregated questionnaire items, for some constructs a singular item was used.

Furthermore, the strength of association between the exogenous (independent) and endogenous (mediator and dependent variables) was expressed in path coefficients, with standardized coefficients appearing on each path. For clarity of presentation, unstandardized coefficients, and the residual variances for the endogenous variables (ϵ), indicating the proportion of unexplained variance, were omitted from the path diagram.

7.2 Explaining HIV Testing Among a Sample of Male Construction Workers

7.2.1 The HBM as an Explanatory Model of HIV Testing

Based on the review of the HBM literature, the following path diagram was empirically estimated (see figure 14):

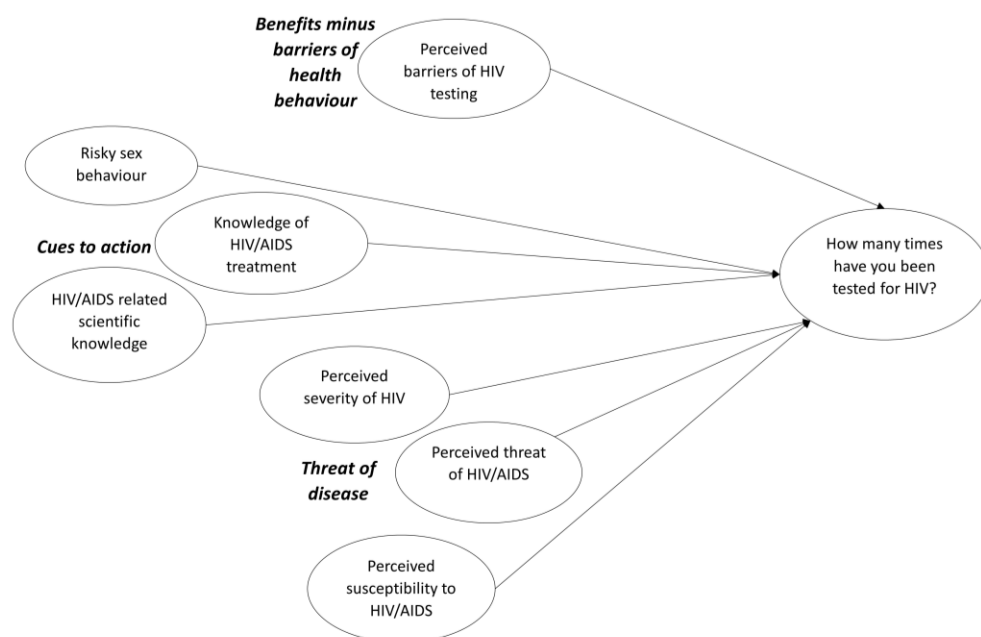


Figure 14 The HBM as an explanatory model of HIV testing among study participants

The paths to be estimated correspond to the individual hypotheses. The base model estimated is shown in figure 15. For ease of presentation, covariances are not shown. Three cues to action constructs were included in the model - knowledge of HIV/AIDS treatment, HIV/AIDS-related scientific knowledge, and risky sex behaviour. All possible direct and indirect effects were estimated.

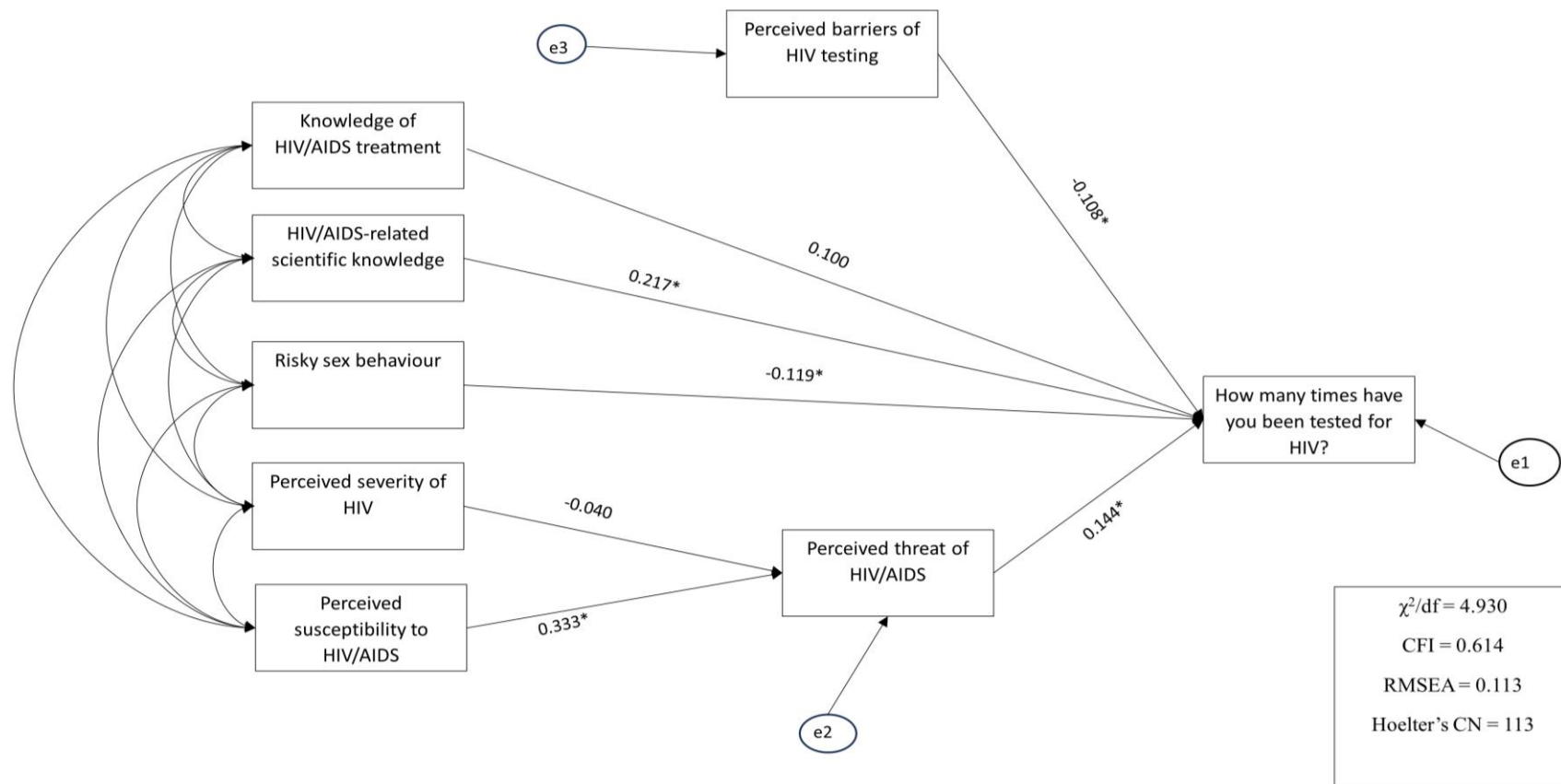


Figure 15 HBM (Base model) explaining participants HIV testing behaviour

* p < 0.050

The Base model

The *base model* (see figure 15) accounted for 10.4% of the explained variance in HIV testing. The fit between the model and data was modest, with $\chi^2/df = 4.930$; CFI = 0.614; RMSEA = 0.113 and Hoelter's CN = 113. However, from a theoretical perspective, the HBM was well supported. As expected from the HBM, perceived barriers toward HIV testing was determined to be negatively associated with frequency of HIV testing ($\beta = -0.108, p = 0.021$), and perceived threat of HIV/AIDS was directly associated with HIV testing ($\beta = 0.144, p = 0.009$), with respondents who perceived HIV/AIDS to be a threat to their health more likely to have tested frequently.

Two of the three variables that were used as indicators for cues to action were found to be statistically significant in explaining HIV testing. These are HIV/AIDS related scientific knowledge ($\beta = 0.217, p < 0.001$) and risky sex behaviour ($\beta = -0.119, p = 0.028$). Participants with higher levels of HIV/AIDS related scientific knowledge, and those who engaged less frequently in risky sex behaviours, were more likely to have tested frequently for HIV. The third variable used as an indicator for cues to action, knowledge of HIV/AIDS treatment, was not determined to be statistically significant in explaining participant frequency of HIV testing ($\beta = 0.100, p = 0.093$). This result calls into question the idea that knowledge of HIV/AIDS treatment services in one's community necessarily increases testing uptake. It also suggests that for the study sample, participants' level of HIV/AIDS related knowledge and their level of engagement in risky sex behaviours are better cues to action in explaining HIV testing than awareness of HITS in the community.

According to the HBM, a participants' perception of the threat of a disease should be associated with their perception of the severity of the disease and their perception of their susceptibility to the disease. In this regard, a statistically significant path was observed between perceived susceptibility to HIV/AIDS and perceived threat of HIV/AIDS ($\beta = 0.333, p < 0.001$), however the path between perceived severity of HIV and perceived threat of HIV/AIDS was not found to be statistically significant ($\beta = -0.040, p = 0.489$) in the study sample.

By the same token, perceived severity was not found to have an indirect effect on HIV testing ($\beta = -0.028, p = 0.151$), while perceived susceptibility was determined to have an indirect effect on HIV testing ($\beta = 0.302, p = 0.042$).

The modified Model

The *base model* was compared with a *modified model* (see figure 16). In the *modified model*, a path from perceived severity of HIV to perceived barriers of HIV testing was introduced. This modification postulates that because of the perceived negative aspects of an HIV positive diagnosis, including HIV-related stigma, a participant's evaluation of the severity of contracting HIV (or leaving it undetected and untreated) will be directly and positively associated with their evaluation of the barriers preventing them from HIV testing. In other words, the perception that HIV is a severe disease acts as an obstacle to performing the recommended health action of HIV testing.

In addition, a path from risky sex behaviour to perceived threat of HIV/AIDS was also introduced, suggesting a direct and positive association between engagement in risky sex behaviour and perceived threat of HIV/AIDS. Thus, it is expected that the more a participant engages in risky sex behaviours, the more likely that they will be to perceive HIV/AIDS as a threat to their health.

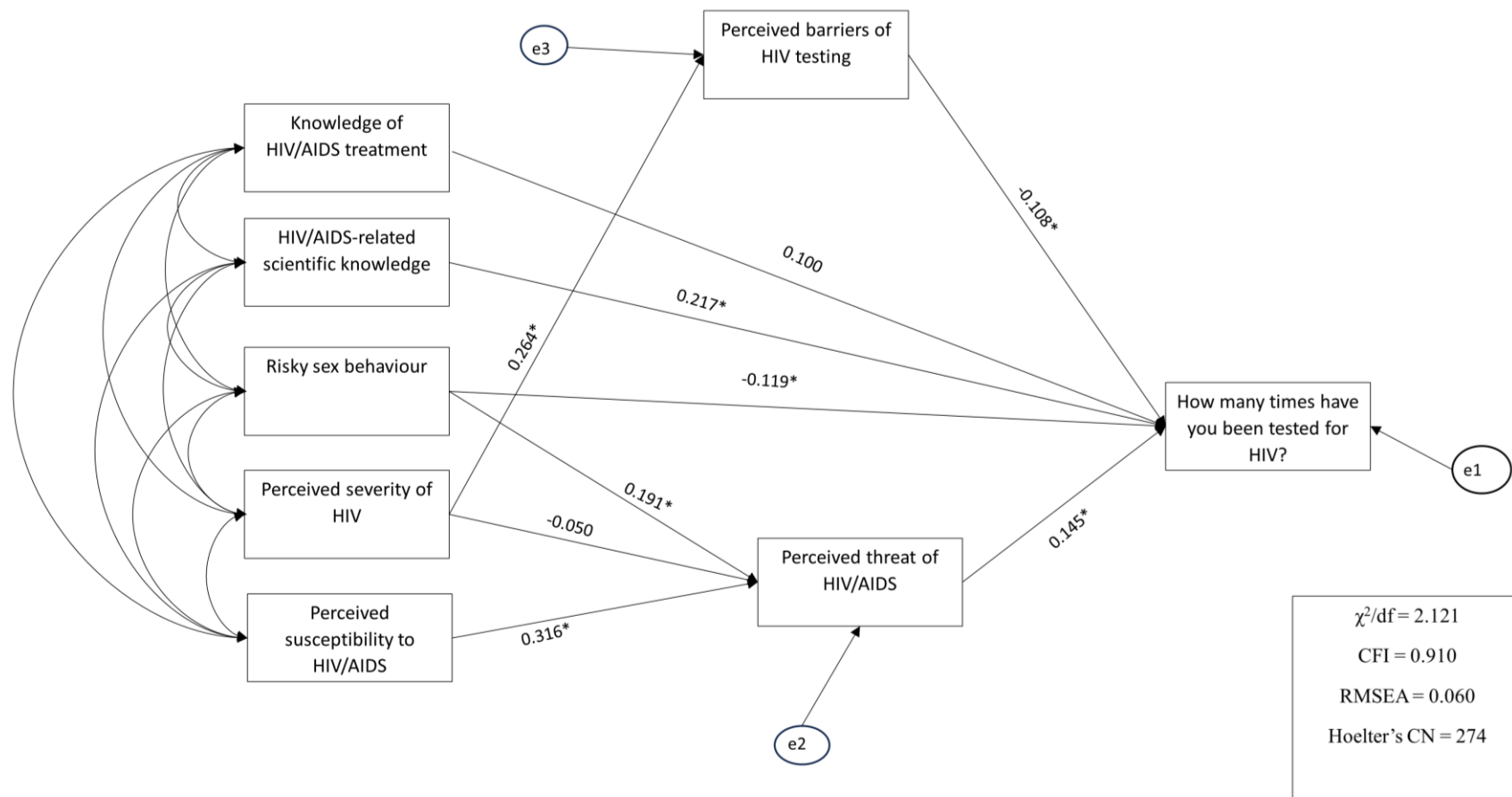


Figure 16 HBM (modified model) explaining participants HIV testing behaviour
* $p < 0.050$

The modified model had better fit statistics than the base model, with $\chi^2/df = 2.121$; CFI = 0.910; RMSEA = 0.060 and Hoelter's CN = 274. From a theoretical perspective, all the paths that were found to be statistically significant in the base model remained significant and in the same direction in the modified model. Moreover, the inclusion of additional paths from perceived severity of HIV to perceived barriers of HIV testing, and risky sex behaviour to perceived threat of HIV/AIDS makes the modified model more nuanced and provides a richer explanation of HIV testing behaviour among participants than the base model (see Table 7.1).

Table 7.1 The HBM as an explanatory model of HIV testing behaviour

Path analysis		Standardised estimates		
Total variance explained (%)		10.4	9.9	
Hypotheses	Direct effects	Base model	Modified model	Supported
H1a	Perceived threat → HIV testing (+)	0.144**	0.145**	Yes
H1b	Perceived barriers → HIV testing (-)	-0.108*	-0.108*	Yes
H1c	Knowledge of HIV/AIDS treatment → HIV testing (+)	0.100	0.100	No
H1d	HIV/AIDS related scientific knowledge → HIV testing (+)	0.217***	0.217***	Yes
H1e	Risky sex behaviour → HIV testing (-)	-0.119*	-0.119*	Yes
H1f	Perceived susceptibility → Perceived threat (+)	0.333***	0.316***	Yes
H1g	Perceived severity of HIV → perceived threat (+)	-0.040	-0.050	No
M1a	Perceived severity of HIV → perceived barriers (+)	-	0.264***	Yes
M1b	Risky sex behaviour → perceived threat (+)	-	0.191***	Yes
	Total indirect effects			
H1h	Perceived susceptibility → HIV testing	0.302*	0.046*	Yes
H1i	Perceived severity of HIV → HIV testing	-0.028	-0.036	No
M1c	Risky sex behaviour → HIV testing	-	0.028*	Yes

* $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$

In particular, the perceived barriers of HIV testing variable was found to be directly associated with perceived severity of HIV ($\beta = 0.264$, $p < 0.001$). Similarly, perceived threat of HIV/AIDS was directly associated with risky sex behaviour ($\beta = 0.191$, $p < 0.001$). Furthermore, risky sex behaviour was determined to have a statistically significant indirect effect on frequency of HIV testing ($\beta = 0.028$, $p = 0.047$).

7.2.2 The TPB as an Explanatory Model of HIV Testing

Based on a review of the TPB literature, the following path diagram was empirically estimated (see figure 17):

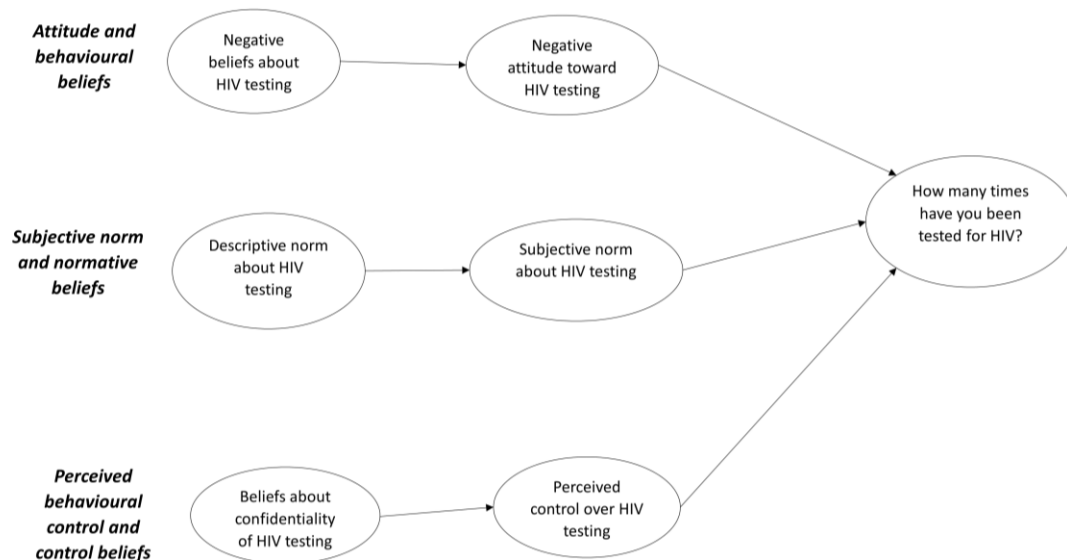


Figure 17 The TPB as an explanatory model of HIV testing among study participants

The paths to be estimated correspond to the individual hypotheses. The base model is shown in figure 18. For ease of presentation covariances are not shown. All possible direct and indirect effects were estimated.

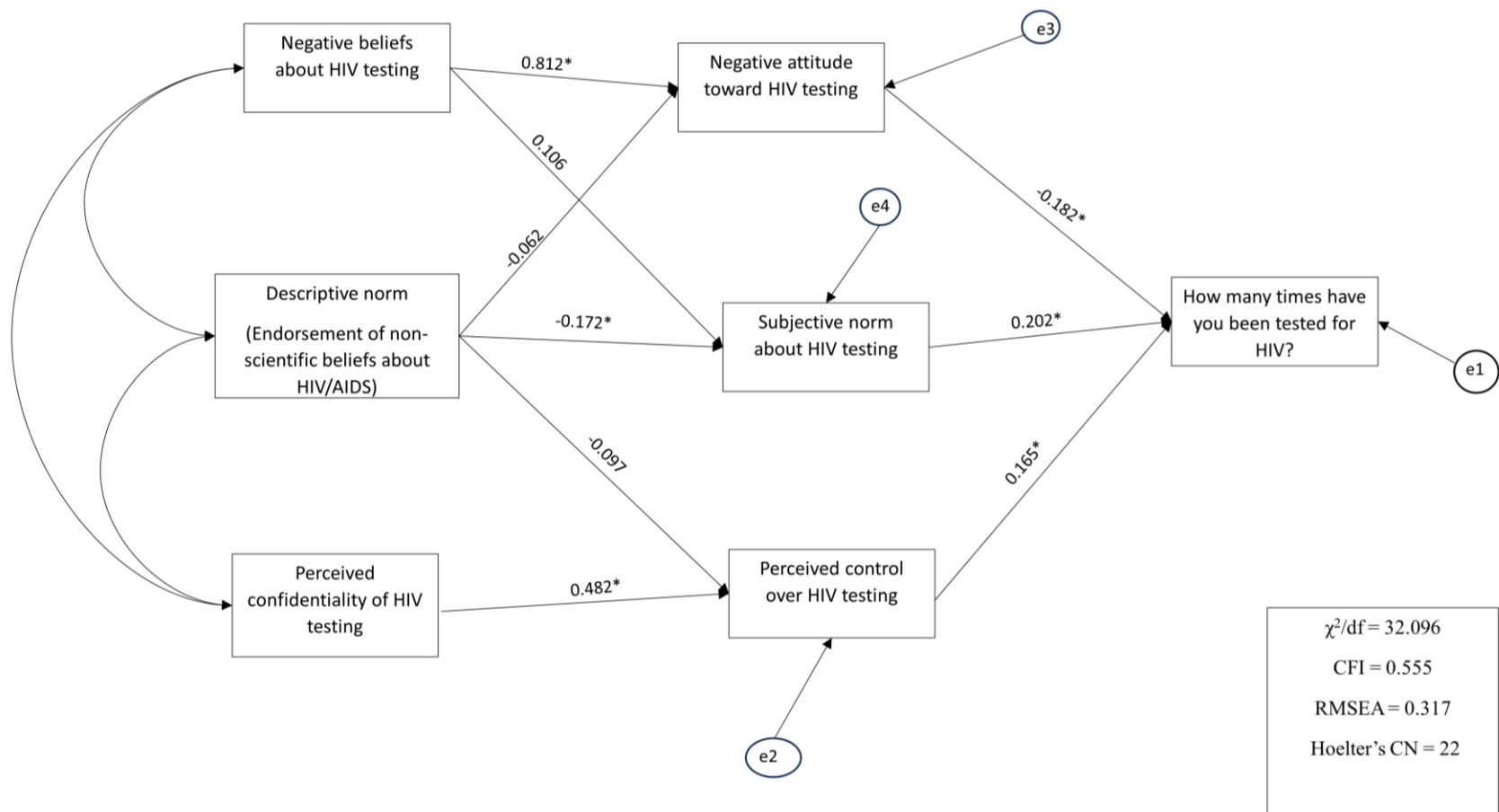


Figure 18 TPB (Base model) explaining participants HIV testing behaviour
* $p < 0.050$

The Base model

The *base model* (see figure 18) accounted for 9.3% of the explained variance in HIV testing. Statistically the base model was not a good fit to the data, with $\chi^2/df = 32.096$; CFI = 0.555; RMSEA = 0.317 and Hoelter's CN = 22. Even so, from a theoretical perspective, the TPB was moderately supported as HIV testing was determined to be directly associated with subjective norm ($\beta = 0.202, p < 0.001$), negative attitude toward HIV testing ($\beta = -0.182, p < 0.001$) and perceived control over HIV testing ($\beta = 0.165, p = 0.035$) as expected.

With the exception of the path from negative beliefs about HIV testing to subjective norm ($\beta = 0.106, p = 0.350$), the path from descriptive norm to negative attitude toward HIV testing ($\beta = -0.062, p = 0.579$) and the path from descriptive norm to perceived control over HIV testing ($\beta = -0.097, p = 0.765$), all the direct hypotheses were determined to be statistically significant. In total, statistical support was found for six out of the nine paths postulating direct effects.

Furthermore, frequency of HIV testing was determined to be indirectly associated with negative beliefs about HIV testing ($\beta = -0.589, p = 0.017$) and descriptive norm ($\beta = -0.053, p = 0.036$), but not perceived confidentiality of HIV testing ($\beta = 0.207, p = 0.051$).

The modified model

All the statistically non-significant paths in the base model were excluded in the modified model (see figure 19). Thereafter, moral norm was included as an additional predictor of HIV testing (Liu & Liu, 2020; Conner & Armitage, 1998). Moral norm was postulated to be positively associated with HIV testing, and so it is expected that respondents who believe that HIV/AIDS is a result of immoral behaviour and religious punishment will have tested more frequently. The descriptive norm (endorsement of non-scientific beliefs about HIV/AIDS) was also postulated to be positively associated with moral norm.

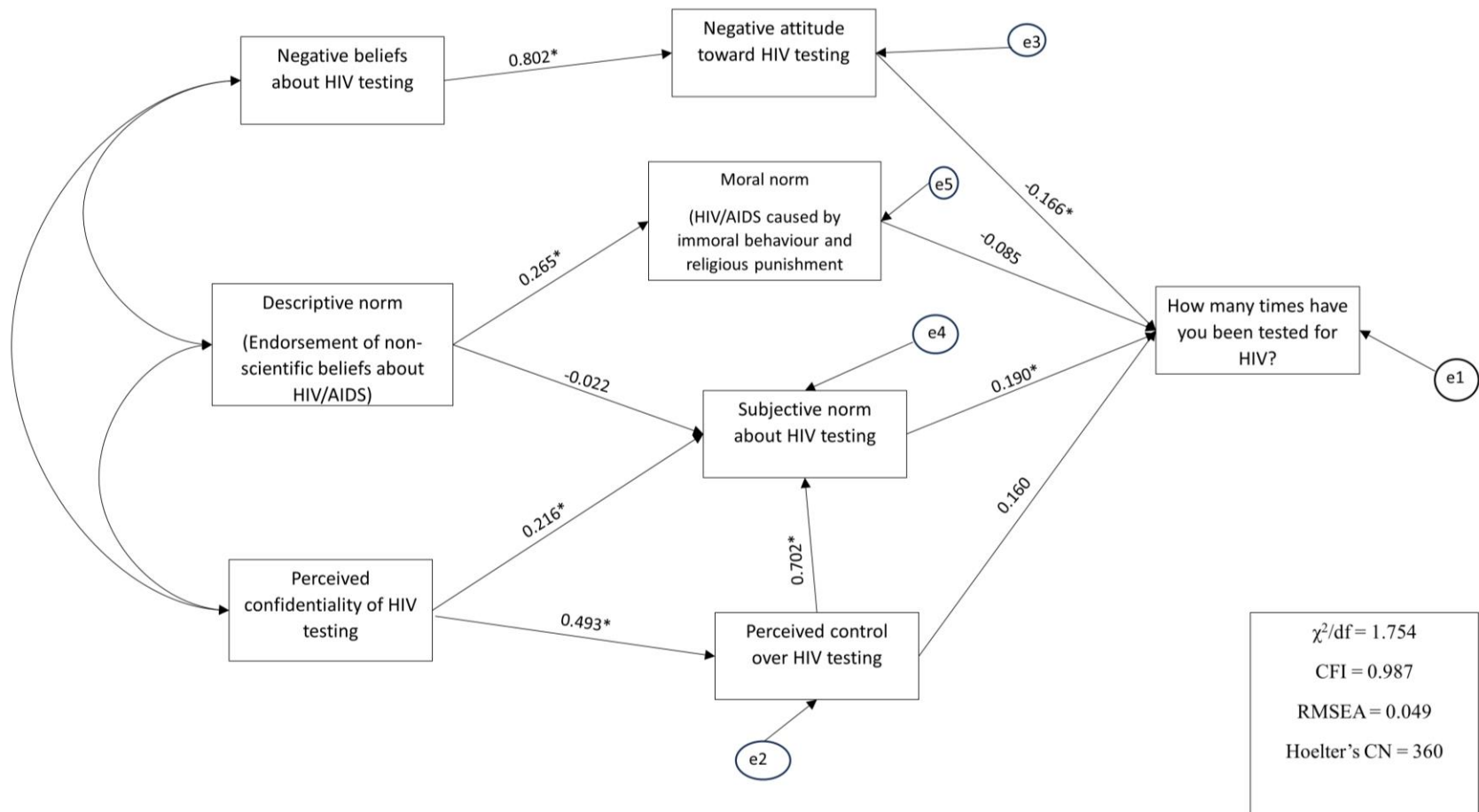


Figure 19 TPB (modified model) explaining participants HIV testing behaviour

* $p < 0.050$

The *modified model* (figure 19) explained a greater proportion of variance in HIV testing than the base model (14% as compared to 9.3%). It also had better fit statistics than the base model, with $\chi^2/df = 1.754$; CFI = 0.987; RMSEA = 0.049 and Hoelter's CN = 360. However, empirical support was not found to justify the extension of the TPB with moral norm, at least among the study participants (see Table 7.2).

Table 7.2 The TPB as an explanatory model of HIV testing behaviour

Path Analysis		Standardised estimates		
Total variance explained (%)		9.3	14	
Hypotheses	Direct effects	Base model	Modified model	Supported
H2a	Negative attitude toward HIV testing → HIV testing (-)	-0.182***	-0.166**	Yes
H2b	Subjective norm → HIV testing (+)	0.202***	0.190*	Yes
H2c	Perceived control over HIV testing → HIV testing (+)	0.165**	0.160	Partially
H2d	Descriptive norm → negative attitude toward HIV testing (+)	-0.062	-	No
H2e	Descriptive norm → subjective norm (-)	-0.172**	-0.022	Partially
H2f	Descriptive norm → Perceived control over HIV testing (-)	-0.097	-	No
H2g	Negative beliefs about HIV testing → negative attitude toward HIV testing (+)	0.812***	0.802***	Yes
H2h	Negative beliefs about HIV testing → subjective norm (-)	0.106	-	No
H2i	Perceived confidentiality of HIV testing → Perceived control over HIV testing (+)	0.482***	0.493***	Yes
M2a	Moral norm → HIV testing (+)	-	-0.085	No
M2b	Descriptive norm → Moral Norm (+)	-	0.265***	Yes
M2c	Perceived control over HIV testing → subjective norm (+)	-	0.702***	Yes
M2d	Perceived confidentiality of HIV testing → subjective norm (+)	-	0.216***	Yes
	Total indirect effects			
H2j	Negative beliefs about HIV testing → HIV testing.	-0.589*	-0.133*	Yes
H2k	Descriptive norm → HIV testing	-0.053*	-0.027	Partially
H2l	Perceived confidentiality of HIV testing → HIV testing	0.207	0.186*	Partially
M2e	Perceived control over HIV testing → HIV testing	-	0.133*	Yes

* $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$

The TPB postulates that a participants' attitude toward HIV testing, subjective norm about HIV testing and perceived control over HIV testing are the principal predictors of HIV testing. These three hypotheses were statistically supported in the base model, where a significant path was observed between negative attitude towards HIV testing and frequency of HIV testing ($\beta = -0.182$; $p < 0.001$); between subjective norm and frequency of HIV testing ($\beta = 0.202$; $p < 0.001$) as well as between perceived control over HIV testing and frequency of HIV testing ($\beta = 0.165$; $p = 0.002$).

In the modified model, the path between perceived control over HIV testing and frequency of HIV testing was not found to be statistically significant ($\beta = 0.160$; $p = 0.075$), but the paths between subjective norm and frequency of HIV testing ($\beta = 0.190$; $p = 0.035$), as well as between negative attitude toward HIV testing and frequency of HIV testing ($\beta = -0.166$; $p = 0.002$) were determined to be statistically significant. There are several reasons for the non-significant result, of which the most important is that perceived control over HIV testing was measured with a single item while negative attitude toward HIV testing and subjective norm were all measured with multiple items. Furthermore, in the literature on TPB (Armitage & Conner, 2001; Godin & Kok, 1996), the association between perceived behavioural control and health behaviour is mediated by behavioural intention, so it is also possible that a non-significant result was obtained because the modified model did not include a measure of HIV testing intention.

Overall, four out the five proposed modifications were empirically supported. Even though the proportion of variance explained in HIV testing improved with the inclusion of moral norm – it was not determined to be directly associated with HIV testing in the modified model. Endorsement of non-scientific beliefs about HIV/AIDS (descriptive norm), however, was found to be positively associated with moral norm ($\beta = 0.265$, $p < 0.001$). Despite the association between descriptive and moral norms, it was the subjective norm and not the moral norm, which was found to be significantly associated with HIV testing ($\beta = 0.190$; $p = 0.035$). Descriptive norm was also found to be negatively associated with the subjective norm ($\beta = -0.172$, $p = 0.008$) in the base model, but when moral norm was included in the modified model, this path was no longer statistically significant ($\beta = -0.022$, $p = 0.497$). This result suggests that in the modified model, moral norm may be moderating the effect of descriptive norm on subjective norm.

7.3 Explaining Condom Use Among a Sample of Male Construction Workers

Sexual partnerships shape and influence condom use (Noar *et al.*, 2012; Lansky *et al.*, 1998). Consistent condom use has been found to be higher within new and casual sexual partnerships than within long-term and primary sexual partnerships (Ragnarsson *et al.*, 2010; Do & Meekers, 2009). In this study, the HBM was used to explain consistent condom use in the last 3 months and the TPB was used to explain condom use intention across three different types of sexual partners – long term sex partner (henceforth regular sex partner); someone you don't know very well (henceforth casual sex partner) and a sex worker.

Only the path diagram for condom use/condom use intention with a casual sex partner is reported in the ensuing section, that of regular sex partner and sex worker are shown in the appendix.

7.3.1 The HBM as an Explanatory Model of Condom Use

Based on the literature review, the following path diagram was empirically estimated (see figure 20):

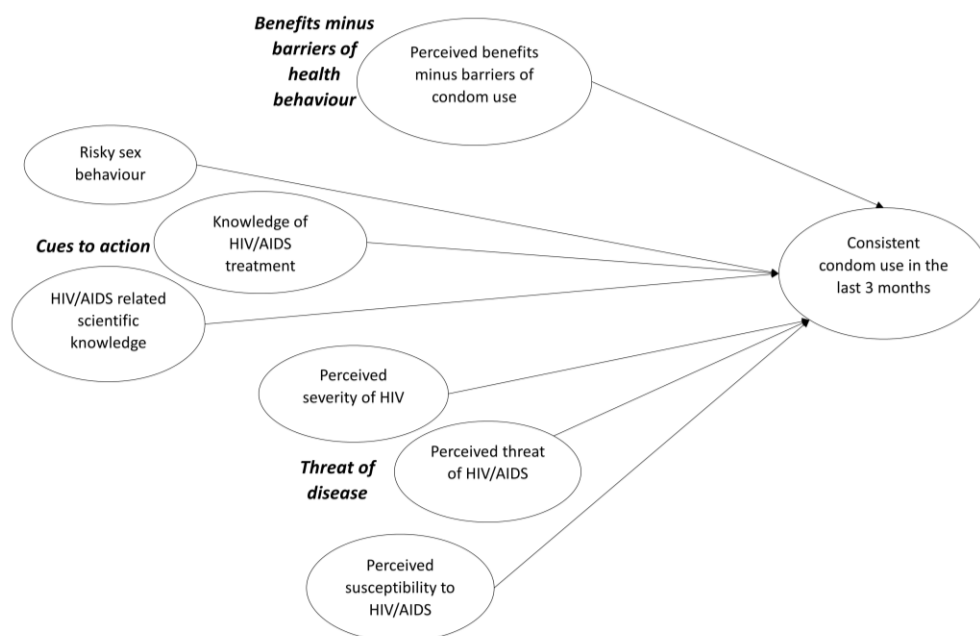


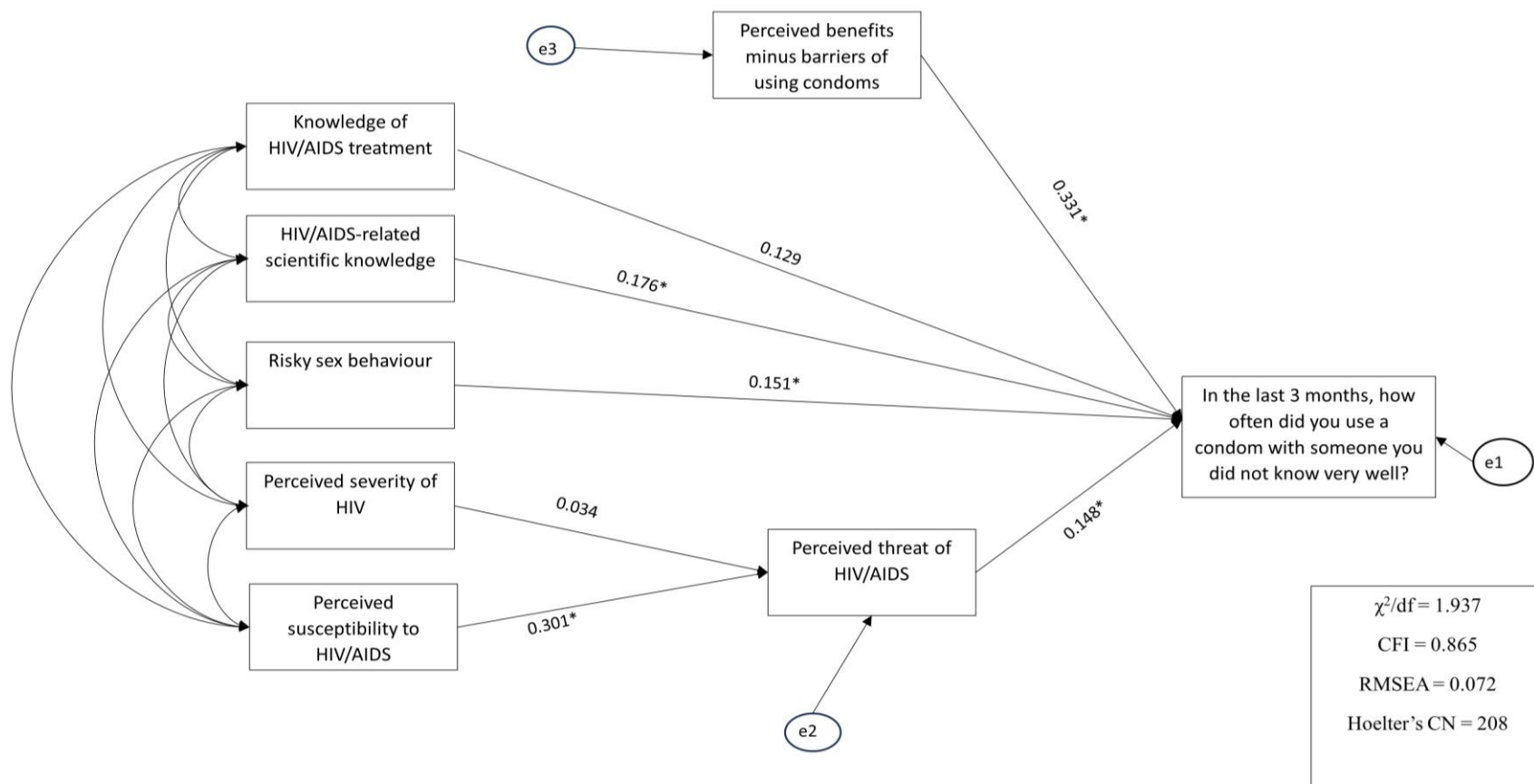
Figure 20 The HBM as an explanatory model of condom use among study participants

The paths to be estimated correspond to the individual hypotheses. The base model is shown in figure 21. For ease of presentation covariances are not shown. All possible direct and indirect effects were estimated.

The Base model

The *base model* accounted for 22% of the explained variance in consistent condom use with a casual sex partner in the last 3 months. Furthermore, the correspondence between the model and the data was satisfactory, with $\chi^2/df = 1.937$; CFI = 0.865; RMSEA = 0.072 and Hoelter's CN = 208.

From a theoretical perspective, the HBM was well supported. With the exception of the path from perceived severity of HIV to perceived threat of HIV/AIDS ($\beta = 0.034$, $p = 0.132$), and the path from knowledge of HIV/AIDS treatment to consistent condom use ($\beta = 0.129$, $p = 0.062$), all the direct hypotheses in the HBM were statistically supported (see figure 21).



As expected from the HBM, perceived threat of HIV/AIDS ($\beta = 0.148, p = 0.033$) and perceived ‘benefits minus barriers’ of condom use ($\beta = 0.331, p < 0.001$) were positively associated with condom use. And so, participants who perceived HIV/AIDS to be a threat to their health, and those who perceived the benefits of using condoms as outweighing the barriers, were found to be more likely to have consistently used a condom with a casual sex partner in the last 3 months. Two out of the three variables that were used as indicators for cues to action were found to be statistically significant in explaining consistent condom use – HIV/AIDS related scientific knowledge ($\beta = 0.176, p = 0.002$) and risky sex behaviour ($\beta = 0.151, p = 0.025$).

Participants with higher levels of HIV/AIDS related scientific knowledge, and those who engaged more frequently in risky sex behaviours, were more likely to have used a condom with a casual sex partner in the last 3 months. The third cue to action, knowledge of HIV/AIDS treatment services in the community ($\beta = 0.129, p = 0.072$), was not determined to be statistically significant in explaining consistent condom use. It is important to note that this result is consistent with that of HIV testing, and so it can be concluded that the knowledge of HIV/AIDS treatment services in the community is not a cue to action for HIV testing or consistent condom use among study participants.

Furthermore, none of the indirect hypotheses were empirically supported. And so, perceived susceptibility and perceived severity were not found to be indirectly associated with condom use with a casual sex partner in the base model.

The modified Model

The base model was contrasted with a *modified model* (see Figure 22).

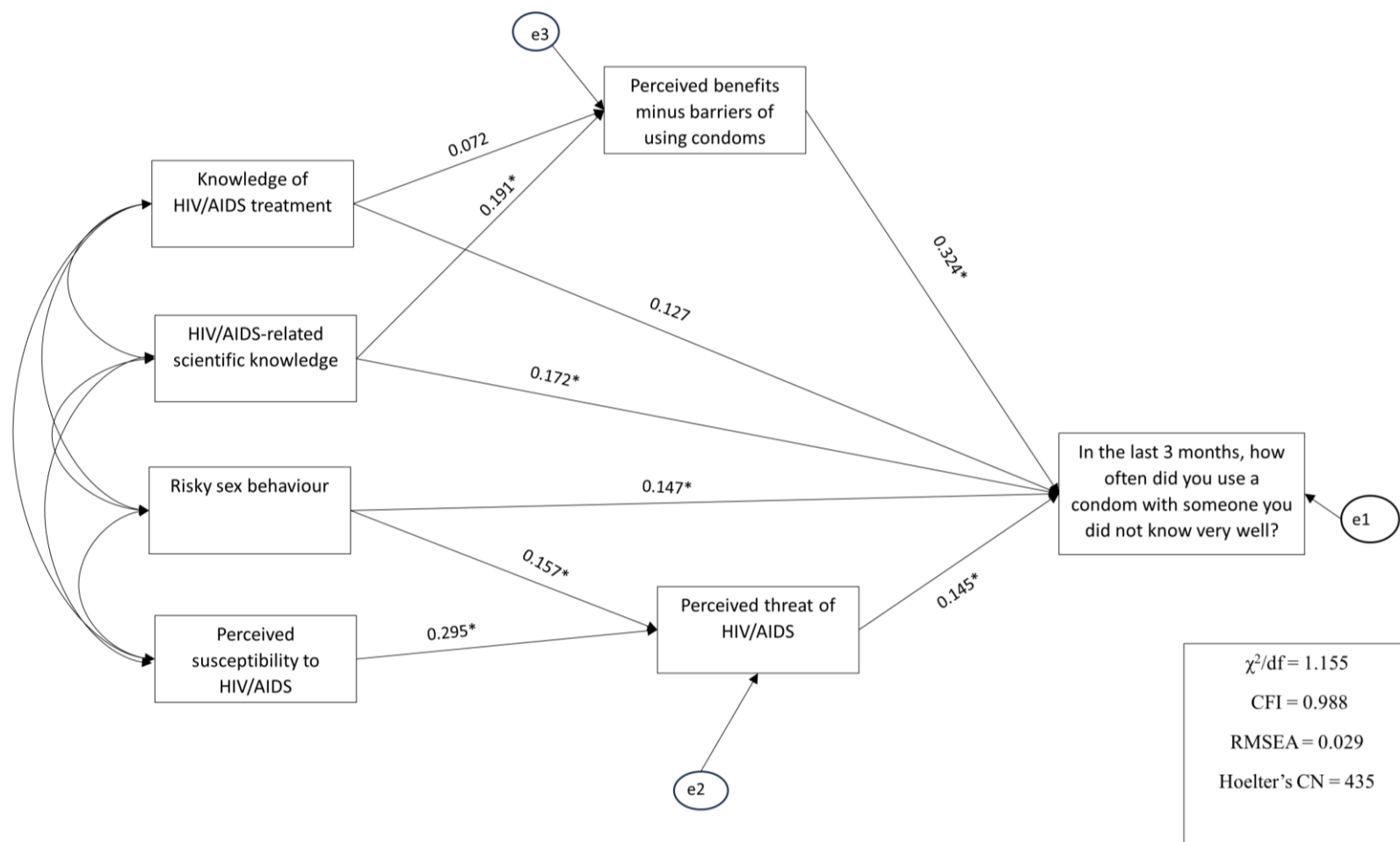


Figure 22 HBM (modified model) explaining consistent condom use with a casual sex partner in the last 3 months

* $p < 0.050$

Perceived severity of HIV was excluded from the modified model because it was not found to be directly associated with perceived threat of HIV/AIDS or indirectly associated with consistent condom use.

A path from risky sex behaviour to perceived threat of HIV/AIDS was introduced in the modified model to test the hypothesis that people who engage more frequently in risky sex behaviours will be more likely to perceive HIV/AIDS as a threat to their health than respondents who do not frequently engage in risky sex behaviours.

A path was also introduced between knowledge of HIV/AIDS treatment and perceived ‘benefits minus barriers’ of condom use to test the hypothesis that the growing availability of ART, and the awareness of treatment services, including modern PHIs (e.g., long-acting PrEP) was negatively associated with ‘benefits minus barriers’ of condom use.

A path was also introduced between HIV-related scientific knowledge and perceived ‘benefits minus barriers of condom use’ variable, to test the hypothesis that participants with higher levels of HIV-related scientific knowledge will perceive the benefits of condom use as outweighing the barriers.

The modified model had better fit statistics than the base model, with $\chi^2/df = 1.155$; CFI = 0.988; RMSEA = 0.029 and Hoelter’s CN = 435. From a theoretical perspective, all the paths that were found to be significant in the base model remained significant and in the same direction. However, only 3 out of the 6 modifications were found to be empirically supported (see Table 7.3).

Table 7.3 The HBM as an explanatory model of consistent condom use with a casual sex partner in the last 3 months				
Path Analysis		Standardised estimates		
Hypotheses	Total variance explained (%)	22	25.2	
	Direct effects	Base model	Modified model	Supported
H3a	Perceived threat → frequency of condom use (+)	0.148*	0.145*	Yes
H3b	Perceived ‘benefits minus barriers’ of condom use → frequency of condom use (+)	0.331***	0.324***	Yes
H3c	Knowledge of HIV/AIDS treatment → frequency of condom use (-)	0.129	0.127	No
H3d	HIV/AIDS related scientific knowledge → frequency of condom use (+)	0.176**	0.172*	Yes
H3e	Risky sex behaviour → frequency of condom use (+)	0.151*	0.147*	Yes
H3f	Perceived susceptibility → Perceived threat (+)	0.301***	0.295***	Yes
H3g	Perceived severity → perceived threat (+)	0.034	-	No
M3a	Knowledge of HIV/AIDS treatment → perceived ‘benefits minus barriers’ of condom use (-)	-	0.072	No
M3b	HIV/AIDS related scientific knowledge → perceived ‘benefits minus barriers’ of condom use (+)	-	0.191*	Yes
M3c	Risky sex behaviour → perceived threat of HIV/AIDS (+)	-	0.157*	Yes
	Total indirect effects			
H3h	Perceived susceptibility → frequency of condom use	0.045	0.043	No
H3i	Perceived severity → frequency of condom use	0.005	-	No
M3d	Risky sex behaviour → frequency of condom use	-	0.023	No
M3e	HIV/AIDS related scientific knowledge → frequency of condom use	-	0.062*	Yes
M3f	Knowledge of HIV/AIDS treatment → frequency of condom use	-	0.023	No

* $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$

HIV/AIDS related scientific knowledge was determined to be directly associated with perceived ‘benefits minus barriers’ of condom use ($\beta = 0.191$, $p = 0.032$), with participants with higher levels of HIV/AIDS related scientific knowledge more likely to perceive the benefits of condom use as outweighing the barriers. Similarly, risky sex behaviour was found to be positively and directly associated with perceived threat of HIV/AIDS ($\beta = 0.157$, $p = 0.039$), and participants who engaged more frequently in risky sex behaviours were found to be more likely perceive

HIV/AIDS as a threat to their health. With the exception of HIV/AIDS related knowledge which was observed to have a statistically significant indirect effect on consistent condom use ($\beta = 0.062$, $p = 0.049$), none of the other indirect hypotheses were statistically supported in the modified model.

Given the hypothesized relationship between condom use and the type of sexual partnership (Maurizio *et al.*, 2000), the modified HBM model was also used to explain consistent condom use with a regular sex partner and a sex worker (see Table 7.4).

Table 7.4 The HBM as an explanatory model of consistent condom use in the last 3 months across different partner types (modified model)

	Path analysis	Standardised estimates		
	Explained variance (%)	25.2	21.5	8.3
Hypotheses	Direct effect	Casual sex partner	Sex worker	Regular sex partner
H3a	Perceived threat → frequency of condom use (+)	0.145*	0.144*	0.193***
H3b	Perceived ‘benefits minus barriers’ of condom use → frequency of condom use (+)	0.324***	0.225**	0.107
H3c	Knowledge of HIV/AIDS treatment → frequency of condom use (-)	0.127	0.111	0.038
H3d	HIV/AIDS related scientific knowledge → frequency of condom use (+)	0.172*	0.167*	0.126*
H3e	Risky sex behaviour → frequency of condom use (+)	0.147*	0.220**	0.047
H3f	Perceived susceptibility → Perceived threat (+)	0.295***	0.263***	0.315***
M3a	Knowledge of HIV/AIDS treatment → perceived ‘benefits minus barriers’ of condom use (-)	0.072	-0.015	0.066
M3b	HIV/AIDS related scientific knowledge → perceived ‘benefits minus barriers’ of condom use (+)	0.191*	0.289***	0.250***
M3c	Risky sex behaviour → perceived threat of HIV/AIDS (+)	0.157*	0.146	0.188***
	Total indirect effect			
H3h	Perceived susceptibility → frequency of condom use	0.043	0.038	0.061*
M3d	Risky sex behaviour → frequency of condom use	0.023	0.021	0.036*
M3e	HIV/AIDS related scientific knowledge → frequency of condom use	0.062*	0.065*	0.027
M3f	Knowledge of HIV/AIDS treatment → frequency of condom use	0.023	-0.003	0.007

* $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$

There were substantial differences in the ability of the modified HBM to explain consistent condom use across the different partner types. While the modified model accounted for 25.2% of the explained variance in consistent condom use with a casual sex partner, it accounted for 21.5% of the explained variance in consistent condom use with a sex worker and only 8.3% of the explained variance in consistent condom use with regular partner.⁵³ Thus, it can be concluded that the modified HBM model is better at explaining consistent condom use with a casual sex partner and a sex worker than with a regular sex partner.

Perceived threat of HIV/AIDS and HIV/AIDS related scientific knowledge were determined to be directly and positively associated with consistent condom use across all three partner types. This finding suggests that regardless of the type of sex partner, participants who perceive HIV/AIDS to be a threat to their health and those with higher levels of HIV/AIDS related scientific knowledge were more likely to have consistently used condoms in the last 3 months. Similarly, regardless of the type of sex partnership, a statistically significant positive association was observed between perceived susceptibility to HIV/AIDS and perceived threat of HIV/AIDS, as well as between HIV/AIDS related scientific knowledge and perceived 'benefits minus barriers' of condom use.

On the other hand, consistent condom use was determined to be directly and positively associated with perceived 'benefits minus barriers' of condom use for a casual sex partner ($\beta = 0.324, p < 0.001$) and a sex worker ($\beta = 0.225, p = 0.002$), but not a regular sex partner ($\beta = 0.107, p = 0.579$). Similarly, risky sex behaviour was found to be a significant predictor of consistent condom use with a casual sex partner ($\beta = 0.147, p = 0.034$) and a sex worker ($\beta = 0.220, p = 0.009$), but not a regular sex partner ($\beta = 0.047, p = 0.391$).

Perceived susceptibility to HIV/AIDS was found to have an indirect effect on consistent condom use with a regular sex partner ($\beta = 0.061, p = 0.039$) but not for a casual sex partner ($\beta = 0.043, p = 0.279$) or a sex worker ($\beta = 0.038, p = 0.563$). Similarly, risky sex behaviour was determined to have a significant and an indirect effect on consistent condom use with a regular sex partner ($\beta = 0.036, p = 0.049$), but not for casual sex partner ($\beta = 0.023, p = 0.548$) or a sex worker ($\beta = 0.021, p = 0.437$). In contrast, HIV/AIDS related scientific knowledge was determined to have an indirect effect on consistent condom use with a casual sex partner ($\beta = 0.062, p = 0.031$) and a sex worker ($\beta = 0.065, p = 0.023$) but not with a regular sex partner ($\beta = 0.027, p = 0.638$).

⁵³ The path diagram is shown in the appendix.

An implication of the non-significant path between knowledge of HIV/AIDS treatment and the perceived ‘benefits minus barriers’ of condom use as well as between knowledge of HIV/AIDS treatment and consistent condom use suggests that the growing availability of ARV treatment services does not have a negative influence on attitudes toward condom use and consistent condom use across among the study participants.

7.3.2 The TPB as an Explanatory Model of Condom Use Intention

Based on the literature review, the following path diagram was empirically estimated (see figure 23):

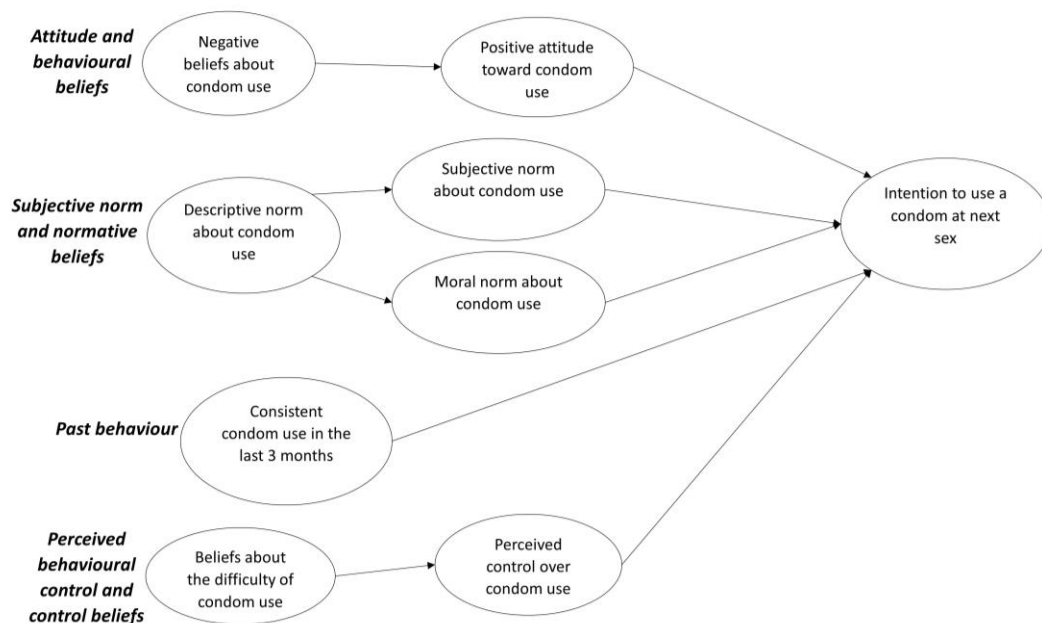


Figure 23 The TPB as an explanatory model of condom use intention among study participants

The paths to be estimated correspond to the individual hypotheses. The base model is shown in figure 24. For ease of presentation covariances are not shown. All possible direct and indirect effects were estimated.

The Base model

The base model (see figure 24) had a satisfactory fit to the data, with $\chi^2/df = 3.450$; CFI = 0.897; RMSEA = 0.117 and Hoelter's CN = 104.

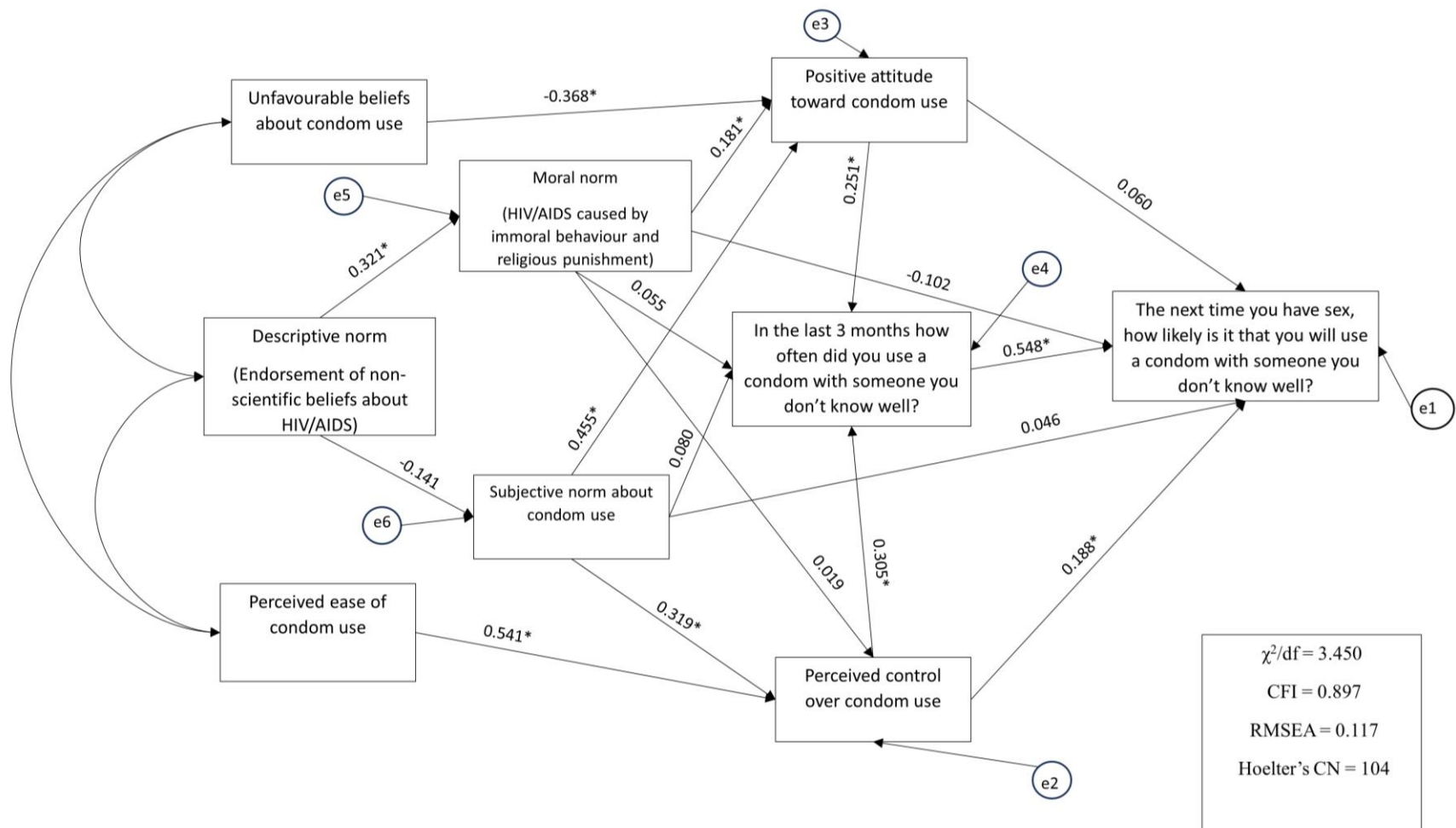


Figure 24 TPB (Base model) explaining participants intention to use a condom at next sex with a casual sex partner

* $p < 0.050$

Some of the paths postulated in the TPB were not empirically supported. The path from positive attitude toward condom use to intention to use a condom at next sex ($\beta = 0.060, p = 0.540$), as well as the path from subjective norm about condom use to intention to use a condom at next sex ($\beta = 0.046, p = 0.375$) and moral norm to intention to use a condom at next sex ($\beta = -0.102, p = 0.072$), were not found to be statistically significant.

Only perceived control over condom use ($\beta = 0.188, p = 0.002$) and consistent condom use in the last 3 months ($\beta = 0.548, p < 0.001$) were determined to be directly associated with intention to use a condom at next sex with a casual partner. Positive attitude toward condom use ($\beta = 0.137, p = 0.023$), and subjective norm ($\beta = 0.247, p = 0.017$) were determined to have an indirect effect on intention to use a condom at next sex with a casual sex partner.

Moral norm was not found to have a significant indirect effect on condom use intention ($\beta = 0.072, p = 0.728$). The base model (see figure 24) accounted for 45.9% of the explained variance in intention to use a condom at next sex with a casual sex partner.

The modified Model

The *modified model* (see figure 25) excluded all the non-significant paths. Furthermore, since the subjective norm and moral norm were not found to be directly associated with consistent condom use in the last 3 months as well as condom use intention in the base model, they were treated as exogenous variables in the modified model, so as to compare the indirect effect of all the normative influences (descriptive, moral, and subjective) on intention to use a condom at next sex.

Since subjective norm was determined to be positively associated with positive attitude toward condom use as well perceived control over condom use, and moral norm was determined to be positively associated with positive attitude toward condom use, these paths were retained in the modified model.

Two paths were included to examine the association between descriptive norm and positive attitude toward condom use and perceived control over condom use. Moreover, since positive attitude toward condom use was not determined to be directly associated with intention to use condom at next sex, in the modified model, the indirect effect via consistent condom use was investigated.

Overall, the *modified model* had better fit statistics than the base model, with $\chi^2/df = 1.165$; CFI = 0.994; RMSEA = 0.030 and Hoelter's CN = 328. Furthermore, all the paths that were found to be statistically significant in the base model remained significant and in the same direction.

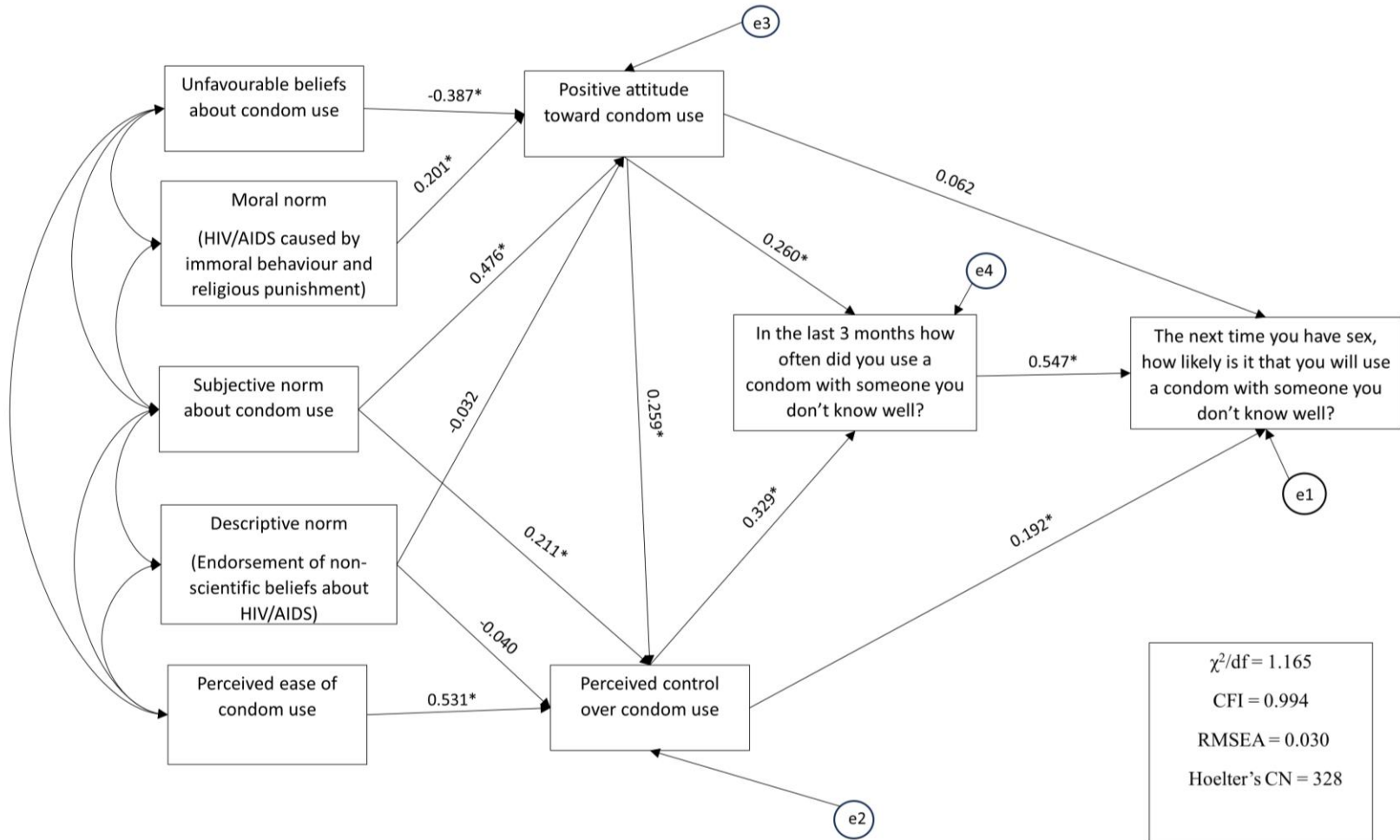


Figure 25 TPB (modified model) explaining participants intention to use a condom at next sex with a casual sex partner

* $p < 0.050$

The modified model accounted for 46% of the explained variance in intention to use a condom at next sex with a casual sex partner (see Table 7.5).

Table 7.5 The TPB as an explanatory model of intention to use a condom at next sex

Path Analysis		Standardised estimates		
	Total variance explained (%)	45.9	46	
Hypotheses	Direct effect	Base model	Modified model	Supported
H4a	Positive attitude toward condom use → frequency of condom use (+)	0.251***	0.260***	Yes
H4b	Positive attitude toward condom use → intention to use a condom at next sex (+)	0.060	0.062	No
H4c	Subjective norm → frequency of condom use (+)	0.080	-	No
H4d	Subjective norm → intention to use a condom at next sex (+)	0.046	-	No
H4e	Perceived control over condom use → frequency of condom use (+)	0.305***	0.329***	Yes
H4f	Perceived control over condom use → intention to use condom at next sex (+)	0.188**	0.192**	Yes
H4g	Descriptive norm → moral norm (+)	0.321***	-	Yes
H4h	Descriptive norm → subjective norm (-)	-0.141	-	No
H4i	Moral norm → frequency of condom use (+)	0.055	-	No
H4j	Moral norm → intention to use a condom at next sex (+)	-0.102	-	No
H4k	Perceived ease of condom use → perceived control over condom use (+)	0.541***	0.531***	Yes
H4l	Unfavourable belief about condom use → positive attitude toward condom use (-)	-0.368***	-0.387***	Yes
H4m	Frequency of condom use → intention to use a condom at next sex (+)	0.548***	0.547***	Yes
H4n	Moral norm → perceived control over condom use (+)	0.019	-	No
H4o	Moral norm → positive attitude toward condom use (+)	0.181**	0.201**	Yes
H4p	Subjective norm → perceived control over condom use (+)	0.319***	0.211***	Yes
H4q	Subjective norm → positive attitude toward condom use (+)	0.455***	0.476***	Yes
M4a	Positive attitude toward condom use → perceived control over condom use (+)	-	0.259***	Yes
M4b	Descriptive norm → positive attitude toward condom use (-)	-	-0.032	No
M4c	Descriptive norm → perceived control over condom use (-)	-	-0.040	No
	Total indirect effect			
H4r	Unfavourable beliefs about condom use → intention to use a condom at next sex	-0.073*	-0.117**	Yes
H4s	Positive attitude toward condom use → intention to use a condom at next sex	0.137*	0.239**	Yes
H4t	Moral norm → intention to use a condom at next sex	0.072	0.061**	Partially
H4u	Descriptive norm → intention to use a condom at next sex	-0.051	-0.024	No
H4v	Subjective norm → intention to use a condom at next sex	0.247*	0.222**	Yes
H4w	Perceived ease of condom use → intention to use a condom at next sex	0.192*	0.197**	Yes
H4x	Perceived control over condom use → intention to use a condom at next sex	0.167*	0.180**	Yes

* $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$

With the exception of the descriptive norm, which was not found to have an indirect effect on intention to use a condom at next sex ($\beta = -0.024, p = 0.576$), all the other indirect hypotheses were empirically supported.

Intention to use a condom with a casual sex partner was directly and positively associated with consistent condom use ($\beta = 0.547, p < 0.001$) and perceived control over condom use ($\beta = 0.192, p = 0.004$). Participants who used a condom consistently with a casual sex partner in the last 3 months, and participants who perceived themselves as having control over their use of condoms, were determined to be more likely to form an intention to use a condom at the next sex.

In contrast, positive attitude toward condom use ($\beta = 0.062, p = 0.873$), was not found to be directly associated with intention to use a condom at next sex. Rather, it was found to have statistically significant indirect effect ($\beta = 0.239, p = 0.002$). Moral norm ($\beta = 0.061, p = 0.009$) and subjective norm ($\beta = 0.222, p = 0.002$) were also determined to have an indirect effect on intention to use a condom at next sex with a casual sex partner.

As expected from the TPB, perceived ease of condom use was directly associated with perceived control over condom use ($\beta = 0.531, p < 0.001$), and indirectly associated with condom use intention ($\beta = 0.197, p = 0.002$). Similarly, unfavourable beliefs about condom use were directly associated with positive attitude toward condom use ($\beta = -0.387, p < 0.001$), and indirectly associated with condom use intention ($\beta = -0.117, p = 0.001$).

Taken together, these findings suggest that past behaviour and perceived behavioural control are the most proximal determinants of intention to use a condom at next sex among the study participants.

The modified model was also used to explain condom use intention with a regular sex partner and sex worker (see Table 7.6).

Table 7.6 The TPB as an explanatory model of condom use intention across different partner types (modified model)

	Total variance explained (%)	46	49.4	49.2
Hypotheses	Direct effect	Casual sex partner	Sex worker	Regular sex partner
H4a	Positive attitude toward condom use → frequency of condom use(+)	0.260***	0.184*	0.013
H4b	Positive attitude toward condom use → intention to use a condom at next sex (+)	0.062	0.034	0.122**
H4e	Perceived control over condom use → frequency of condom use (+)	0.329***	0.310***	0.350***
H4f	Perceived control over condom use → intention to use condom at next sex(+)	0.192**	0.183**	0.067
H4k	Perceived ease of condom use → Perceived control over condom use (+)	0.531***	0.558***	0.485***
H4l	Unfavourable beliefs about condom use → positive attitude toward condom use (-)	-0.387***	-0.351***	-0.425***
H4m	Frequency of condom use → intention to use a condom at next sex (+)	0.547***	0.601***	0.644***
H4o	Moral norm → positive attitude toward condom use (+)	0.201**	0.163*	0.086
H4p	Subjective norm → perceived control over condom use (+)	0.211***	0.190**	0.224***
H4q	Subjective norm → positive attitude toward condom use (+)	0.476***	0.498***	0.503***
M4a	Positive attitude toward condom use → perceived control over condom use (+)	0.259***	0.276***	0.267***
M4b	Descriptive norm → positive attitude toward condom use (-)	-0.032	-0.051	0.047
M4c	Descriptive norm → perceived control over condom use (-)	-0.040	0.003	-0.016
	Total indirect effect			
H4r	Unfavourable beliefs about condom use → intention to use a condom at next sex	-0.117**	-0.086**	-0.088**
H4s	Positive attitude toward condom use → intention to use a condom at next sex	0.239**	0.212**	0.086*
H4t	Moral norm → intention to use a condom at next sex	0.061**	0.040	0.018
H4u	Descriptive norm → intention to use a condom at next sex	-0.024	-0.011	0.005
H4v	Subjective norm → intention to use a condom at next sex	0.222**	0.192**	0.170**
H4w	Perceived ease of condom use → intention to use a condom at next sex	0.197**	0.206**	0.142**
H4x	Perceived control over condom use → intention to use a condom at next sex	0.180**	0.186**	0.225**

* $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$

Marginal differences were observed in the ability of the modified TPB to explain condom intention use across the different partner types. While the modified model accounted for 46% of the explained variance in condom use intention with a casual sex partner, it accounted for 49.4% of the explained variance in condom use with a sex worker and 49.2% of the explained variance in condom use intention with a regular partner.

Across the three partner types, intention to use a condom was determined to be directly and positively associated with consistent condom use in the last 3 months. Specifically, participants who used condoms consistently in the last 3 months were more likely to form an intention to use a condom the next time they have sex.

Perceived control over condom use was found to be a statistically significant predictor of condom use intention for a casual sex partner ($\beta = 0.192, p = 0.002$) and a sex worker ($\beta = 0.183, p = 0.007$) but not for a regular sex partner ($\beta = 0.067, p = 0.476$). On the other hand, positive attitude toward condom use was found to be directly and positively associated with condom use intention for a regular sex partner ($\beta = 0.122, p = 0.002$) but not with a casual sex partner ($\beta = 0.062, p = 0.382$), or a sex worker ($\beta = 0.034, p = 0.798$). Positive attitude toward condom use was however found to have a statistically significant indirect effect on condom use intention across the three partner types.

Regarding the hypothesized indirect effects of the normative influences, only subjective norms were found to have a statistically significant indirect effect on condom use intention across all three sexual partnerships. In particular, respondents who perceived their important referent others as approving of condom use, were more likely to form an intention to use a condom the next time they have sex.

Moral norms were found to have a statistically significant indirect effect for a casual sex partner ($\beta = 0.061, p = 0.009$), but not for a regular sex partner ($\beta = 0.018, p = 0.632$) or a sex worker ($\beta = 0.040, p = 0.514$). On the other hand, descriptive norms were not found to have a statistically significant indirect effect on condom use intention across any partner type.

7.4 Summary of Results

In this chapter, path analysis was used to investigate how well the HBM and the TPB explained HIV testing and condom use in the study sample. Specifically, model fit statistics provided an indication of whether the hypothesized pathways in the explanatory models were representative of underlying relationships in the data (Byrne, 2016). Given that the HBM and the TPB were appropriately fit to the data in the modified models, it can be concluded that there is empirical support for the hypothesized relationships in the HBM and TPB among study participants. Beyond the examination of pathways between constructs, an estimate of the explained variance in the outcome variable accounted for by the predictors in the model, was used to determine the discrepancy between the explanatory model and the data.

In terms of explained variance, the TPB was found to provide a marginally better explanation of HIV testing than the HBM. In particular, the modified HBM model accounted for 9.9% of the explained variance in frequency of HIV testing, while the modified TPB model accounted for 14% of the explained variance. This finding aligns with the literature which has found the TPB to provide an overall better explanation of health behaviours than the HBM (Chin & Mansori, 2019; Gabriel *et al.*, 2019; Gerend & Shepherd, 2012).

Substantial differences were observed in the ability of the HBM to explain consistent condom use across the different partner types. While the modified HBM model accounted for 25.2% of the explained variance in consistent condom use with a casual sex partner, it accounted for 21.5% of the explained variance in consistent condom use with a sex worker and only 8.3% of the explained variance in consistent condom use with regular partner. Based on these results, it can be concluded that the modified HBM model is relatively weaker at explaining condom use with regular sex partner than with a casual sex partner or a sex worker among the study participants. In contrast, the differences in the ability of the TPB to explain intention to use a condom at next sex was marginal. While the modified TPB model accounted for 46% of the explained variance in intention to use a condom at next sex with a casual sex partner, it accounted for 49.4% with a sex worker and 49.2% with a regular sex partner.

As expected from the HBM, perceived ‘benefits minus barriers’ (of HIV testing and condom use) and perceived threat of HIV/AIDS were found to be directly associated with the outcome variables. Furthermore, two out of the three cues to action, HIV-related scientific knowledge, and risky sex behaviour were found to be directly associated with the outcome variables. The third cue to action, knowledge of HIV/AIDS treatment services was not found to be directly associated with either HIV testing or condom use.

In terms of indirect associations, perceived severity of HIV was not determined to have an indirect effect on either HIV testing or condom use, but perceived susceptibility to HIV/AIDS was found to have a significant indirect effect on both outcomes.

The aforementioned results suggest that while perceived severity of HIV and knowledge of HIV/AIDS treatment services in the community are theoretically plausible predictors of health behaviour as per the HBM, there was no empirical support for the inclusion of these constructs in explaining HIV testing or condom use in this study. The lack of empirical support may be partly attributed to how perceived severity of HIV and knowledge of HIV/AIDS treatment were measured in this study. Thus, it is important to develop alternative measures of perceived severity and knowledge of HIV/AIDS treatment in future research (Ajzen & Timko, 1986).

As per the TPB, HIV testing was determined to be directly associated with subjective norm about HIV testing, attitude toward HIV testing and perceived control over HIV testing. These associations remained statistically significant in the modified model, except for perceived control over HIV testing. Given that the modified TPB model includes moral norm as an additional predictor, this finding suggests that the inclusion of moral norm to the TPB might moderate the influence of perceived behavioural control on HIV testing. Moral norm, however, was not found to be directly associated with frequency of HIV testing. Furthermore, in alignment with the TPB, negative beliefs about HIV testing and perceived confidentiality of HIV testing, were found to have an indirect effect on HIV testing.

Across the three partner types, consistent condom use in the last 3 months was determined to be directly and positively associated with intention to use a condom at next sex. Attitude toward condom use, subjective norm, perceived control over condom use, unfavourable beliefs about condom use and perceived ease of condom use were all found to have a statistically significant indirect effect on intention to use a condom at next sex. Thus, past behaviour, which has been suggested as an extension to the TPB, was found to be the most proximal predictor of condom use intention in the study sample.

In addition, perceived control over condom use was found to be directly associated with condom use intention for a casual sex partner and a sex worker, but not for a regular sex partner. On the other hand, attitude toward condom use and consistent condom use in the last 3 months were found to be associated with condom use intention for a regular sex partner but not with a casual sex partner, or a sex worker. When viewed together, these results indicate that some of the constructs as well as hypothesized pathways within the HBM and TPB may be relevant in understanding HIV testing, consistent condom use, and intention to use a condom among the study participants.

8 INTEGRATING THE HBM & TPB

The use of theory in understanding health behaviours and in the design of health promotion interventions has been widely recommended (George *et al.*, 2021; Ganz *et al.*, 2017, Eccles *et al.*, 2005; Michie & Abraham, 2004). Despite this, researchers and health interventionists may be overwhelmed by the multitude of theories available to them, as well as the fragmented, and often contradictory evidence on the relationship between the use of theory and the effectiveness of interventions (Sniehotta *et al.*, 2014a). Questions also remain regarding the applicability of theories to contexts other than those in which they were developed (Airhihenbuwa & Obregon, 2000).

A challenge faced by researchers and policy makers is deciding which theory to use. One way of addressing this challenge is to perform an empirical test. When a theory is empirically tested, evidence is collected to confirm or falsify its hypotheses. This allows for the refinement of theory, and ultimately leads to a better and more nuanced understanding of the phenomena which a theory explains. Additionally, empirical comparison of theory assists researchers in identifying which constructs are most effective in explaining specified behaviours - which can in turn inform the development of behavioural interventions and policies (Yastica *et al.*, 2020; Orłowski & Hallam, 2008; Noar & Zimmerman, 2005).

The empirical testing of theory entails several different considerations. The first approach involves what de Vries (2017) has termed as *theory combination*, which implies a simple additive model wherein constructs from two or more theories are added together (de Vries, 2017). Although theory combination can be logical, it has some drawbacks since it does not critically reflect on the added value of a new construct to a theoretical framework and as a result is susceptible to redundancy. In contrast, *theory integration* implies a testing of constructs in a systematic manner, in which constructs may only be included in an integrated model if they have been proven to add value (de Vries, 2017). Critics of theory integration argue that it could result in a theory of everything (Johnston & Dixon, 2008). Proponents on the other hand, see the benefits of an integrated approach (de Vries, 2017).

The position taken in this dissertation is that an integration of complementary theory has theoretical and empirical value. Several scholars have integrated constructs from the HBM and TPB and applied it to the study of a diverse array of behaviours including risk preventive behaviours (Huang *et al.*, 2020), HIV-related behaviours (Wulfert & Fan, 1995), participation in an injury prevention program (Gabriel *et al.*, 2019), breast cancer screening (Chin & Mansori, 2019), COVID-19 vaccination (An *et al.*, 2021), HPV vaccination (Gerend & Shepherd, 2012)

among others.⁵⁴ Against this background, two models integrating constructs from the HBM and TPB were empirically tested in this chapter.

8.1 An Integrated Model of HIV Testing

Based on the empirical findings in the previous chapter, it was posited that three factors directly influence frequency of HIV testing among study participants (see figure 26).

These are:

- 1) Attitude toward HIV testing
- 2) Perception of the threat posed by HIV/AIDS
- 3) Subjective norm about HIV testing

⁵⁴ For example, Gabriel *et al.* (2019) have included constructs from the HBM, namely cues to action, perceived consequences of injury, and fear of injury to the TPB. Similarly, Chin and Mansori (2019) include perceived severity of breast cancer, perceived susceptibility to breast cancer, and perceived benefits minus barriers of breast cancer screening as predictors of intention for breast cancer screening.

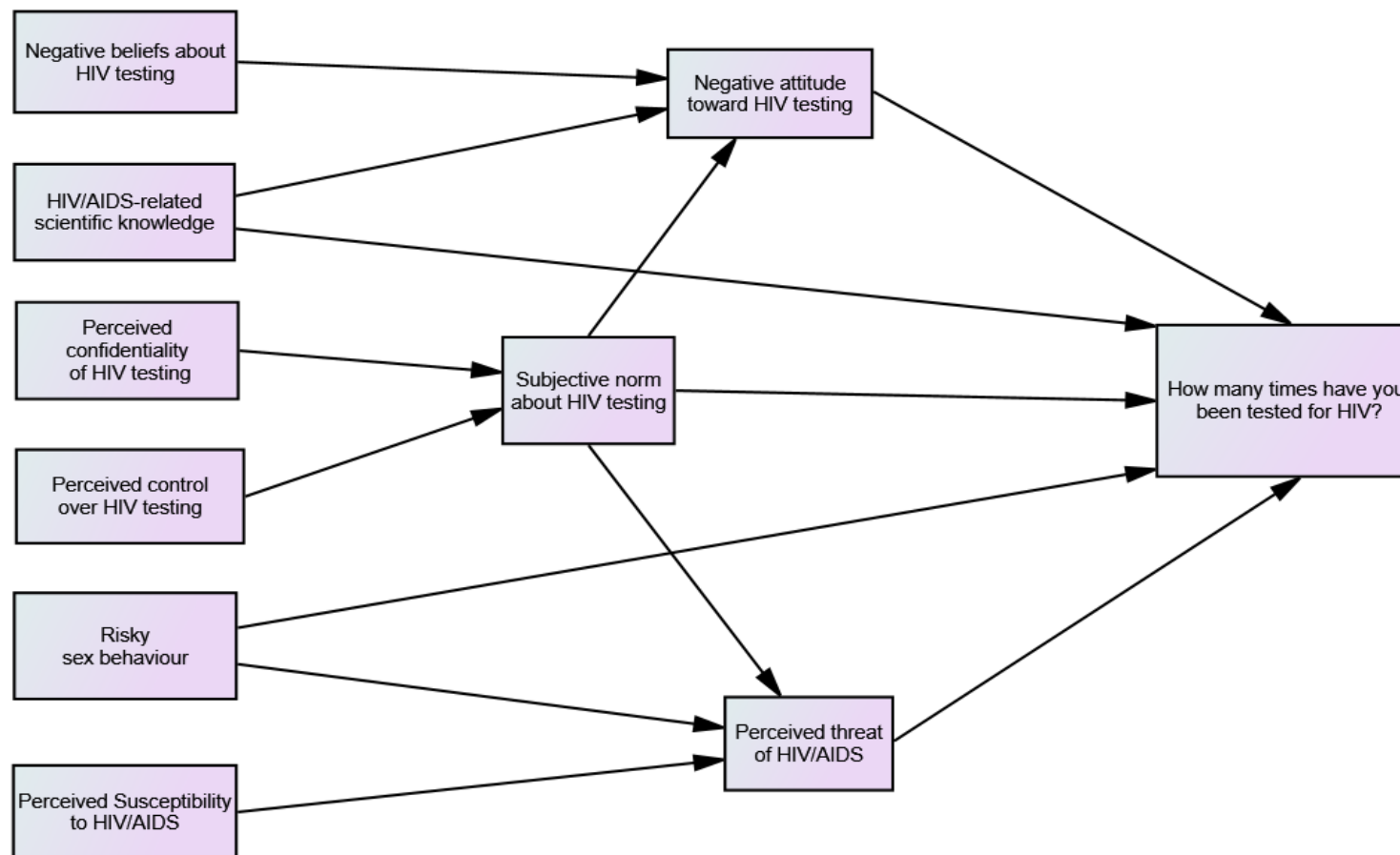


Figure 26 An Integrated model of HIV testing among study participants

Path analysis testing of the integrated model of HIV testing is shown in Figure 27. For ease of presentation, covariances are not shown. All possible direct and indirect effects were estimated. The integrated model was determined to be a good fit to the data, with $\chi^2/df = 1.280$; CFI = 0.995; RMSEA = 0.030 and Hoelter's CN = 475.

Furthermore, the proximal determinants of HIV testing were determined to be negative attitude toward HIV testing, subjective norm about HIV testing (both from the TPB), and perceived threat of HIV (from the HBM).

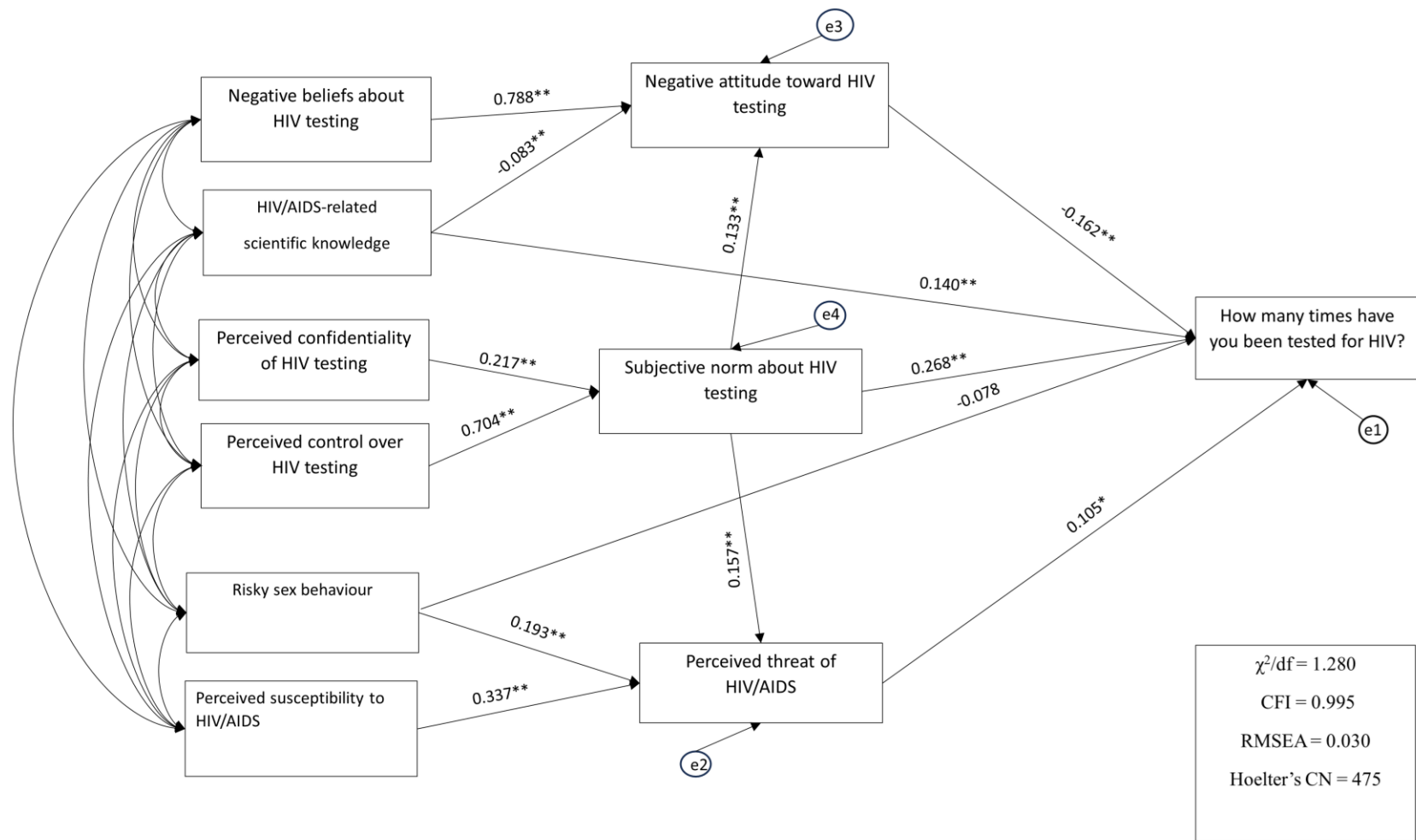


Figure 27 Empirically tested integrated model of HIV testing behaviour
 ** $p < 0.050$; * $p < 0.100$

The integrated model explained approximately 15% of the variance in frequency of HIV testing. In terms of explanatory power, the performance of the integrated model was marginally better than the TPB (14%) and much better than the HBM (10%). Overall, the results indicate that the HBM and TPB are complementary. That said, the integrated model presents one conceptualization of the way in which constructs from the HBM and TPB can be integrated in a unified framework. Further conceptualizations of the same variables are possible.

As expected, perceived threat of HIV/AIDS ($\beta = 0.105$; $p = 0.054$), negative attitude towards HIV testing ($\beta = -0.162$; $p = 0.003$) and subjective norm about HIV testing ($\beta = 0.268$; $p < 0.001$) were all determined to have a direct effect on HIV testing. And so, based on the integrated model, it can be deduced that if a participant perceives HIV/AIDS to be a threat to their health, if they have a positive attitude about HIV testing, and if they feel that HIV testing is supported and approved by a person or group of people (whom they deem important), then they are more likely to have had an HIV test. This finding is consistent with previous studies that have independently used the HBM and the TPB to explain HIV-related health behaviours (Conner & Sparks, 2015, 2005; Carpenter, 2010).

It is important to note that subjective norm was determined to have a stronger effect on HIV testing than attitude toward HIV testing and perceived threat of HIV/AIDS. Although the integrated model is not directly comparable to the TPB, this result differs from applications of the TPB which suggest that subjective norm has a relatively weak effect on behavioural intention, relative to attitude towards specified behaviour and perceived behavioural control (Ajzen, 2011). Furthermore, negative beliefs about HIV testing were positively and directly associated with negative attitude towards HIV testing ($\beta = 0.788$; $p < 0.001$), while HIV-related scientific knowledge was negatively and directly associated with negative attitude towards HIV testing ($\beta = -0.083$; $p = 0.017$). Thus, the integrated model suggests that participants who hold negative beliefs about HIV testing will be more likely to have a negative attitude toward HIV testing and those who possess more HIV-related scientific knowledge will be less likely to have a negative attitude towards HIV testing.

Perceived confidentiality of HIV testing was directly and positively related to subjective norm about HIV testing ($\beta = 0.217$; $p < 0.001$), and perceived control over HIV testing was positively and directly associated with subjective norm about HIV testing ($\beta = 0.704$; $p < 0.001$). One interpretation of this result is that participants who trust HIV/AIDS counsellors to keep their information confidential and those who would not be bothered if someone they knew saw them getting an HIV test were more likely to feel socially supported regarding HIV testing.

Risky sex behaviour ($\beta = 0.193$; $p < 0.001$) and perceived susceptibility to HIV/AIDS ($\beta = 0.337$; $p < 0.001$), were directly and positively associated with perceived threat of HIV/AIDS. Thus, participants who engaged more in risky sex behaviours and those who perceived themselves to be susceptible to HIV/AIDS were found to be more likely to view HIV/AIDS as a threat to their health.

Additionally, subjective norm about HIV testing was found to be directly and positively associated with perceived threat of HIV/AIDS ($\beta = 0.157$; $p < 0.001$). Thus, workers who feel that important referent others would support and approve of their decision to get an HIV test, were also more likely to perceive HIV/AIDS as threat to their health.

An empirical finding which requires further investigation was the direct and positive association between subjective norm about HIV testing and negative attitude towards HIV testing ($\beta = 0.133$; $p < 0.001$). This finding is remarkable because it suggests that participants' who feel that important referent others would support and approve of their decision to get an HIV test, are also more likely to have negative attitudes toward HIV testing.

In addition to the aforementioned direct effects, indirect effects of relevant variables in the model were investigated (see Table 8.1). Regarding these indirect effects, subjective norm was found to mediate the effect of perceived confidentiality of HIV testing and perceived control over HIV testing on frequency of HIV testing. Negative attitude toward HIV testing was also determined to mediate the effect of HIV-related scientific knowledge, negative beliefs about HIV testing and subjective norm on frequency of HIV testing.

No significant indirect effects were observed for risky sex behaviour and perceived susceptibility to HIV/AIDS.

Table 8.1 An integrated model of HIV testing

Total direct effects	Standardised estimates
Perceived confidentiality of HIV testing → subjective norm about HIV testing	0.217***
Perceived control over HIV testing → subjective norm about HIV testing	0.704***
Negative beliefs about HIV testing → Negative attitude toward HIV testing	0.788***
HIV/AIDS related scientific knowledge → Negative attitude toward HIV testing	-0.083*
Subjective norm about HIV testing → perceived threat of HIV/AIDS	0.157**
Risky sex behaviour → HIV testing	-0.078
HIV/AIDS related scientific knowledge → HIV testing	0.140*
Risky sex behaviour → perceived threat of HIV/AIDS	0.193***
Perceived susceptibility to HIV/AIDS → perceived threat of HIV/AIDS	0.337***
Negative attitude toward HIV testing → HIV testing	-0.162**
Subjective norm about HIV testing → negative attitude toward HIV testing	0.133***
Subjective norm about HIV testing → HIV testing	0.268***
Perceived threat of HIV/AIDS → HIV testing	0.105*
Total indirect effects	
Perceived confidentiality of HIV testing → HIV testing	0.057**
Perceived susceptibility to HIV/AIDS → HIV testing	0.035
Perceived control over HIV testing → HIV testing	0.185**
Risky sex behaviour → HIV testing	0.020
HIV/AIDS related scientific knowledge → HIV testing	0.013*
Negative beliefs about HIV testing → HIV testing	-0.128**
Perceived confidentiality of HIV testing → perceived threat of HIV/AIDS	0.034**
Perceived confidentiality of HIV testing → negative attitude toward HIV testing	0.029**
Subjective norm → HIV testing	-0.005
Perceived control over HIV testing → negative attitude toward HIV testing	0.093**
Perceived control over HIV testing → perceived threat of HIV/AIDS	0.111**

* $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$

8.2 An Integrated Model of Intention to use a Condom at next Sex with a Casual Partner

Based on the empirical findings in the previous chapter, a participant's intention to use condom at next sex with a casual sex partner was posited as being directly predicted by the following (see figure 28):

- 1) Attitude toward condom use,
- 2) Perception of control over condom use
- 3) Past behaviour

Moreover, HIV/AIDS related scientific knowledge and risky sex behaviour were included as cues to action and postulated as having an indirect effect on condom use intention.

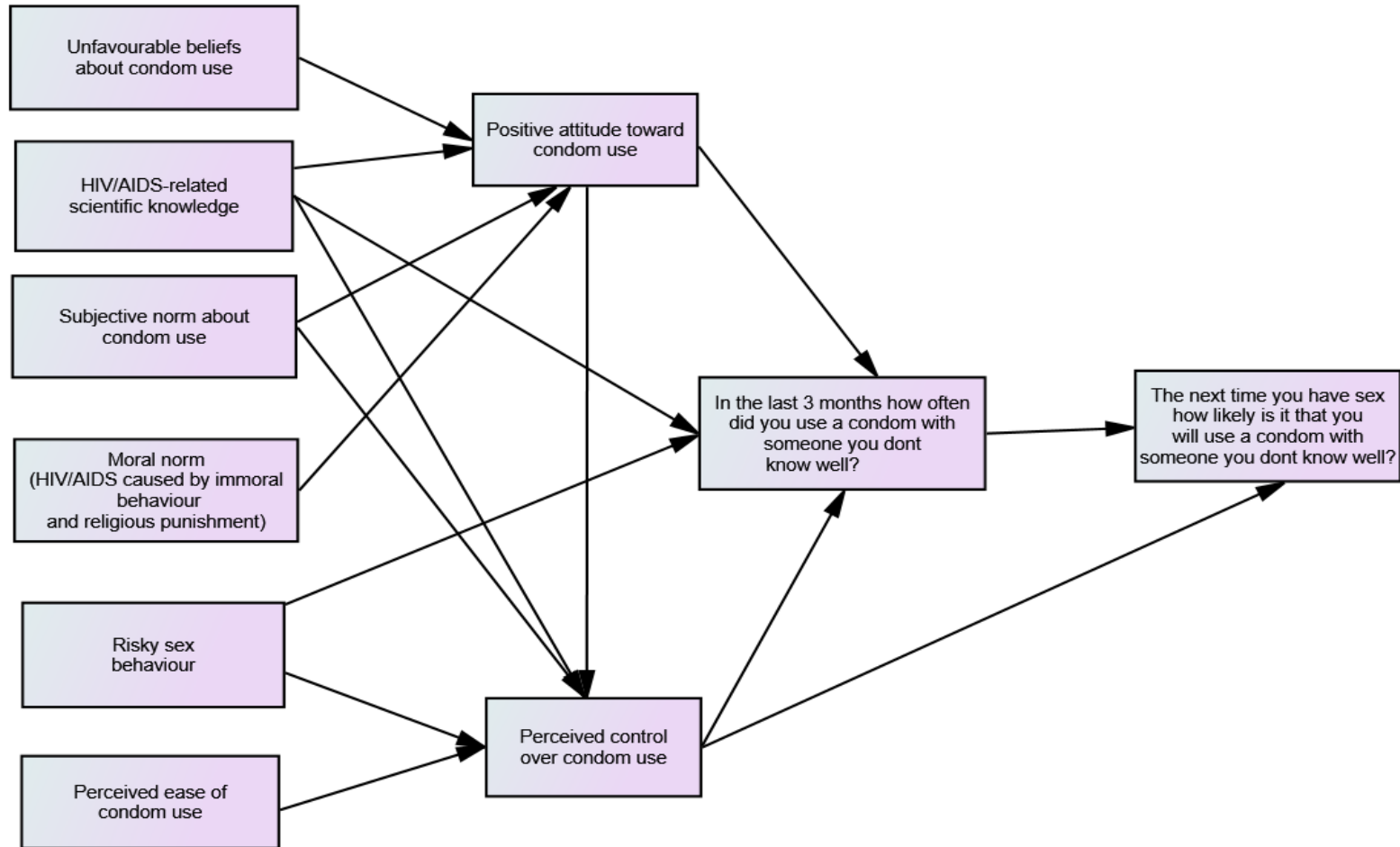


Figure 28 An Integrated model of intention to use a condom (with a casual sex partner) among study participants

Path analysis testing of the integrated model explaining intention to use a condom at next sex with a casual sex partner is shown in figure 29. For ease of presentation covariances are not shown. All possible direct and indirect effects were estimated.

The integrated model was a good fit to the data, with $\chi^2/df = 1.246$; CFI = 0.991; RMSEA = 0.037 and Hoelter's CN = 293.

The proximal determinants of condom use intention in the integrated model are past behaviour and perceived control over condom use (both from the TPB).

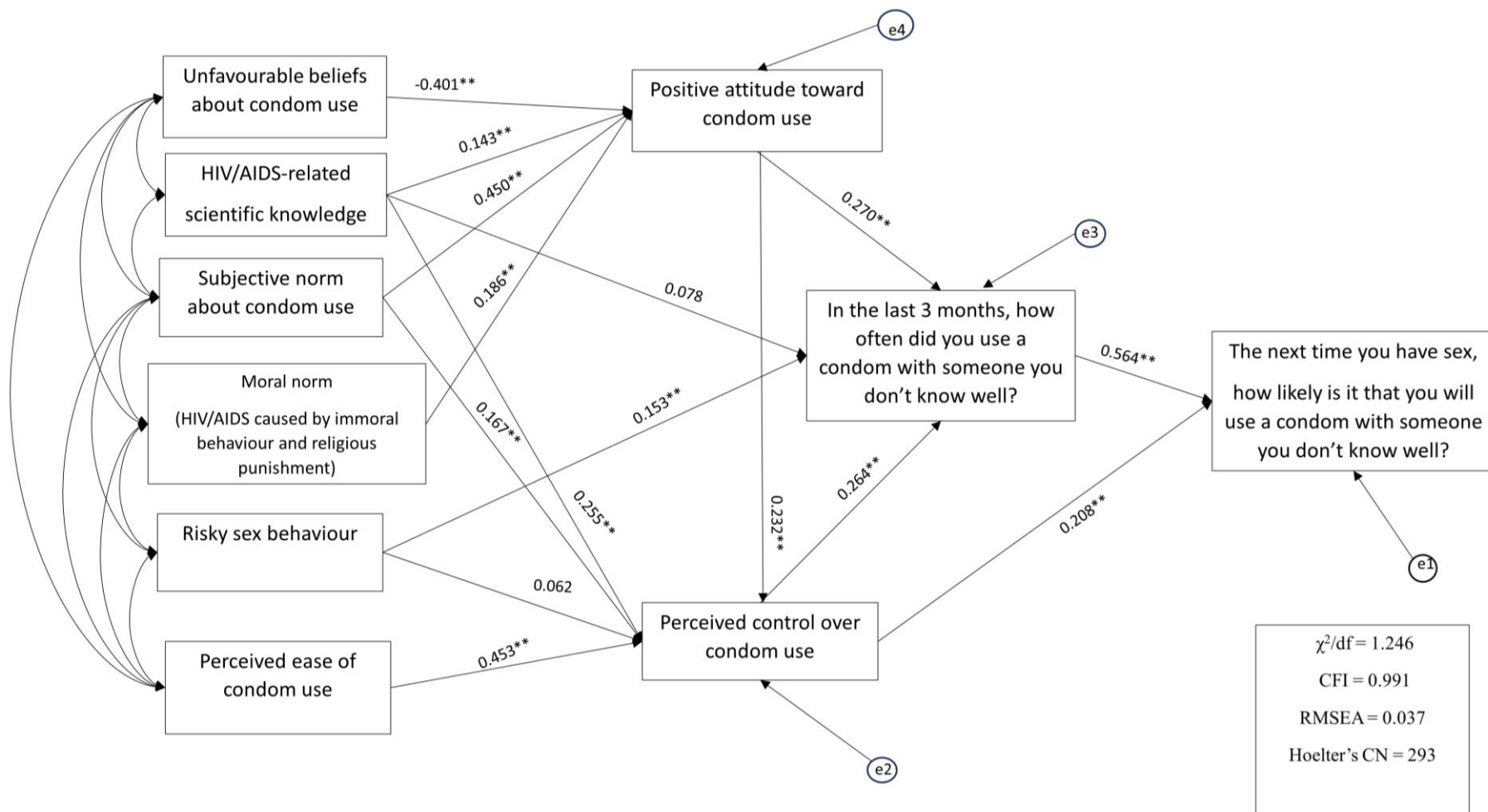


Figure 29 Empirically tested integrated model of intention to use a condom (with a casual sex partner)
 ** $p < 0.050$; * $p < 0.100$

The integrated model explained approximately 46.1% of the explained variance in intention to use a condom at next sex with a casual sex partner. Consistent condom use in the last 3 months (henceforth past behaviour) ($\beta = 0.564$; $p < 0.001$), and perceived behavioural control ($\beta = 0.208$; $p < 0.001$), were both determined to have a direct effect on intention to use a condom at next sex. And so, participants who consistently used a condom with a casual sex partner in the last 3 months and those who perceived themselves as having control over condom use, were found to be more likely to form an intention to use a condom at next sex. It is important to note that past behaviour was determined to have a stronger effect than perceived behavioural control.

Furthermore, risky sex behaviour ($\beta = 0.153$; $p = 0.018$), perceived behavioural control ($\beta = 0.264$; $p < 0.001$), and positive attitude toward condom use ($\beta = 0.270$; $p < 0.001$), were determined to be directly associated with past behaviour. Thus, participants who had a more positive attitude toward condom use, those who perceived themselves as being in control of their behaviour, and those who engaged in more risky sex behaviours were more likely to have used condoms consistently in the last 3 months.

Perceived behavioural control was directly predicted by positive attitude toward condom use ($\beta = 0.232$; $p < 0.001$), HIV/AIDS-related scientific knowledge ($\beta = 0.255$; $p < 0.001$), subjective norm ($\beta = 0.167$; $p = 0.003$), and perceived ease of condom use ($\beta = 0.453$; $p < 0.001$). This empirical finding suggests that participants who had a positive attitude toward the use of condoms, high levels of HIV/AIDS-related scientific knowledge, those who perceived condoms as being easy to use and those who felt that important referent others would support and approve of the decision to use a condom perceived themselves as having more control over condom use. Positive attitude toward the use of condoms was explained by unfavourable beliefs about condom use ($\beta = -0.401$; $p < 0.001$), HIV/AIDS-related scientific knowledge ($\beta = 0.143$; $p = 0.026$), moral norm ($\beta = 0.186$; $p = 0.004$), and subjective norm ($\beta = 0.450$; $p < 0.001$). The implication of this result is that participants with more favourable beliefs about the use of condoms, those with higher levels of HIV/AIDS-related scientific knowledge, those who think that HIV/AIDS is a consequence of immoral behaviour and religious punishment, and those who felt that important referent others would support and approve of the decision to use a condom were found to be more likely to have a positive attitude toward the use of condoms.

In addition to the aforementioned direct effects, the indirect effects of relevant variables in the model were investigated (see Table 8.2). It was determined that unfavourable beliefs about condom use, HIV/AIDS related scientific knowledge, subjective and moral norms were indirectly associated with past behaviour and perceived behavioural control.

Relatedly, perceived behavioural control mediated the effect of HIV/AIDS-related scientific knowledge, subjective norm, perceived ease of condom use, and positive attitude toward condom use on past behaviour and condom use intention. Finally, risky sex behaviour, positive attitude toward condom use and perceived behavioural control were all found to have an indirect effect on condom use intentions. The integrated model for intention to use a condom at next sex with a regular sex partner and a sex worker are shown in the appendix.

Table 8.2 An integrated model of intention to use a condom at next sex (with a casual sex partner)

Total direct effects	Standardised estimates
Positive attitude toward condom use → frequency of condom use in past 3 months	0.270***
Risky sex behaviour → frequency of condom use in past 3 months	0.153*
Perceived control over condom use → frequency of condom use in past 3 months	0.264***
Perceived control over condom use → intention to use condom at next sex	0.208***
HIV/AIDS related scientific knowledge → frequency of condom use in past 3 months	0.078
HIV/AIDS related scientific knowledge → positive attitude toward condom use	0.143*
Perceived ease of condom use → perceived control over condom use	0.453***
Unfavourable beliefs about condom use → positive attitude toward condom use	-0.401***
Frequency of condom use → intention to use a condom at next sex	0.564***
HIV/AIDS related scientific knowledge → perceived control over condom use	0.255***
Moral norm → positive attitude toward condom use	0.186**
Subjective norm about condom use → perceived control over condom use	0.167**
Subjective norm about condom use → positive attitude toward condom use	0.450***
Positive attitude toward condom use → perceived control over condom use	0.232***
Risky sex behaviour → perceived control over condom use	0.062
Total indirect effects	
Risky sex behaviour → Frequency of condom use in the past 3 months	0.016
Risky sex behaviour → intention to use a condom at next sex	0.109*
Unfavourable beliefs about condom use → intention to use a condom at next sex	-0.094*
Unfavourable beliefs about condom use → frequency of condom use in past 3 months	-0.133*
Unfavourable beliefs about condom use → perceived control over condom use	-0.093*
HIV/AIDS related scientific knowledge → Perceived control over condom use	0.033*
HIV/AIDS related scientific knowledge → Frequency of condom use in past 3 months	0.115*
HIV/AIDS related scientific knowledge → intention to use a condom at next sex	0.169*
Positive attitude toward condom use → frequency of condom use in past 3 months	0.061*
Positive attitude toward condom use → intention to use a condom at next sex	0.235*
Moral norm → frequency of condom use in past 3 months	0.062*
Moral norm → intention to use a condom at next sex	0.044*
Moral norm → perceived control over condom use	0.043*
Subjective norm → perceived control over condom use	0.104*
Subjective norm → frequency of condom use in past 3 months	0.193*
Subjective norm → intention to use a condom at next sex	0.166*
Perceived ease of condom use → intention to use a condom at next sex	0.162*
Perceived ease of condom use → Frequency of condom use in past 3 months	0.120*
Perceived control over condom use → intention to use a condom at next sex	0.149*

* $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$

8.3 Summary of Results

In this chapter, two models integrating constructs from the HBM and TPB were presented. Such models can serve a variety of purposes, including understanding health behaviour, directing, and translating research into practice and facilitating the transferability of theoretical frameworks and constructs from one health issue, geographical area or setting to another (George *et al.*, 2021; de Vries, 2017; Abraham & Michie, 2008).

By definition, the HBM and the TPB reduce a complex reality into component parts in order to provide an overview of their main theoretical constructs and pathways. Due to this reductionism, both the HBM and the TPB have been subject to criticism. While meta-analyses have shown both theories to be effective in accounting for variation in health behaviours, both have shortcomings in terms of their predictive utility. The HBM for example, has been criticized as being a rational actor model, which does not appropriately account for the influence of social and environmental factors on individual decision making (Davidhizar, 1983). Relatedly, the TPB has been criticized for not paying attention to the influence of past behaviour and habit on intentions and future behaviour (van Bree *et al.*, 2015).

The integrated models presented in this chapter attempt to keep the strengths and eliminate the weaknesses of the HBM and TPB. While the HBM is used to explain the perceptions and cognitive pathways which underpin HIV testing and condom use, the TPB provides an account of the motivational and volitional pathways. To explain a study participant's HIV testing behaviour, the HBM was supplemented with attitude toward HIV testing and subjective norm from the TPB. Similarly, to predict condom use intention, past behaviour and two cues to action from the HBM (HIV/AIDS-related scientific knowledge and risky sex behaviour) were added to the TPB.

Most importantly, the empirical results suggest that integrating constructs from the HBM and TPB in a unified framework can overcome their individual shortcomings in explaining HIV testing and condom use intention. The higher proportion of explained variance in the outcome variables illustrates how these two theories provide a complementary explanation of frequency of HIV testing and condom use intention from a statistical and model fitting perspective.

Substantively, the key benefit of the integrated approach includes the following:

1. A comprehensive assessment of the cognitive, perceptual, and motivational pathways through which beliefs about HIV/AIDS influence behavioural intention as well as actual condom use and HIV testing behaviour.

2. A more holistic and nuanced explanation of the relationship between beliefs, attitudes, intentions, and action than either model alone.
3. It expands upon the theoretical constructs which can be used to explain HIV testing and condom use, and as a result directly contributes to the development of more theory driven interventions.⁵⁵

While the HBM and TPB were determined to complement each other, one finding that was contrary to hypotheses was the significant and positive effect of subjective norm on negative attitude toward HIV testing. While the unexpected association between subjective norm and negative attitude toward HIV testing may be attributable to a lack of measurement correspondence between the two variables in the context of the study, subjective norms, reflect controlling and externally referenced beliefs about engaging in HIV testing in the future. And so, while subjective norms may appear outwardly controlling, they are however, also likely to reflect an individuals' internalised beliefs about HIV testing. In other words, subjective norm, by definition, may reflect both controlling and internalised beliefs associated with HIV testing. Future studies integrating the HBM and TPB should therefore distinguish between perceived pressure from referent others and internalised beliefs, so as to further examine the relationship between normative influences and attitude toward HIV testing.

The integrated models presented in this study provide an illustration of how the HBM and the TPB complement each other, and how to go about integrating them in a unified framework. That said, given the purposive sample, the empirical finding is limited in that it is analytically generalizable to the HBM and TPB, but not generalizable to a population of male construction workers in South Africa. There are also likely to be different pathways that exhibit a good fit to the data. And so, future researchers should investigate the plausibility of alternative sequencing of constructs and effects in an integrated model.

⁵⁵ For instance, in promoting condom use, the HBM can be used to assess individual beliefs about susceptibility and severity of HIV/AIDS, as well as the perceived benefits and barriers of condom use. The TPB can then help explain the intention to use a condom by considering factors such as attitude toward condom use, subjective norms, and perceived control. In this way, interventions can be designed to address specific barriers and leverage motivational factors to increase condom use.

9 DISCUSSION

9.1 Relevance and Application of the HBM and TPB to Behavioural Change Interventions

PHIs involve the use of biomedical innovations, such as medicines and vaccines to prevent, treat and control disease at multiple levels. On the other hand, nPHIs prevent, treat, and control disease by promoting changes in individual and communal health behaviours (Molla *et al.*, 2023; Cain *et al.*, 2013). The historical evolution in South Africa's response to HIV/AIDS saw human rights playing a pivotal role in the contestation between the global pharmaceutical industry, the government, civil society, and activist groups from the 1990s through to the mid-2000s.

This unique evolutionary path resulted in a policy environment in which PHIs and nPHIs were contrasted, and an emphasis of public HIV/AIDS interventions, at least in the post-2008 period, has been on securing access to essential medications and financing of PHIs. When UTT was institutionalized in an expanded NCHCMTP in 2016, South Africa already had one of the world's largest public sector ART programmes (Onoya *et al.*, 2021; 2020). In July 2022, the WHO released new guidelines advising countries to include the provision of CAB-LA (long-acting *cabotegravir*) as part of their national comprehensive HIV/AIDS prevention and treatment programmes (WHO, 2022).

Cabotegravir is an injectable PrEP (to be taken once every two months) which has been demonstrated to be highly effective at reducing the sexual transmission of HIV (Landovitz *et al.*, 2021). Furthermore, evidence from clinical trials conducted in South Africa have shown CAB-LA to be more effective at preventing HIV infection than the daily HIV prevention pill⁵⁶ because users are less likely to be non-adherent (Delany-Moretlwe *et al.*, 2022; Green, 2021). In March 2023, sub-licences to produce generic versions of CAB-LA were granted to several pharmaceutical companies, and in April 2023, *Cipla*, an Indian multinational pharmaceutical company, announced that it would produce generic versions of CAB-LA in South Africa.⁵⁷ Expanding the array of PHI options, including the provision of generic CAB-LA, is a step in the right direction. However, many of the persons at risk of becoming infected with HIV/AIDS do not always recognize or accept that they are at high risk, and hence do not behave in ways which optimise the benefits of the increasingly available PHIs (Abdool Karim, 2021; Boyer *et*

⁵⁶ oral *tenofovir disoproxil fumarate–emtricitabine* (TDF–FTC)

⁵⁷ <https://www.theguardian.com/global-development/2023/may/18/injectable-hiv-prevention-drug-to-be-made-in-south-africa-for-the-first-time>

al., 2016). To effectively make use of PHIs such as CAB-LA, individuals need to understand their risk, have an awareness of, and be accepting of available PHIs. Thus, moving forward in the South African HIV/AIDS response, it will be crucial to intensify efforts at generating demand for PHIs, particularly among high-risk and often overlooked community populations (Abdool Karim, 2021).

Although there is a burgeoning and rich literature on the factors affecting HIV-related health outcomes of males in South Africa, including – hegemonic masculinity (Morrell *et al.*, 2012; Lindegger & Quayle, 2009); HIV-related stigma (Mfecane, 2012); the role of alcohol in decision making (Mfecane, 2011); and, the lack of healthcare services tailored to the specific needs of men (Gittings, 2017; Fitzgerald *et al.*, 2010) – relatively little research is available that examines HIV-related health behaviours of male employees in the context of male-dominated workspaces. This is despite the fact that a lack of gender diversity in the sociocultural milieu and across business sectors, has been linked to gendered rules that uphold hegemonic masculinities and organisational cultures which condone and encourage risk taking behaviours (Galea & Chappell, 2022; Connell & Messerschmidt, 2005).

Through an analysis of HIV-related health behaviours of a sample of male employees in a male dominated construction industry (Aneke, 2015; Jahn, 2009), this dissertation begins to address this gap. Due to the physical demands of construction work, the high levels of occupational stress, as well as the increased likelihood of work-related travel from site-to-site (particularly being away from regular sexual partners for long periods), male workers in construction are predisposed to engage in behaviours which increase their risk of HIV/AIDS and STIs, including alcohol and drug abuse, unprotected sex, multiple and concurrent sex partnerships, and transactional sex (Harinarain & Haupt, 2014a; Meintjes *et al.*, 2007). Given this vulnerability, the HBM and the TPB are used to better understand the enduring impact of normative scripts regarding condom use and HIV testing among a sample of male employees in the South African construction industry.

Given the different emphases of the HBM and TPB, the HBM was used to explain a participants' frequency of HIV testing and consistent condom use, and the TPB was utilized as an explanatory model of participants' frequency of HIV testing and intention to use a condom at next sex.⁵⁸ Empirically, the TPB was found to account for a larger proportion of explained

⁵⁸ And so, while the same measure of HIV testing applies for the HBM and TPB, it is important to note that for condom use, the outcome variable for the HBM was consistent condom use, and for the TPB, the outcome variable was condom use intention.

variance than the HBM in all the outcome variables, however, both models have their strengths and limitations, and it is difficult to say definitively which model is better at explaining HIV testing or condom use. This finding is especially important because of the self-report questionnaire utilized, and possible issues regarding a participants' ability to reliably evaluate their own behaviour.

Prospective evaluation refers to a behaviour or experience that is likely to happen in the future, while retrospective evaluation refers to a behaviour or experience that has already happened (Soman, 2003). The outcome variable for condom use intention was prospective, and specific with regards to temporality and type of sex partnership (i.e., "the next time, you have sex, how likely is it that you will use a condom with a regular sex partner/casual sex partner/sex worker?"). On the other hand, the outcome variable for HIV testing was retrospective, and not well specified with regards to temporality or situation (i.e., "How many times have you been tested for HIV?"). Similarly, the outcome variable for consistent condom use was retrospective, but unlike that of HIV testing, it was better specified (i.e., "In the last 3 months, how often did you use a condom with a regular sex partner/casual sex partner/sex worker?").

Given that the temporal distance between a behaviour and the time of making an evaluation influences the reliability of the evaluation (Bilgin & Leboeuf, 2010; Ariely & Carmon, 2000; Block & Zakay, 1997) and, the effects of temporal distance depend on whether the evaluation is being made retrospectively or prospectively (Lim *et al.*, 2015) – the empirical results may be a consequence of the difference between prospective and retrospective evaluations of behaviour, as well as the temporal and contextual specificity of the outcome variables. Despite the differences in prospective and retrospective evaluations of behaviour, the results of the study suggest that the theoretical constructs and hypothesized pathways in the HBM and TPB can be used to explain a participant's frequency of HIV testing (in their lifetime), consistent condom use (in the last 3 months) and intention to use a condom (at next sex). The study faced limitations related to the operationalization of the theoretical constructs. Some measures and items did not perfectly align with the constructs they were intended to represent, and some single-item indicators were used, due to the broader research context in which the study data were collected. This misalignment could affect the robustness of the conclusions drawn. It is also important to acknowledge that the study utilized a cross-sectional questionnaire. This research design inherently limits the ability to make causal inferences. Cross-sectional data capture a snapshot of variables at one point in time, which means that while associations between variables can be identified, causal relationships cannot be definitively established. And so, while there is empirical support for theoretical constructs and hypothesized pathways

in the HBM and TPB, it should be considered provisional. In other words, it is more accurate to view the study results as indicative rather than definitive, acknowledging that while there is evidence supporting the theoretical models, further research with longitudinal designs and refined measures are needed to validate these findings more robustly and explore causal relationships.

Moreover, because of the purposive sampling approach adopted, the study results cannot be readily generalized to the total population of male construction workers in South Africa as would be the case in probability sampling. Instead, the results of the study are analytically generalizable (Polit & Beck, 2010; Yin, 2010; Firestone, 1993), in the sense that they illustrate how theoretical constructs and pathways from the HBM and the TPB can be used to explain HIV testing and condom use among a subsample of an at-risk male community population group. In this way, the study results add to the empirical evidence for the theoretical relevance of the HBM and TPB in explaining HIV-related health behaviours in an African setting and context (Mpeta *et al.*, 2021; Sacolo *et al.*, 2013; Campbell *et al.*, 2007). This finding contrasts with the view of Airhihenbuwa and Obregon (2000), who have posited that because of “assumptions such as individualism as opposed to collectivism, on which these theories and models are based, are foreign to many non-Western cultures” (Airhihenbuwa & Obregon, 2000:8), we should not expect them “to be productive in explaining behaviour in social contexts where commonsense knowledge of the world takes quite a different form” (Airhihenbuwa & Obregon, 2000:9).

Thus, an important implication of the study is that it suggests that one can draw upon the HBM and the TPB to design and implement HIV/AIDS interventions in the context of the South African construction industry.⁵⁹ Although the results of the study provide an empirical basis for the application of the HBM and TPB in designing behavioural change interventions, it is important to note that the success of interventions do not only depend on whether the intervention has a theoretical basis, but on a myriad of other factors, including the collaboration between stakeholders such as governments, civil society organisations and NGOs, health care

⁵⁹ For example, based on the HBM, an intervention targeting males employed in the construction industry might focus on raising awareness about their susceptibility to, and severity of HIV/AIDS; incorporate workplace and community-based awareness campaigns or health outreach initiatives as cues to action, or highlight the benefits of adopting healthy sexual behaviours. Similarly, based on the TPB, interventions might focus on changing attitudes towards safe sex practices; addressing social norms that might influence behaviour; empowering individuals to have greater control over their reproductive health or the formation of positive intentions related to sexual practices.

providers and community leaders. In addition, Airhihenbuwa and Obregon (2000) make a valid point, as continuous evaluation and adaptation of interventions based on the local context are crucial for them to be effective (see Colvin, 2019).

In the HBM, cues to action refer to events that prompt individuals to take action to improve their health. These cues are diverse and can operate at various levels, from personal experiences to societal influences. The empirical findings suggest that an individual's engagement in risky sex behaviour and their level of HIV/AIDS-related scientific knowledge can be regarded as cues to action, and as a result can be instrumentally targeted in the design of behavioural change interventions.

Furthermore, the empirical results support the inclusion of past behaviour and moral norm as extensions to the TPB and challenge the hypothesis that normative influences are relatively poor determinants of behaviour (Liu & Liu, 2020; Phoenix *et al.*, 2019; Ravis & Sheeran, 2003; Manstead, 2000). The implication of a critical consideration of an individual's past behaviour for tailoring HIV/AIDS related behavioural change interventions include the following:

- *Risk assessment and targeted intervention strategies:* Knowledge of past behaviours allows researchers and practitioners to identify high risk behaviours and assess an individual's risk of HIV transmission. Understanding the factors contributing to high-risk behaviours can guide the development of effective strategies for risk reduction.
- *Partner notification and support:* Knowledge of past behaviour is crucial for contact tracing and notifying partners who may have been exposed to HIV/AIDS. This helps in preventing further transmission and providing support to those at risk.
- *Community health education:* Understanding the prevalent behaviours in a community helps in designing targeted health education campaigns which can address the specific challenges and misconceptions related to HIV prevention and treatment.
- *Policy and program development:* Policymakers can use information about past behaviours to make informed decisions about resource allocation, program development and the prioritization of interventions.

The implication of a critical consideration of moral norms for tailoring HIV/AIDS related behavioural change interventions include the following:

- *A nuanced understanding of stigma and discrimination:* Negative moral judgements can contribute to stigmatization and discriminations against individuals with HIV, and

so factoring moral norms as a distinct type of normative influence which differs from subjective and descriptive norms will lead to a better understanding of how fear of moral judgement can deter certain individuals from using condoms, getting tested or seeking treatment.

- *Comprehensive prevention strategies:* Moral norms, particularly those rooted in conservative religious ideologies may advocate for abstinence as the primary HIV prevention strategy which may not be effective for all community populations. Furthermore, moral objections to certain forms of biomedical interventions may limit their accessibility, and so broader conceptualisations of normative influences and factoring in the role of diverse moral norms into behavioural change interventions helps ensure access to healthcare.

One of the main issues regarding consistent condom use among sex workers in South Africa are the clients of the sex workers – some of whom offer to pay more money for unprotected sex; threaten violence if sex workers insist on condoms and some who refuse to stop intercourse when the condom breaks (George *et al.*, 2019; Mukumbang, 2017). Regarding the issue of consistent condom use and sex work, Huschke and Coetzee (2020) have noted that for over two decades, there has been a constant focus of interventions on sex workers rather than their clients - which they interpret as an expression of “whore stigma” with the sex workers taking the blame for HIV incidence in the country, and a condition of patriarchal power dynamics in public health research where it is predominantly women’s bodies and sexualities that are regulated and policed.

According to Noar *et al.* (2012) people distinguish between at least three partner types: a one-night stand, “regular” casual partner, and main partner. Following a similar approach, condom use was assessed across 3 different types of partners in the present study – regular sex partners; casual sex partners whom the respondent “does not know very well” and sex workers. In particular, sex workers were included so as to better understand the health behaviours of male clients of sex workers in a South African sample. The empirical findings indicate that condom use varies systematically according to the type of sexual partnership (Kenyon *et al.*, 2016; Lansky *et al.*, 1998).

While condom use intention across all three partner types was found to be directly predicted by consistent condom use in the last 3 months (past behaviour) and by perceived behavioural control, there was some variation in the predictors of consistent condom use in the last 3 months. As expected, the determinants of consistent condom use with a sex worker and a casual

sex partner were almost identical, and, differed from that of a regular sex partner. In particular, for the two casual sex partnerships (i.e., sex worker and casual sex partner), attitude toward condom use, risky sex behaviour and perceived behavioural control were found to be directly associated with consistent condom use. In regular sex partnerships, only perceived behavioural control was determined to be associated with consistent condom use. An implication of this result is that interventions with the goal of promoting condom use among participants and men more broadly, need to consider the influence of partner types, and importantly distinguish between casual sex partners and regular sex partners. For people in regular sex partnerships, interventions prioritising risky sex behaviour and attitudes toward condom use may not be entirely appropriate. Rather, condom use in regular sex partnerships seemed to be better predicted by perceived behavioural control, spotlighting the role of relationship power inequity, trust, and communication.

HIV testing was found to be directly associated with HIV/AIDS-related scientific knowledge, attitudes toward HIV testing, subjective norm about HIV testing, and perceived threat of HIV/AIDS. Thus, participants who had high levels of HIV/AIDS-related scientific knowledge, those who perceived HIV/AIDS to be a threat to their health, and those who perceived themselves as being socially supported, were found to have tested for HIV more frequently in their lifetime than their colleagues. It is important to note that among all the factors, subjective norm, was found to have the strongest effect on HIV testing. This finding goes against the grain of research on the TPB, which often refers to a relatively weak effect of subjective norms on behaviour. Ajzen (1991) has observed that the weak effect of subjective norm may be an indication of the fact that behavioural intention and by extension, actual behaviour, is influenced to a greater extent by personal factors, such as attitudes and perceived behavioural control than by non-personal factors. On the other hand, Armitage and Conner (2001), have suggested that the narrow conceptualisation of normative influence in the subjective norm variable in most TPB research is responsible for the observed weak effect. As a consequence, they propose additional measures of normative influence such as moral and descriptive norms. Following on from Armitage and Conner (2001), a distinction was made between subjective, moral, and descriptive norms in the current study.

Moral and descriptive norms were however not found to be directly associated with HIV testing, consistent condom use, or condom use intention. Thus, the study findings add to existing empirical research that argues for the importance of taking subjective norms into account when analysing HIV testing and condom use. In practical terms, the fact that subjective norms were determined to be significant suggests that more efforts should be placed on the

influence of the individual's perception of significant others when promoting HIV testing and condom use. As part of counselling and testing, health care professionals should encourage individuals to discuss their concerns surrounding HIV with important referent others, including partners and/or family. This recommendation is supported by research on other community populations. For example, perceived social pressure and subjective norms have been found to be associated with HIV risk among AGYW (Psaros *et al.*, 2018) and interventions which put an emphasis on normative influences including subjective norms have been found to be effective in improving HIV-related outcomes amongst the youth in South Africa (Harrison *et al.*, 2010).

Two theoretical frameworks integrating constructs from the HBM and TPB were developed and empirically tested to explain HIV testing and condom use intention. Overall, the integrated models performed better than the HBM or TPB alone (in terms of explained variance), indicating that the HBM and TPB complement each other, and that a unified framework integrating constructs from both theories can lead to more nuanced explanations of HIV-related health behaviours.

Given that the application of theory to the design of an intervention necessarily requires the development of psychometric measurements assessing latent constructs explicated, the empirical findings also provide an illustration of how latent constructs in the HBM and TPB may be operationalized and measured using a cross-sectional survey instrument.

A further implication of the study is that it provides a theoretical and empirical basis for the design of interventions targeting men working in the construction industry. While there is a burgeoning literature on HIV-related health behaviours of persons employed in the South African construction industry, this literature is not theory intensive. Even when theory is used, it is best described as being 'theory-inspired' as opposed to 'theory-based', because it makes use of a range of constructs without specifying where they have been derived from. In other words, it seems that the attempt to explain behaviour and develop interventions targeting workers in the construction industry is often based on intuition rather than systematic application. For example, Bowen *et al.* (2016, 2014) and Haupt *et al.* (2005) have examined HIV related health behaviours of employees in the construction industry and have used their findings as the basis for behavioural change interventions as well as policy implications, however they do not systematically apply health behaviour theory, and make no serious discussion of the theoretical basis of the variables which they empirically test or the hypothesised causal pathways.

George *et al.* (2021) have noted more generally that if the effectiveness of HIV/AIDS interventions are to be improved in South Africa, then “ensuring that programmes are designed using behavioural science principles during the inception stage is key to creating enabling environments in which people can make healthier decisions” (George *et al.*, 2021:841). The present study is the first attempt in using health behaviour theory to systematically examine the factors associated with condom use intention and HIV testing among males employed in the South African construction industry. In this regard, the study findings are a useful resource for researchers, policy makers and health practitioners.

In the ensuing section, the pathways determined to be empirically significant in the testing of the integrated models and the results of the tests of difference are used to formulate an evidence based ‘menu’ of multi-level factors (Kaufman *et al.*, 2014a) to consider in the development of an intervention targeting HIV testing and condom use.

9.2 Factors Influencing HIV Testing and Condom Use Among Male Construction Workers

The structural and institutional determinants of HIV-related health behaviours have been emphasised over and above the individual level determinants (Ward-Peterson *et al.*, 2018; Skovdal *et al.*, 2017; Gupta, 2008), and calls have been made for methodological and theoretical research that help advance our understanding of health behaviour from a multi-level perspective (Mahlangu *et al.*, 2019; Cook *et al.*, 2014; Kaufman *et al.*, 2014a). Given that the integrated models of HIV testing and condom use intention presented in this study can be criticized for focusing on the individual level of analysis, this section juxtaposes these models with the empirically observed bivariate associations between the composite variables computed to test the HBM and TPB, across the dichotomized socio-demographic and experiential characteristics of the study participants. This approach aims to provide a more holistic understanding by acknowledging the influence of background factors, even though a full multi-level analytical strategy was not employed. This effort moves towards incorporating the empirical results within a broader, contextually informed framework

As a response to the need for multi-level explanations of health behaviour in HIV/AIDS prevention, Kaufman *et al.* (2014a) have provided a list of relevant factors related to health behaviour at all points on the individual-structural spectrum. Moreover, they have posited that providing a ‘menu’ or list of behaviour change factors (Kaufman *et al.*, 2014a: 251) helps researchers and practitioners easily consider multiple levels of influence and related variables.

Following a similar approach, figure 30 provides a list of factors related to HIV testing and condom use at each level of the individual-structural spectrum. While Kaufman *et al.*, (2014) provide a comprehensive list, the list of factors outlined in figure 30 is not comprehensive. Most importantly the list of relevant factors is restricted to those which were empirically confirmed in the study.

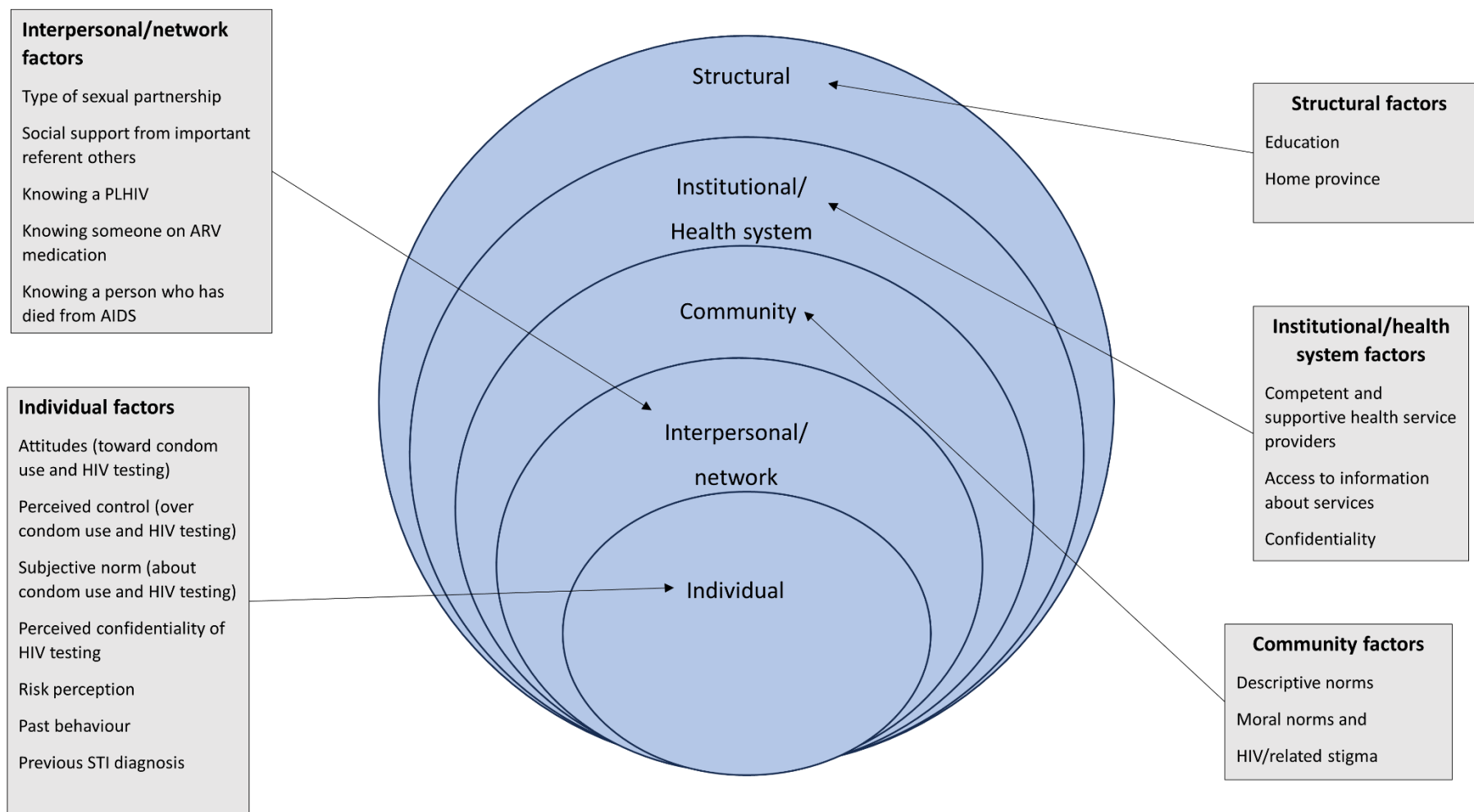


Figure 30 Multi-level factors influencing HIV testing and condom use among study participants

The non-individual level factors in figure 30 were identified through an analysis of the relationship between socio-demographic and experiential categories and the composite variables computed to empirically test the HBM and the TPB. Specifically, t-tests (chapter 6) were used to identify the community, institutional and structural factors associated with HIV testing and condom use intention. Relatedly, the pathways determined to be empirically valid in the integrated models (Chapter 8) were used to identify the individual factors.

Incorporating socio-demographic considerations in the design of health behaviour interventions is viewed as good practice and enhances their relevance, effectiveness, and reach (Armoon *et al.*, 2021; Jooste *et al.*, 2021; Steenkamp *et al.*, 2014). Recognizing the diversity within a population allows for the development of interventions that are tailored to address specific challenges faced by different groups and the design of interventions which are inclusive. A practical implication of the study is that it suggests that some of the popular indicators used to understand the diversity of groups within a population (i.e., age, marital status, and work status) may be of limited use in understanding HIV testing and condom use among the study participants. It also suggests that the progression of HIV/AIDS in South Africa provides an opportunity for researchers to come up with novel categorical variables which can provide insights into the unique needs, challenges, and preferences of different groups in an evolving context.

Participant education and home province were established as key differentiators of the composite variables computed to test the HBM and TPB, whereas age, marital status, and work status were not empirically confirmed. And so, three out of the 5 socio-demographic variables included in the study were not found to be empirically significant. In contrast, all the experiential variables were found to be empirically associated with the composite variables used for theory testing. Given this finding, the experiential categories are recommended over the more common socio-demographic categories of age, marital status, and work status for future research.⁶⁰

⁶⁰ For example, categorical variables distinguishing between workers who have previously been diagnosed with an STI (vs. those who have never been diagnosed with an STI); those who know someone taking ARV medication (vs. those who do not know someone taking ARV medication); those who know where to obtain ART and related services in their community (vs. those who do not know where to obtain ARV medication and services); those who know a PLHIV (vs. those who do not know a PLHIV) and those who know someone who has died from AIDS (vs. those who do not know someone who has died from AIDS) are recommended as having more explanatory power over the more common socio-demographic categories of age, marital status and work status.

Such categorical variables can be used to capture the surrounding circumstances, life events and social network that influences individual-level health behaviours in an era of UTT and SDI. Most importantly, these variables can provide insight into how decreases in HIV-related mortality and the increasing availability of PrEP products such as CAB-LA influence HIV testing and condom use in South Africa. For example, rather than targeting single men or men in a certain age cohort, men who have never been diagnosed with an STI or men who do not know someone taking ARV medication could be targeted.

Although the factors relevant to a behaviour change intervention may be quite specific to a particular community, the list of factors outlined in figure 30 can be taken as a provisional list of potentially relevant factors to consider when designing interventions targeting HIV testing and condom use among men working in the construction industry or similar samples in South Africa. This list should be considered as provisional in the sense that it is not exhaustive, nor is it generalizable to other populations or settings. For example, while age and marital status were not determined to be a relevant factor among the study participants (and so are not indicated in figure 30), epidemiological data suggests that risk taking behaviours, including inconsistent and non-condom use, follow an inverted U-pattern, rising in adolescence, peaking in early adulthood, and declining into middle age and old age (Duell *et al.*, 2018). Based on a nationally representative sample Shisana *et al.* (2016) observed that persons in South Africa who were married and living with their spouse have significantly reduced odds of being HIV-positive compared to all other spousal arrangements. Similarly, Tlou (2019) found that married persons were at a reduced risk of HIV infection as compared to those who had never been married, those who were married but separated, and those who were divorced or widowed.

To summarize, the list of variables presented in figure 30 is intended as a useful resource to help expand the details of theoretically driven explanations of HIV testing and condom use. However, while it serves as a useful heuristic, it is oversimplified, and so it is recommended that researchers and practitioners rigorously test theory as part of their intervention design process (Noar & Mehrotra, 2011; Rothman, 2004), and develop a list of relevant factors based on their particular sample, setting, and context.

9.3 Practical Orientation of Empirical Findings

While there has been an unprecedented upscaling in PHIs in South Africa, it has been hampered by suboptimal uptake. Moreover, health facility-based interventions are constrained by high demand (Tlou, 2009), and public health services are impacted by various inefficiencies, including long waiting times and congestion (Maphumulo & Bhengu, 2019; Mayosi *et al.*, 2012). Furthermore, the differential expenditure on health services under apartheid (Price, 1986), unaffordable private health care for a majority of the population, and high transportation costs to and from public health facilities have all been identified as barriers to the utilisation of public health services in general (Abrahams *et al.*, 2022) and HTS in particular (Chimoyi *et al.*, 2022).

In the current landscape, where uptake in HTS is not as widespread as desired (Baisley *et al.*, 2018) it is crucial to harness the power of communication technology. Specifically, the swift acceptance and widespread use of mobile phones across rural and urban locations (Okonkwo, 2019) can be leveraged (Limbada *et al.*, 2021). Indeed, several studies have found non-health facility based (nHFB) and health facility based (HFB) interventions to be equally effective at changing health behaviours (Fox *et al.*, 2019; Hanrahan *et al.*, 2019; Tsondai *et al.*, 2017), and various nHFB interventions have been tested in a South African context. These include the distribution of HIV self-testing kits, allowing individuals to test for HIV in private, reducing stigma and inconvenience associated with visiting a health facility (Shahmanesh *et al.*, 2021; Shapiro *et al.*, 2020); the use of mobile phone technology for HIV counselling and education (Webster *et al.*, 2016; de Tolly *et al.*, 2012); workplace based interventions, wherein employers provide a range of HIV prevention and treatment services (George & Quinlan, 2009; Setswe, 2009; George, 2006; Connelly & Rosen, 2005); and community based interventions including the distribution of condoms, ART medication and PrEP (Rousseau *et al.*, 2021).⁶¹

According to O'Donnell (2017), workplace interventions are important for three reasons. Firstly, they can increase awareness. Secondly, they can encourage employees to adopt healthier lifestyles, and thirdly, they foster environments that support healthy living. The South African construction industry is characterized by migration and temporary employment,

⁶¹ nHFB interventions are valuable and have a critical role to play moving forward, however, the eagerness to explore the potential of nHFBs must be tempered by a recognition that they are not a substitute for well-functioning health systems. They can only complement the fundamental components of a health system such as “service delivery, a healthy workforce, health information systems, access to essential medicines, vaccines and technology, financing and, governance” (Kipruto *et al.*, 2022:2).

attracting especially young, low skilled men from rural to urban areas as well as from the neighbouring countries (Harinarain and Haupt, 2014b; Meintjes *et al.*, 2007). While the burden of HIV in Southern Africa disproportionately affects AGYW between 15 -24 years, in 2019, 28% of new HIV infections were among men aged 25 - 49 years (Giguère *et al.*, 2021). This is the typical peak age of employment. Given that South Africa is an economic pillar in the Southern African Development Community (SADC), and an attractive destination for both skilled and unskilled labour migrants,⁶² reaching employed men with HIV prevention, testing and treatment coverage is critical to reducing HIV incidence not only in South Africa, but also in the SADC region (Muwanguzi *et al.*, 2021).

Since the construction industry is male dominated, the construction workplace presents an ideal environment and platform to offer nHFB to employed men in South Africa. Consequently, if the empirical findings are extended to their logical conclusion, a practical orientation of the present study is that it identifies factors and pathways associated with condom use and HIV testing among a sample of at risk, hard-to-reach men in South Africa (van Rooyen *et al.*, 2019). These factors and pathways can then be targeted by an HBM or TPB based nHFB provided analytical generalizability is plausible.

Basing an intervention on theory does not guarantee that the intended outcomes will be realised or sustained. For an intervention to have a lasting impact, it needs to be meticulously planned, implemented, and evaluated with rigour (Horan *et al.*, 2021). Several strategies have been recommended to develop sustainable interventions including participatory design (Arapovic-Johansson *et al.*, 2018; Heaney, 2011) and the use of a standardised reporting framework (Michie *et al.*, 2005). The behaviour change wheel (BCW) (Michie *et al.*, 2011) and the behaviour change technique taxonomy (BCTT (v1)) (Michie *et al.*, 2014) are standardized frameworks which attempt to unify the scientific community's understanding of what constitutes a theory-based intervention on three overarching categories: methods used to measure the constructs; empirical tests of mediated effects and the relationship between constructs and the chosen behavioural change techniques (BCTs). In the ensuing section, the empirical findings are used to demonstrate the utility of the aforementioned standardised frameworks (see figure 31).

⁶² [International Migrant Stock | Population Division \(un.org\)](https://www.un.org/en/development/desa/pop/migration/stock)

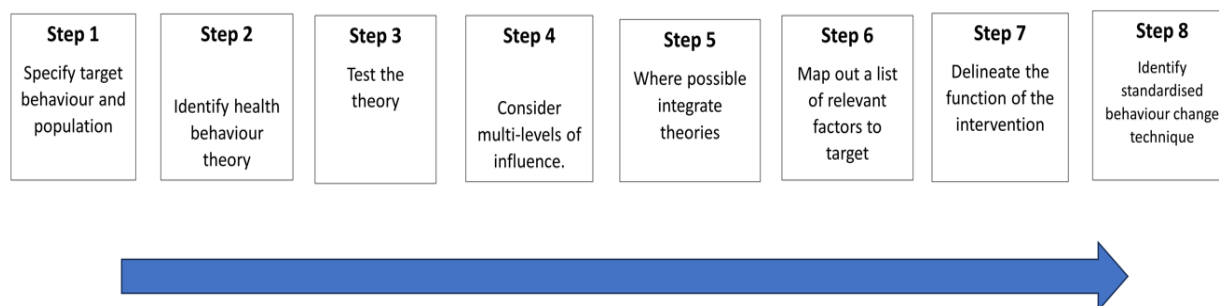


Figure 31 Essential steps to follow in the process of designing a health behaviour theory based intervention

1. Specify the target behaviour and population.
2. Identify the health behaviour theory which best explains the target behaviour.
3. Empirically determine the suitability of the chosen health behaviour theory to the target population.
4. Consider all levels of influence and their associated variables on the individual-structural spectrum. Use analytic methods that consider relationships within and across levels.⁶³
5. Where possible, integrate already existing theories rather than creating new theories, until such a time that the need for a new theory is clearly established.
6. Based on the results of the empirical testing, map out a list of relevant factors which may be targeted by an intervention.
7. Use the theoretical framework to delineate what function the intervention will serve and what methods will be most appropriate for the intervention given the local context.
8. Once the function of an intervention has been clearly delineated, identify the behaviour change technique (Michie *et al.*, 2014) which is relevant to each function.

⁶³ For example, the relationship between socio-demographic and experiential characteristics of participants and the composite variables computed to test the theory can be used to make informed empirical decisions about non-individual level influences on behaviour.

The behaviour change technique taxonomy (BCTT (v1)) refers to a comprehensive and standardised system for classifying the active components of behavioural change interventions (Michie, et al., 2013). It consists of 93 distinct behaviour change techniques (BCTs) with labels, definitions, and examples - organised into 16 categories. BCTs refer to “an observable, replicable, and irreducible component to alter causal processes that regulate behaviour. It is the ‘active ingredient’ (e.g., feedback, self-monitoring, and reinforcement) of an intervention” (Michie *et al.*, 2013: 82). Such a taxonomy is a valuable tool for researchers and practitioners, enabling systematic investigation, replication, and synthesis of interventions across different domains and settings (Michie & Johnston, 2012).

The behaviour change wheel (BCW) (see figure 32) consists of three layers – the inner hub, which identifies the sources of behaviour to be targeted by an intervention; a middle layer of nine intervention functions and an outermost layer which identifies seven policy categories (Michie *et al.*, 2011). The BCW provides a systematic and evidence-based approach to designing behavioural change interventions. It serves as an overarching guide that links the explanation of a behaviour to the functions of an intervention and set policy categories. In this way, the BCW provides a framework that links theory to practice.

By providing a shared, standardized terminology for specifying the active ingredients of behaviour change interventions, the BCW and the BCTT (v1) facilitate communication and collaboration among researchers, practitioners, and policymakers and make it less difficult to replicate behavioural change interventions and identify effective BCTs.

To provide an illustration of steps 7 and 8 (see figure 31), the integrated model of condom use intention (Chapter 8.2), the BCW, the BCTT (v1), and the list of empirically relevant factors (see figure 30), were used to present a preliminary framework of an interactive digital health intervention to increase condom use among male workers in the construction industry (Kipruto *et al.*, 2022; Bailey *et al.*, 2010).

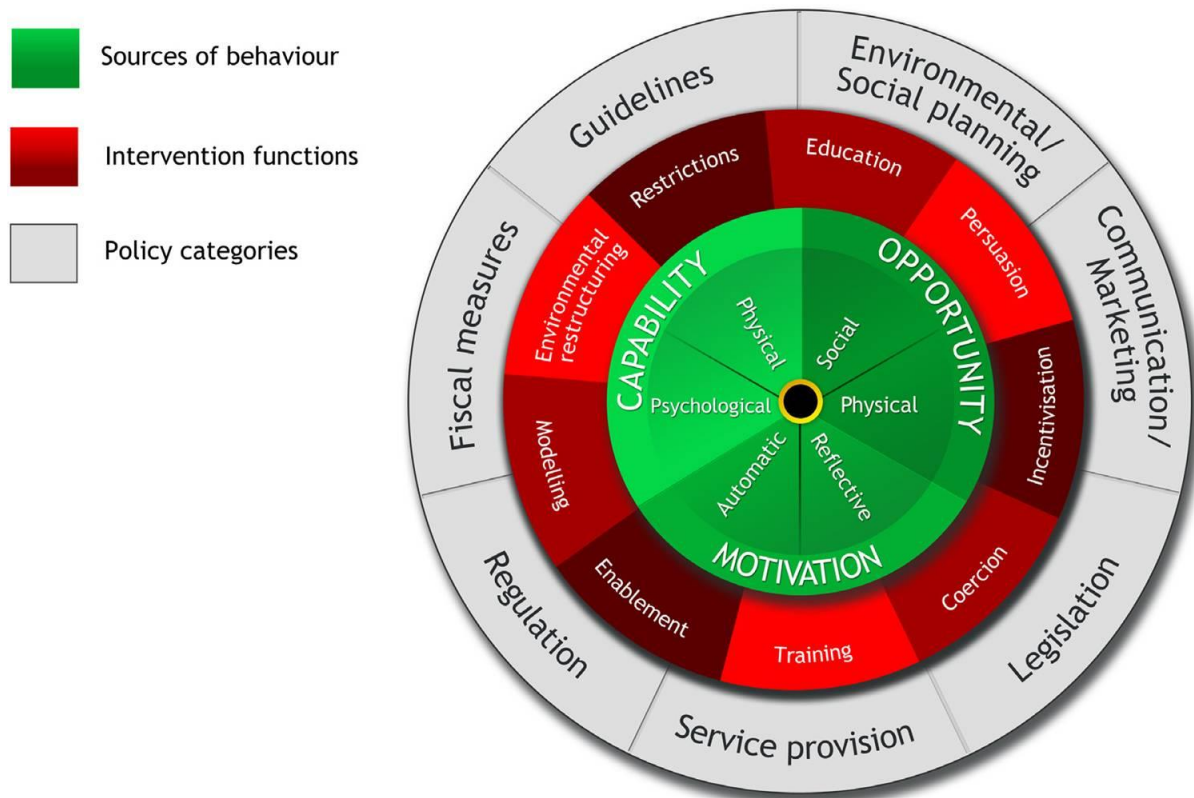


Figure 32 Behaviour change wheel (see Michie et al., 2011)

Based on the integrated model of condom use intention (Chapter 8.2), it was posited that a person's intention to use a condom at next sex was directly determined by their past behaviour and perceived behavioural control; and indirectly determined by their engagement in risky sex behaviour and their attitude toward condom use. Consequently, behaviour change was conceptualised as requiring a change in perceived and actual control over condom use, reduced engagement in risky sex behaviours and the cultivation of positive attitudes toward condom use.

The BCW identifies nine possible 'mechanisms of action' which can be used for behaviour change. These include education, persuasion, incentivisation, coercion, training, restriction, environmental restructuring, modelling, and enablement. For our present purposes, which is simply to illustrate, three out of the 9 intervention functions were highlighted – educating, persuasion and training (see figure 33).

In terms of risky sex behaviour, the intervention seeks to educate the target population by providing information about the consequences of risky sex behaviours. In terms of attitude toward condom use, the function of the intervention is to encourage participants that condoms can enhance pleasure, and in terms of the perceived control over condom use, the function of

the intervention is to instruct participants about how to be more in control over their condom use. Furthermore, based on the BCW policy categories, it is suggested that the intervention take the form of a digital health mobile app service, providing communication to the target population.

Figure 9.5 An interactive digital health intervention to increase condom use among men working in construction

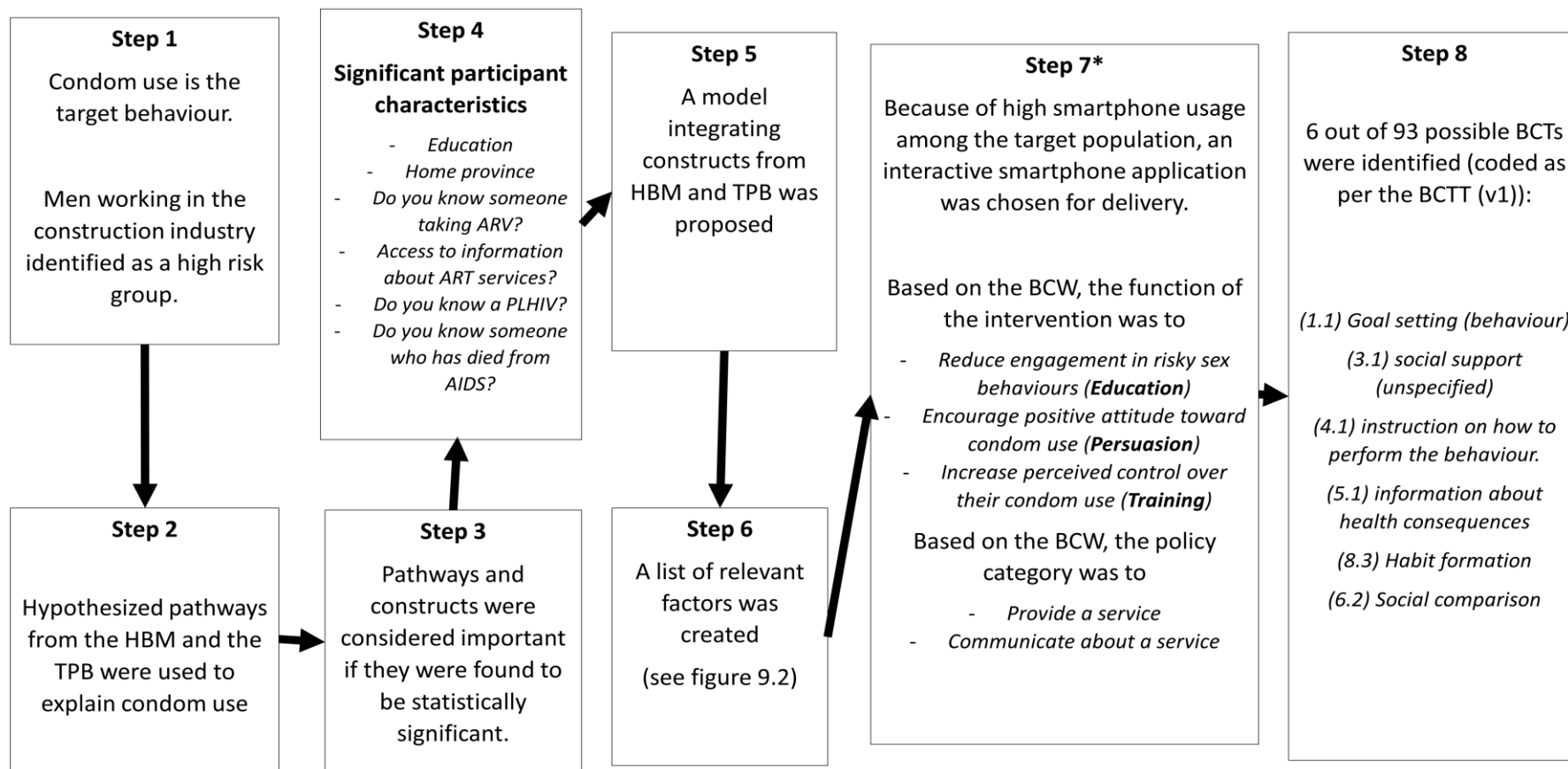


Figure 33 An illustration of the necessary steps for an interactive digital health intervention to increase condom use among study participants

Broadly defined, digital health interventions rely on information and communication technologies which allow tailored interventions to be delivered to individuals at sustainable costs (Murray *et al.*, 2016). Digital health was chosen as the preferred modality for illustrating an nHFB intervention because the WHO recently recommended behavioural change interventions, accessible at a minimum via mobile devices as a way of complementing and enhancing health systems in resource limited settings (WHO, 2019).⁶⁴

Six out of 93 possible BCTs were determined to be potentially relevant for this hypothetical intervention. Further details about the BCTs are not provided – given that the purpose of this example is illustrative.

To summarize, some of the key roles of the BCW and the BCTT (v1) in the development of behavioural change interventions include:

- *Standardization and communication:* They provide a common language to articulate the key components of behavioural change interventions. This standardized vocabulary enhances clear and effective communication among researchers, practitioners, and other stakeholders.
- *Identification of active components of an intervention:* They provide a framework for intervention designers to identify the specific techniques that drive behaviour change within an intervention. Recognizing these key components allows researchers to gain a deeper understanding of which parts of an intervention are effective and which might require modification to suit different contexts or demographic groups. This ensures that interventions are not only theoretically grounded but also tailored to the specific needs of the target population.
- *Evidence-based practice:* Both the BCW and the BCTT(v1) are grounded in empirical evidence, with each technique for example, validated through comprehensive systematic reviews and meta-analysis. This approach, rooted in evidence, bolsters the efficacy and reliability of interventions, allowing practitioners to select techniques that have a demonstrated history of facilitating behaviour change.
- *Replication of interventions:* They aid in the replication of interventions and allow for comparison. Through the systematic categorization and detailing of behaviour change techniques, researchers can effortlessly reproduce interventions in diverse settings,

⁶⁴ [WHO launches a new Global Initiative on Digital Health supported by the G20 Presidency](#)

among different populations and contexts, allowing for a more robust understanding of the generalizability and effectiveness of specific techniques.

In summary, a practical orientation of the present study is that the empirical findings can be used in a demonstration of the critical steps necessary for designing a health behavioural change intervention in the construction workplace for male employees. Regarding this, the BCTT (v1) and the BCW play a critical role by providing a systematic and standardized approach to identifying, describing, and categorizing the active components of the intervention. Specifically, they serve as a valuable foundational tool and resource for researchers, practitioners and policymakers involved in designing and evaluating behaviour change strategies, offering a standardized language, evidence-based guidance and a systematic approach to intervention design.

9.4 Limitations

The empirical findings should be interpreted in light of the sampling and methodological limitations of the study. Because of the fragmented nature of the South African construction industry and the ubiquity of informal labour, a purposive sampling strategy was adopted. Given that the purposive sample is not representative of the total population of men employed in the construction industry, it is inaccurate to generalize the results to workers outside the setting. Moving forward, it will be important for future studies to confirm the analytical generalizability of the study findings to other samples. Another limitation is the focus on one out of nine provinces (Western Cape) as well as the focus on the construction industry, which further complicate the generalizability of study findings to other provinces or industries.

A further limitation of the study related to the sampling strategy is that the questionnaire did not include a measure of gender self-identification (Garbaski, 2023; Lindqvist *et al.*, 2018), and so while reference was made to ‘men’, this label is loosely used, and refers to sex assigned at birth. Even though all the males present during the site visit were included in the sampling frame for data collection, we are in fact not entirely sure if the study participants would self-identify as men, because they were not given the option to do so. It is recommended that future studies include a measure of gender self-identification or include additional gender categories,

such as transgender or non-binary.⁶⁵ Relatedly, the questionnaire did not include a measure of sexual orientation, and so the study findings do not provide any insights about the relationship between HIV-related health behaviours and a participant's sexual orientation. The association between sexual orientation and HIV-related health behaviours among men working in the construction industry should be examined in future studies.

Statistical modelling of cross-sectional survey data was used for theory testing, and it was implied that changing the statistically significant factors and pathways would result in subsequent changes in a participants' health behaviour. However, since cross-sectional survey research cannot demonstrate causality, it is important to caveat the empirical findings and explicitly acknowledge that the support generated by a cross-sectional approach to theory testing does not imply that causal mechanisms have been demonstrated. And so, while the models offer valuable insights into the relationships between constructs, the directionality of these relationships should be interpreted with caution. The potential for reverse causality is a valid concern in this study. For example, the number of times an individual tests for HIV may influence their risky sexual behaviour, HIV/AIDS-related knowledge, and knowledge of treatment. Similarly, consistent condom use could affect perceived susceptibility to HIV/AIDS. These reverse causal relationships complicate the interpretation of the model paths and can potentially bias the results. Because cross-sectional survey research cannot demonstrate causality, some researchers have advocated for the use of other methodological tools such as longitudinal survey research, lab experiments, field experiments (randomized control trials) and meta-analysis that allow causality to be better demonstrated (Noar & Mehrotra, 2011; Weinstein, 2007; Rothman, 2004). Given the challenge of demonstrating causality in cross-sectional surveys future studies should move beyond cross-sectional survey research designs towards more experimental methods.

It has been noted that respondents generally misreport and underreport their sex behaviour in survey research (Buve *et al.*, 2001; Catania *et al.*, 1990). Misreporting and underreporting of behaviour are a threat to the validity and reliability of data. Because of this challenge, Hewett *et al.* (2008) have suggested that sex behaviour data obtained from surveys be triangulated with STI biomarkers or other data collection methods to ascertain their validity. Given that biomarkers

⁶⁵ Aside from categorical measures, gradational measures of femininity and masculinity can be incorporated to better reflect gender diversity (Magliozzi *et al.*, 2016).

were not used to verify the self-reported data collected for this study, an important limitation of the study is that the self-reports are subject to social desirability bias.

Moreover, because the questionnaire used for this study was part of a much larger study, the computation of composite variables to measure the latent constructs explicated in the HBM and TPB was limited to the available items in the questionnaire. As a result, a number of constructs were not assessed in this study, including HIV testing intentions. Furthermore, some of the measures were limited in length – for example, subjective norms about condom use and perceived control of HIV testing were measured with single items. In order to establish measurement correspondence between theory and data, future studies should strive to measure all theoretical constructs in the HBM and TPB with multiple questionnaire items.

While it is acknowledged that harmful gender norms and masculine identities adversely affect health-seeking behaviour and pose a challenge to the HIV-related health outcomes of boys and men in South Africa, the study does not explicitly use gender or masculine norms as an analytical lens (aside from their expression as normative influences in the TPB). There are quantitative measures such as the GEMS scale (Pulerwitz *et al.*, 2000) which assess power dynamics in sexual relationships that can be integrated within a multi-level framework of HIV-related health behaviours in future research. In addition, the exclusion of potential confounding variables or moderating factors, such as socioeconomic status, cultural norms, or access to sexual health education in the integrated model is a significant limitation. Future research could benefit from exploring moderating effects to gain a more nuanced understanding of how demographic and experiential variables interact with the constructs of the HBM and TPB, potentially providing deeper insights into the factors influencing HIV-related health behaviours.

9.5 Conclusion

In this final section, the key findings from the literature review and empirical analysis are highlighted. While some of the findings are general and apply broadly to the application of health behaviour theory to the design of behavioural change interventions, others are more restricted to the study sample, context, and setting.

The findings restricted to the study sample are outlined below. While these findings are insightful, they apply only to the study participants, and so it is recommended that researchers and practitioners confirm their analytical generalizability to other samples, settings, and contexts.

1. The HBM, the TPB and an integrated model unifying the two theories, can be used as a framework to explain HIV testing and condom use.
2. Past behaviour was determined to be a significant extension to the TPB. Distinguishing between subjective norm and other normative influences, including moral and descriptive norm was also found to be significant in improving the explanatory power of the TPB.
3. A participant's level of HIV related knowledge and their frequency of engagement in risky sex behaviour were determined to be cues to action in the HBM. Knowledge of HIV services in the community was not determined to be a cue to action.
4. HIV testing was found to be directly predicted by a participants' perceived threat of HIV/AIDS, subjective norm about HIV testing, and attitude toward HIV testing. This result suggests that interventions targeting HIV testing should aim to change participant perceptions about the threat posed by HIV/AIDS, attitudes toward HIV testing and addressing the normative beliefs associated with HIV testing.
5. Intention to use a condom with a casual sex partner was found to be directly predicted by a participant's past condom use (consistent condom use in the last 3 months) and their perceived control over condom use. This result suggests that an intervention targeting condom use should focus on beliefs that prevent individuals from using condoms, promoting preparatory behaviours (such as carrying a condom) as well as an individual's confidence in their ability to negotiate the use of condoms with different types of partners.
6. Only two socio-demographic variables (education, home province) were determined to be associated with both the HBM and the TPB . Age, marital status and work status were not determined to be statistically significant for any of the integrated models unifying both theories.

Given that a person's health behaviour may vary across context, it is important to take the characteristics of the targeted population group into account when designing an intervention. Regarding this, categorical variables which measure critical life events and experiences are recommended over the traditional socio-demographic variables such as age, marital status, and work status for future studies. Examples include variables distinguishing between people who have previously been diagnosed with an STI (vs. those who have never been diagnosed with an STI); people who know someone taking ARV medication (vs. those who do not know

someone taking ARV medication); people who know where to obtain ARV medication and services (vs. those who do not know where to obtain ARV medication and services); people who know a PLHIV (vs. those who do not know a PLHIV) and people who know someone who has died from AIDS (vs. those who do not know someone who has died from AIDS).

The general findings of the study can be summarised as follows:

1. The success of the response to HIV/AIDS in South Africa since 2008 is commendable, however, moving forward, it will be necessary to shift our attention from pharmaceutical and health facility-based interventions towards non pharmaceutical, and non-health facility-based interventions. This shift is important because of the sub optimal uptake of current HIV services. Advances in biomedical science, including the availability of long-acting pre-exposure prophylaxis, HIV self-test kits, and advances in mobile communication technologies present an opportunity for the individual to cultivate the capabilities to assume greater personal responsibility for their health.
2. Given that men in South Africa have been observed to engage less in HIV services, have worse HIV-related health outcomes than women, as well as the difficulties observed in reaching employed men with health facility-based HIV interventions, male dominated industries (such as the construction workplace) present an ideal environment to reach employed men with non-health facility-based HIV interventions.
3. While the association between intervention effectiveness and the use of theory is not well understood, it is good practice to use health behaviour theory in intervention design. As a result, more rigorous theory testing is recommended. Although cross-sectional and longitudinal survey research methods can be used for theory testing, they are correlational by design and so have serious limitations in ability to draw causal conclusions. Future studies should move from survey research methods towards experimental methods which can better demonstrate causality. For example, a randomized controlled trial (RCT) could be designed where participants are randomly assigned to different intervention groups aimed at promoting HIV-related health behaviours (such as increased frequency of HIV testing, consistent condom use or the use of PrEP). One group could receive an educational intervention based on the HBM and TPB, while another group receives standard health information, and a third group serves as a control with no intervention. By comparing the outcomes across these groups over time, researchers can more definitively determine the causal impact of the

theoretical constructs and interventions on HIV-related health behaviours. Another approach could be a longitudinal cohort study where participants are followed over time to observe changes in their HIV-related behaviours and the influence of various factors. This would help in establishing temporal relationships and causality. Quasi-experimental designs, such as interrupted time series analysis, can also be utilized. For instance, implementing a health intervention at a specific point in time and then measuring HIV-related behaviours before and after the intervention can help in understanding the intervention's impact while controlling for other variables. Additionally, field experiments can be conducted where interventions are tested in real-world settings. For example, distributing free condoms in certain construction sites and comparing the HIV testing and condom usage rates with sites that did not receive the intervention can provide insights into the effectiveness of practical interventions in natural settings. Furthermore, if an existing theory is determined to be incomplete or inappropriate, it can be integrated with another theory. Only theories best supported empirically and those that resonate with researchers should proliferate further inquiry.

4. Although it is important to use health behaviour theory to design health behaviour change interventions, it is equally important to use standardised frameworks to document the intervention design process in order to promote replication and synthesis of findings.

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10 APPENDIX – Factor Analysis

A.1 HIV/AIDS-related scientific knowledge

Items	Factor loadings
1. A woman can get HIV if she has anal sex with a man	0.408
2. There is a female condom that can help decrease a woman's chance of getting HIV	0.701
3. Having sex with more than one partner can increase a person's chance of being infected with HIV	0.707
4. A person can get HIV from oral sex	0.541
5. Coughing and sneezing DOES NOT spread HIV	0.373

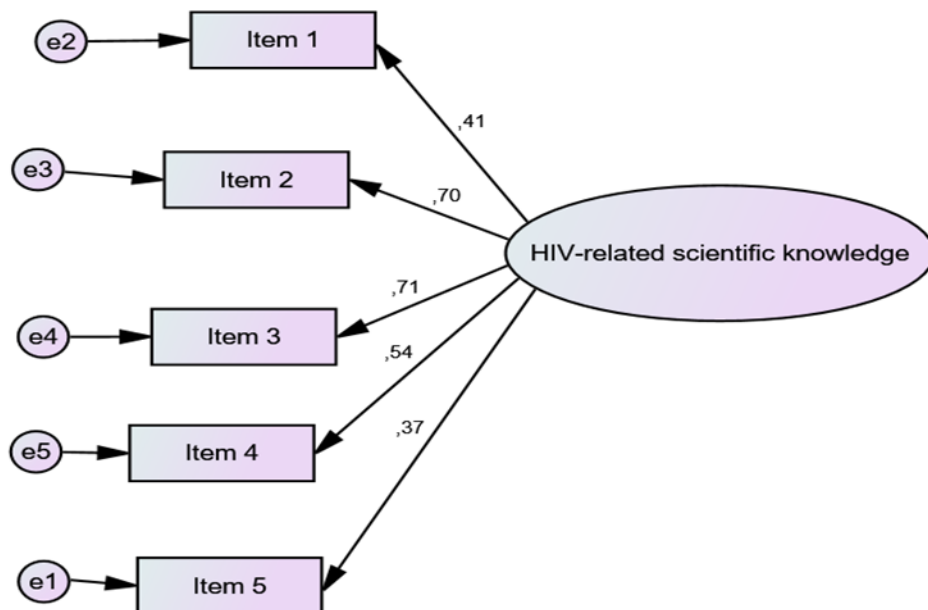


Figure A.1: Measurement model (HIV/AIDS-related scientific knowledge)

A.2 Knowledge of HIV/AIDS treatment

Items	Factor
1. ARV medication can cure HIV/AIDS	-0.545
2. When you feel better you can stop taking your ARV medication	-0.652
3. Persons who are taking ARVs have to take the medication forever.	0.039*
4. ARV cannot cure HIV/AIDS, but it can manage it.	0.004*
5. A person will not get HIV/AIDS if they are taking ARVs	0.776
6. Persons who are taking ARVs cannot spread HIV/AIDS	0.679

* loading < 0.300

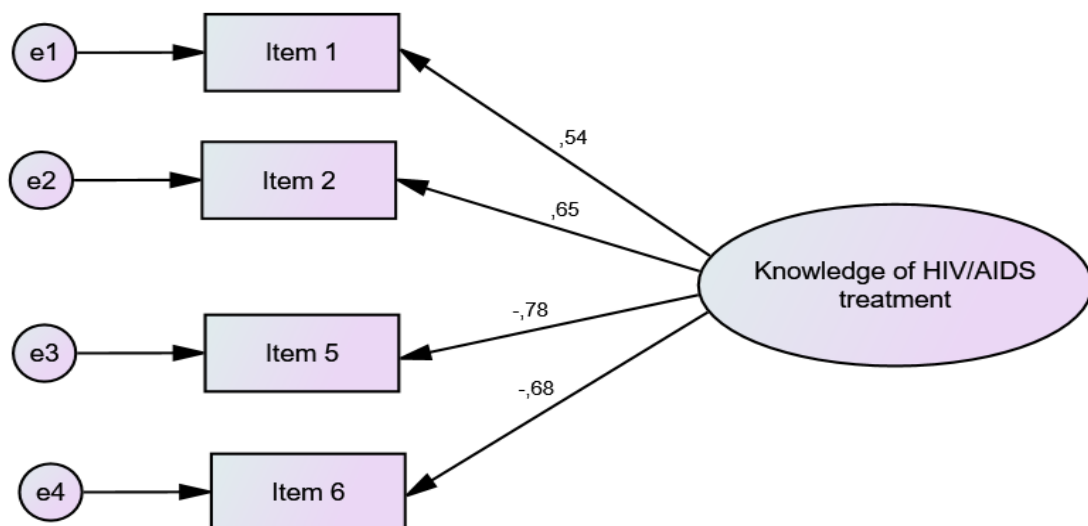


Figure A.2: Measurement model (Knowledge of HIV/AIDS treatment)

A.3 Risky sex behaviour

Items	F1	F2
1. How often have you had sex with a sex worker?	0.557	
2. Have you had sex with a partner who was menstruating?	0.577	
3. Have you had a sexual relationship with more than one person at the same time?	0.724	
4. How often have you gone out to taverns/bars/parties/social events with the intent of meeting someone with the intention of having sex with them?	0.783	
5. How often have you had an unexpected or unanticipated sexual experience with someone?	0.706	
6. How often have you had sex with someone you don't know well or have just met?	0.735	
7. How often have you used alcohol before or during sex?	0.335	-0.306
8. How often have you used drugs before or during sex?		-0.965
9. How often have you used both alcohol and drugs before or during sex?		-0.708
10. How often (that you know of) have you had sex with someone who was also engaging in sex with others during the same period?	0.635	

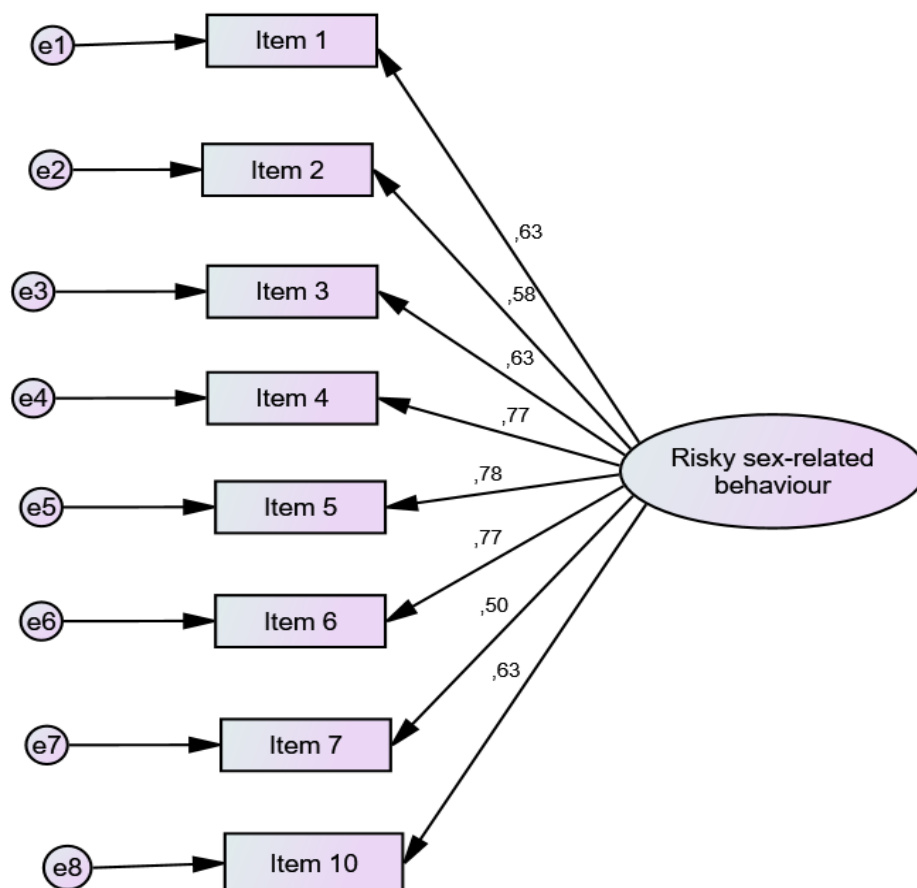


Figure A.3: Measurement model (Risky sex behaviour)

A.4 Perceived severity of HIV

Items	Factor1	Factor2
1. Getting HIV is a punishment for bad behaviour	0.593	
2. People with HIV have themselves to blame	0.509	
3. A person with HIV must have done something wrong to deserve it	0.798	
4. People with HIV should be ashamed of themselves	0.751	
5. I think less of someone because they have HIV		0.609
6. I would not employ someone with HIV		0.794
7. I feel uncomfortable around people with HIV	0.424	
8. I would not drink from a tap if a person with HIV had just drunk from it		0.723
9. If I was in public or private transport, I would not like to sit next to someone with HIV		0.797
10. I feel afraid to be around people with HIV	0.404	
11. I would not like someone with HIV to live next door to me		0.855
12. I would not like to be friends with someone with HIV		0.818

Factor 1 (Moral norm); Factor 2 (Perceived severity of HIV/AIDS)

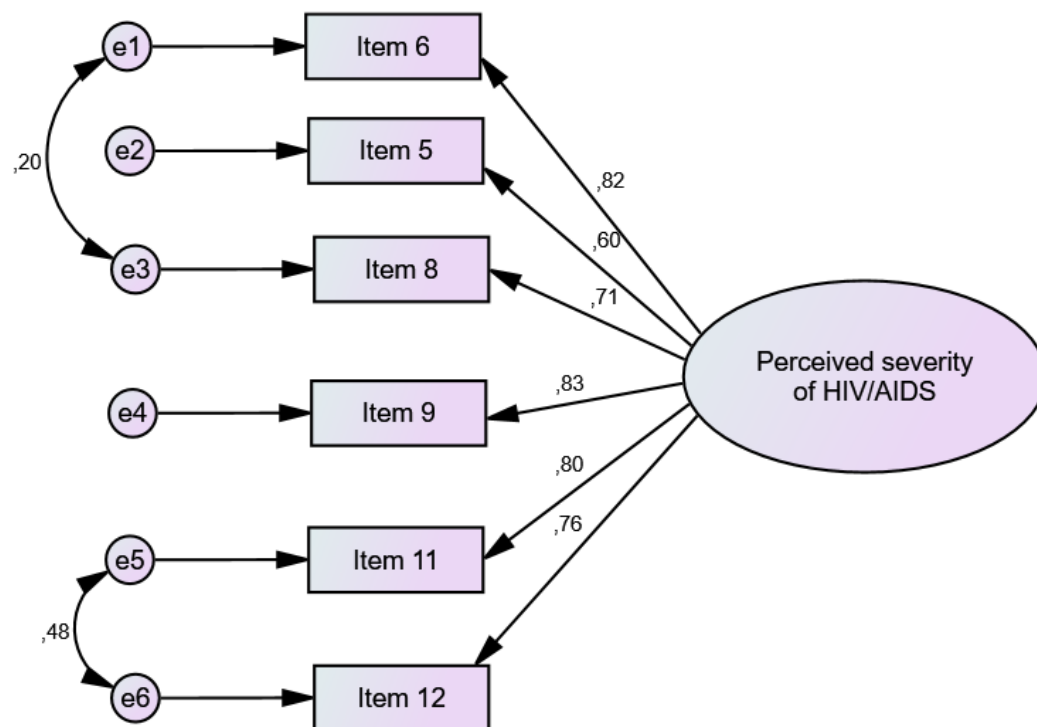


Figure A.4: Measurement model (Perceived severity of HIV/AIDS)

A.5 Perceived 'benefits minus barriers' of condom use

Items	F1	F2
1. Condoms are uncomfortable		0.649
2. Using condoms makes sex unenjoyable.		0.902
3. Proper use of condoms enhances sexual pleasure	0.367	
4. Using condoms is unmanly		0.362
5. Condoms are the best way to protect myself from HIV.	0.984	
6. Condoms are the best way to protect myself from other sexually transmitted infections	0.794	

Factor 1 (perceived benefits of condom use); Factor 2 (Perceived barriers of condom use)

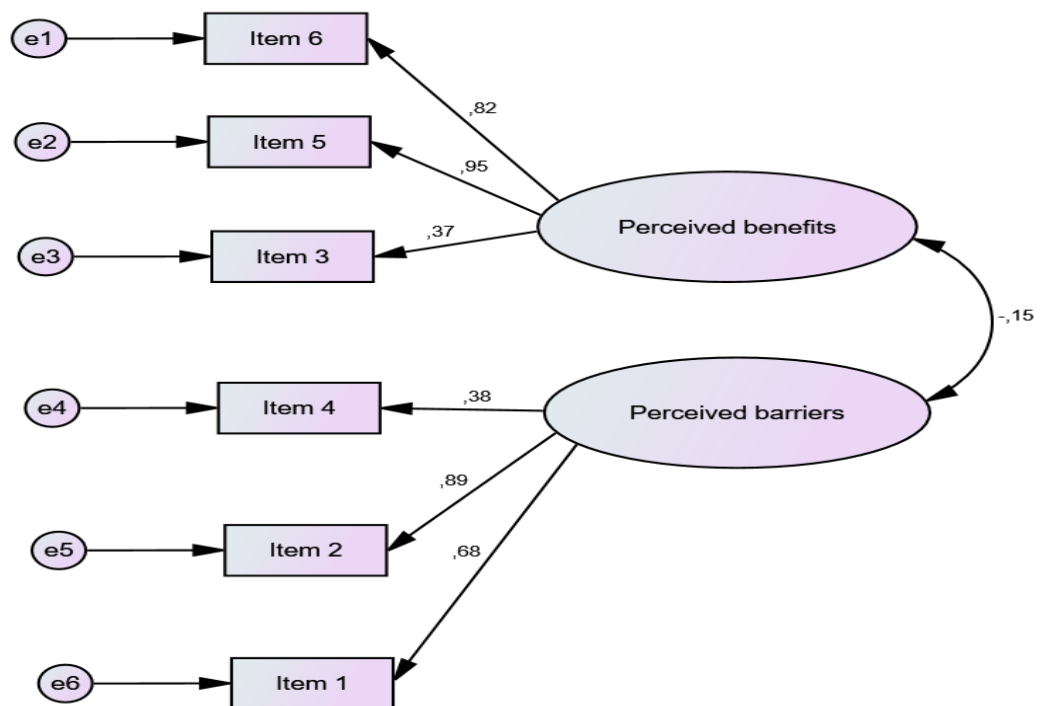


Figure A.5: Measurement model (Perceived 'benefits minus barriers' of condom use)

A.6 Perceived susceptibility to, and threat of HIV/AIDS

Items	F1	F2
1. What is your gut feeling about how likely you are to get infected with HIV? (<i>Extremely unlikely, very unlikely, somewhat likely, very likely, extremely likely</i>)		0.505
2. I worry about getting infected with HIV (<i>None of the time, rarely, some of the time, a lot of the time, all of the time</i>)		0.770
3. Getting HIV is something I am... (<i>Not concerned about, a little concerned about, moderately concerned about, concerned about a lot, extremely concerned about</i>)		0.730
4. I am sure I will NOT get infected with HIV (<i>strongly disagree, disagree, undecided, agree, strongly agree</i>)	0.772	
5. I feel I am unlikely to get infected with HIV (<i>strongly disagree to strongly agree</i>) ⁺	0.856	
6. I feel vulnerable to HIV infection (<i>strongly disagree to strongly agree</i>) ⁺	0.416	0.313
7. There is a chance, no matter how small, I could get HIV (<i>strongly disagree to strongly agree</i>) ⁺	0.333	0.327
8. I think my chances of getting infected with HIV are (<i>zero, almost zero, small, moderate, large, very large</i>)		0.500

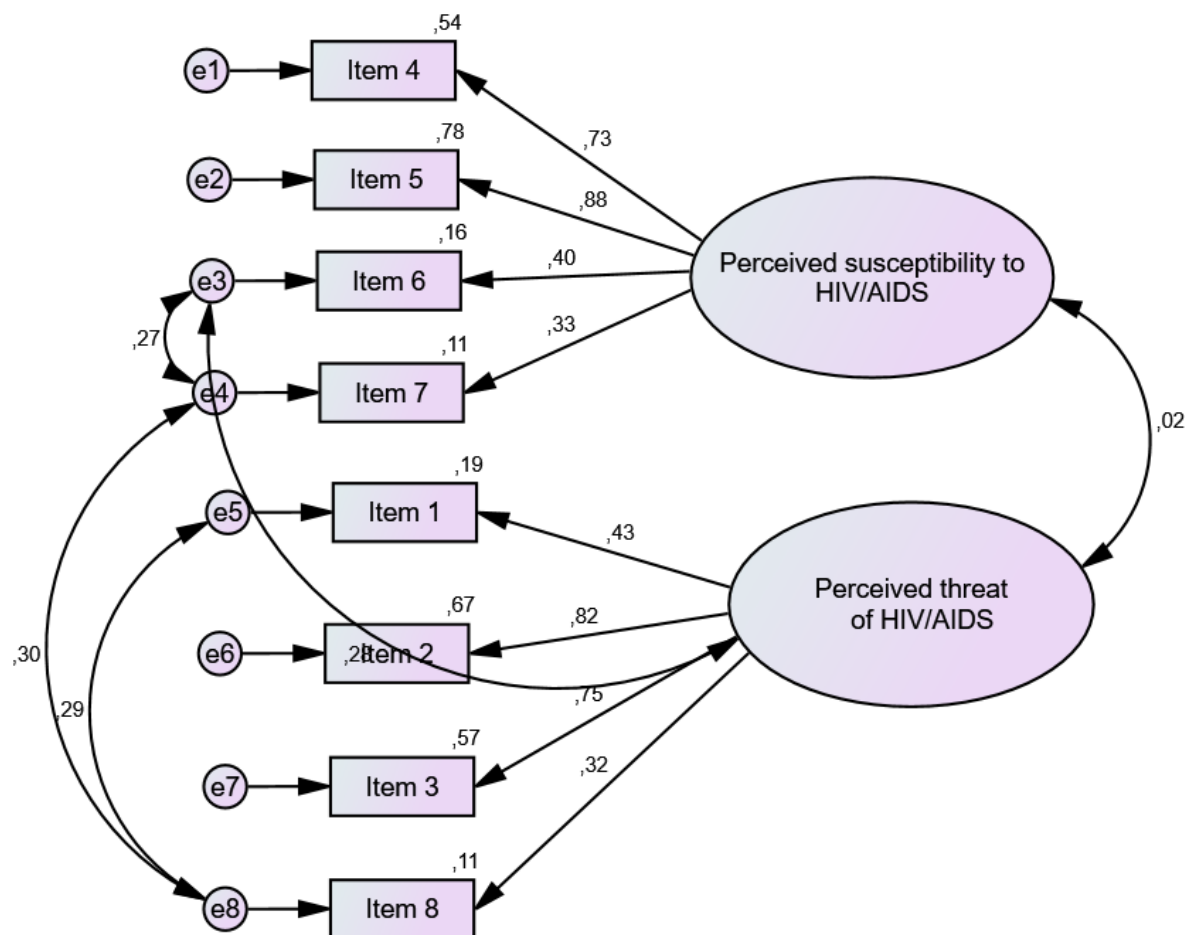


Figure A.6: Measurement model (Perceived susceptibility to, and threat of HIV/AIDS)

A.7 Perceived barriers of HIV testing

Items	Factor
1. I am afraid that if I were to be tested for HIV, my name would go into public records	0.590
2. I do not have time to get an HIV test	0.698
3. I would not consider getting an HIV test because I would be asked about things that I have done that could get me into trouble	0.771
4. I would be embarrassed if my friends found out I had decided to have an HIV test	0.727
5. People would assume I have HIV if I decided to get tested	0.777
6. I am afraid someone would find out I was tested for HIV	0.799
7. I would not get tested for HIV because I would be asked information that was too personal	0.738

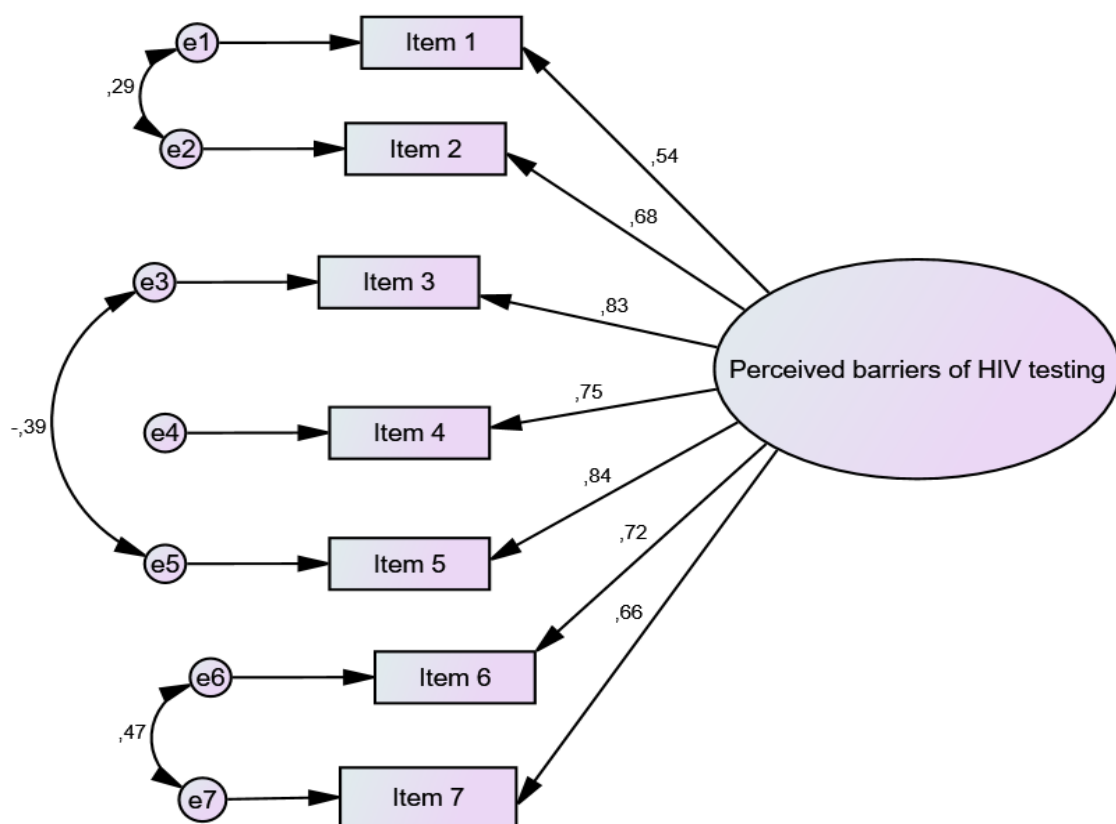


Figure A.7: Measurement model (Perceived barriers to HIV testing)

A.8 Descriptive Norm

Items	F1
1. A person can get HIV by touching someone who has HIV/AIDS	0.334
2. Showering or washing one's genitals/private parts after sex keeps a person from getting HIV/AIDS	0.389
3. Pulling out the penis before a man climaxes/cums keeps a woman from getting HIV during sex	0.281*
4. A person can get HIV/AIDS by sharing a glass of water with someone who has HIV/AIDS	0.301
5. Spirits or supernatural forces cause HIV/AIDS	0.614
6. A Sangoma or traditional healer can cure HIV/AIDS	0.794
7. Traditional medicines can cure AIDS	0.786
8. Sangomas or traditional healers are better than western doctors at treating HIV/AIDS	0.701
9. A person can get rid of HIV/AIDS by having sex with a virgin	0.562
10. People with HIV are bewitched or cursed	0.733

* loading < 0.300

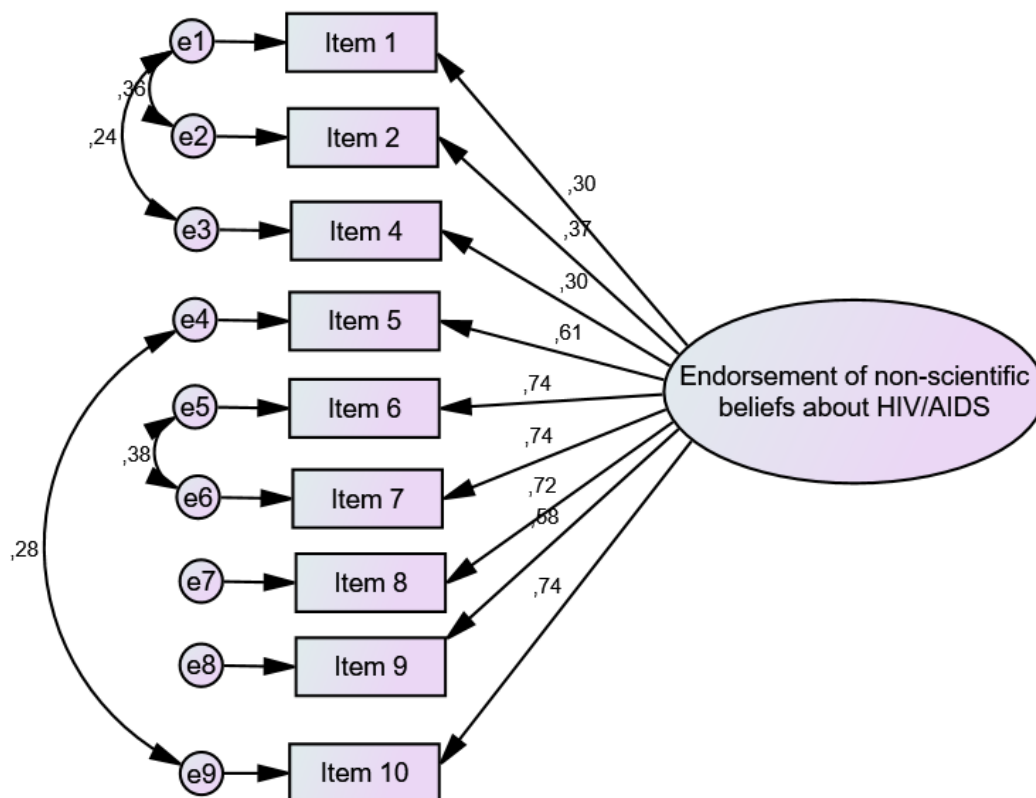


Figure A.8: Measurement model (Descriptive norm)

A.9 Moral Norm

Items	Factor1	Factor2
1. Getting HIV is a punishment for bad behaviour	0.593	
2. People with HIV have themselves to blame	0.509	
3. A person with HIV must have done something wrong to deserve it	0.798	
4. People with HIV should be ashamed of themselves	0.751	
5. I think less of someone because they have HIV		0.609
6. I would not employ someone with HIV		0.794
7. I feel uncomfortable around people with HIV	0.424	
8. I would not drink from a tap if a person with HIV had just drunk from it		0.723
9. If I was in public or private transport, I would not like to sit next to someone with HIV		0.797
10. I feel afraid to be around people with HIV	0.404	
11. I would not like someone with HIV to live next door to me		0.855
12. I would not like to be friends with someone with HIV		0.818

Factor 1 (Moral norm); Factor 2 (Perceived severity of HIV/AIDS)

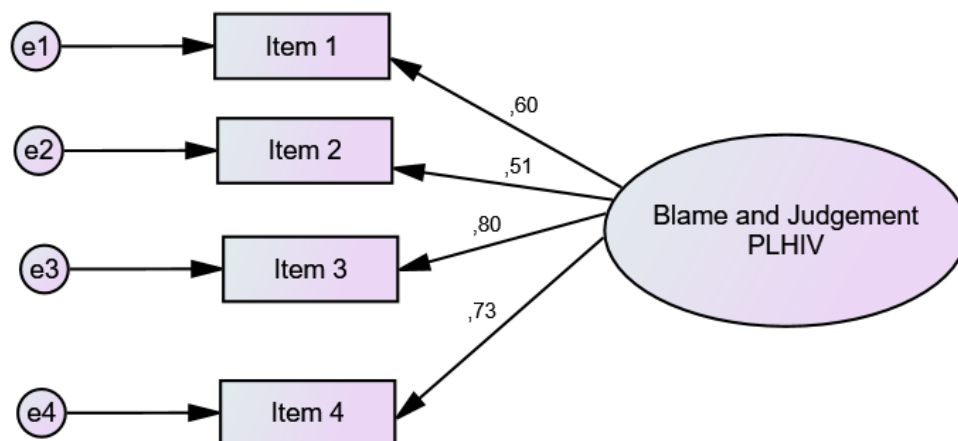


Figure A.9: Measurement Model (Moral norm)

A.10 Subjective norm about HIV testing

Items	Factor
1. My friends would support my decision to get an HIV test	0.894
2. I could talk to my friends about making the decision to get an HIV test	0.871
3. My family would support me if I decided to be tested for HIV	0.903
4. I could easily discuss HIV antibody testing with my family	0.822
5. My friends would not treat me any different if I were tested for HIV	0.763

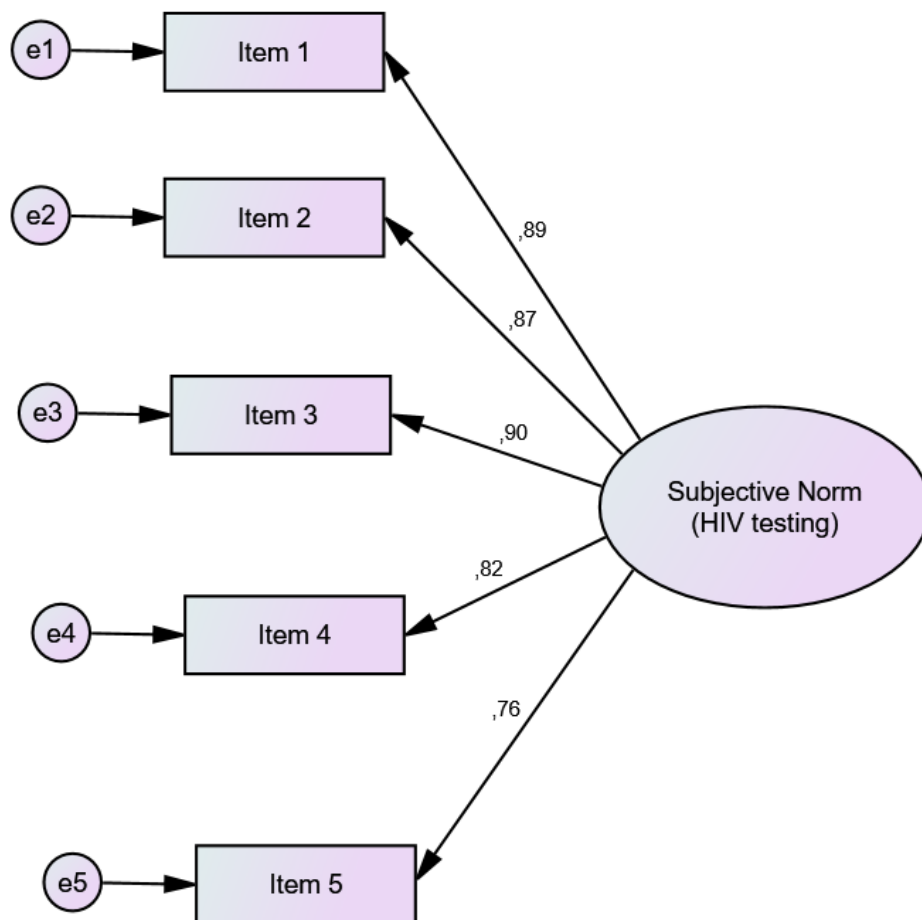


Figure A.10: Measurement Model (Subjective norm about HIV testing)

A.11 Unfavourable beliefs about condom use

Items	Factor
1. The idea of using condoms does not appeal to me	0.733
2. I would avoid using a condom if possible	0.721
3. I just don't like the idea of using condoms	0.799
4. A suggestion from a partner to use a condom means that he/she doesn't trust his/her partner	0.467

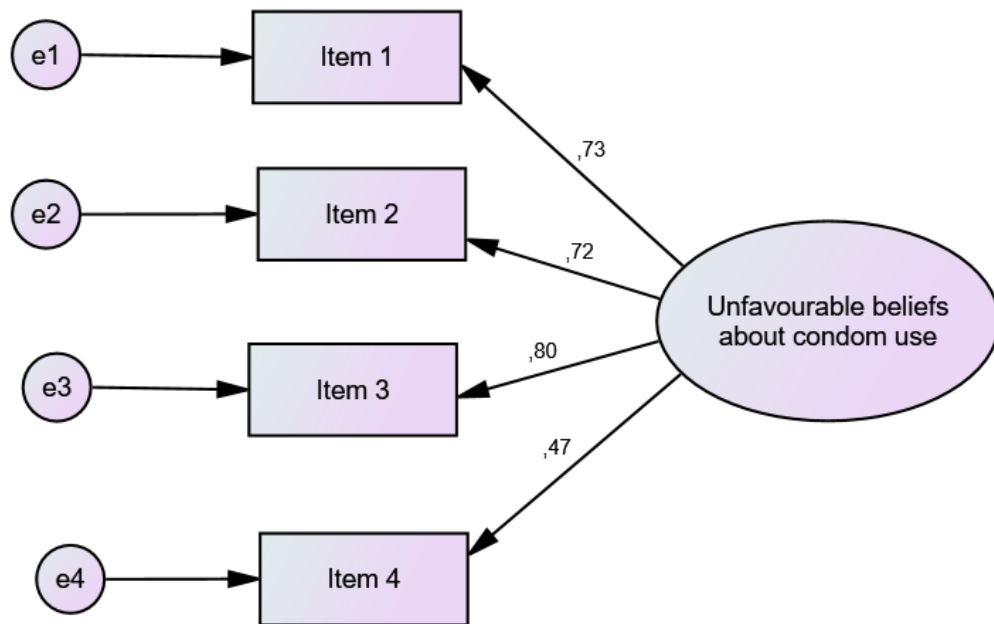


Figure A.11: Measurement Model (Unfavourable beliefs about condom use)

A.12 Unfavourable beliefs about HIV testing

Items	Factor
1. Anyone who is tested for HIV is disgusting	0.374
2. HIV testing is not really confidential	0.334
3. My parents or family would be upset if they knew I was planning to get tested for HIV	0.453
4. My friends would look down on me if I was tested for HIV	0.896
5. My friends would treat me badly if I were to be tested for HIV	0.888
6. A suggestion from a partner to do an HIV test means that he/she doesn't trust me	0.638

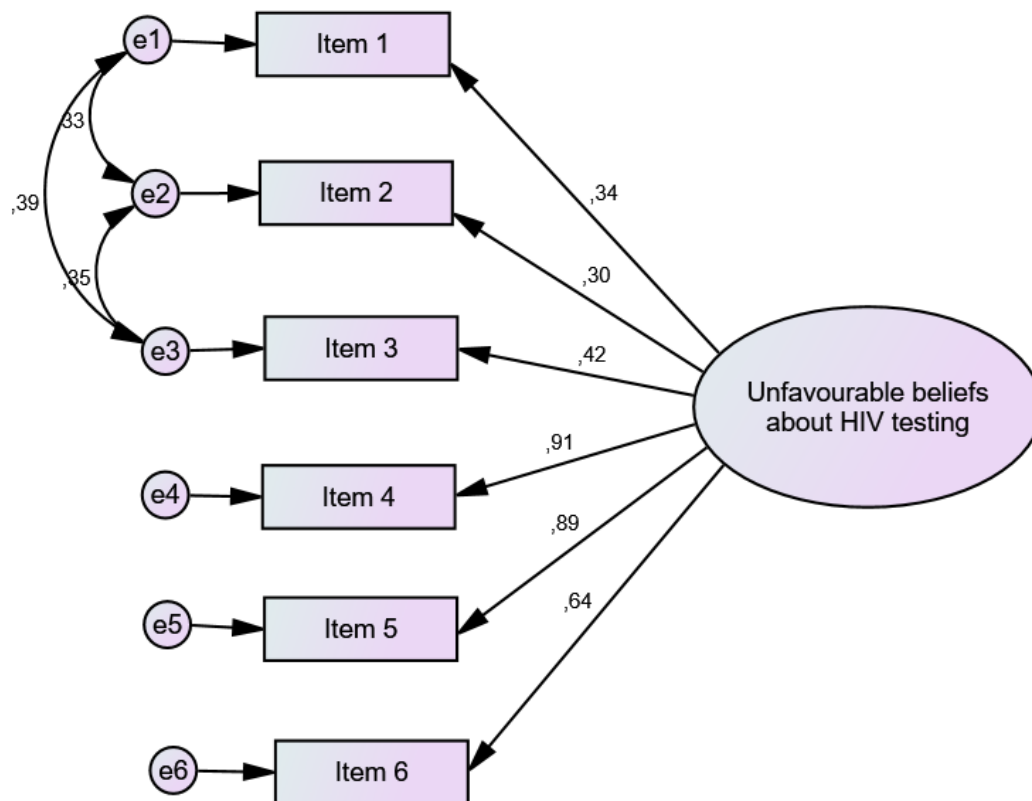


Figure A.12: Measurement Model (Unfavourable beliefs about HIV testing)

A.13 Perceived control over condom use

Items	Factor
1. I am confident I will be able to make sure a condom is used every time I have sex	0.779
2. I am certain that I will be able to make sure a condom is used every time I have sex	0.827
3. It is mostly up to me to make sure to use a condom every time I have sex	0.893
4. I have control over whether I make sure a condom is used every time I have sex	0.878
5. It is difficult to make sure a condom is used every time I have sex	0.295*

* loading < 0.300

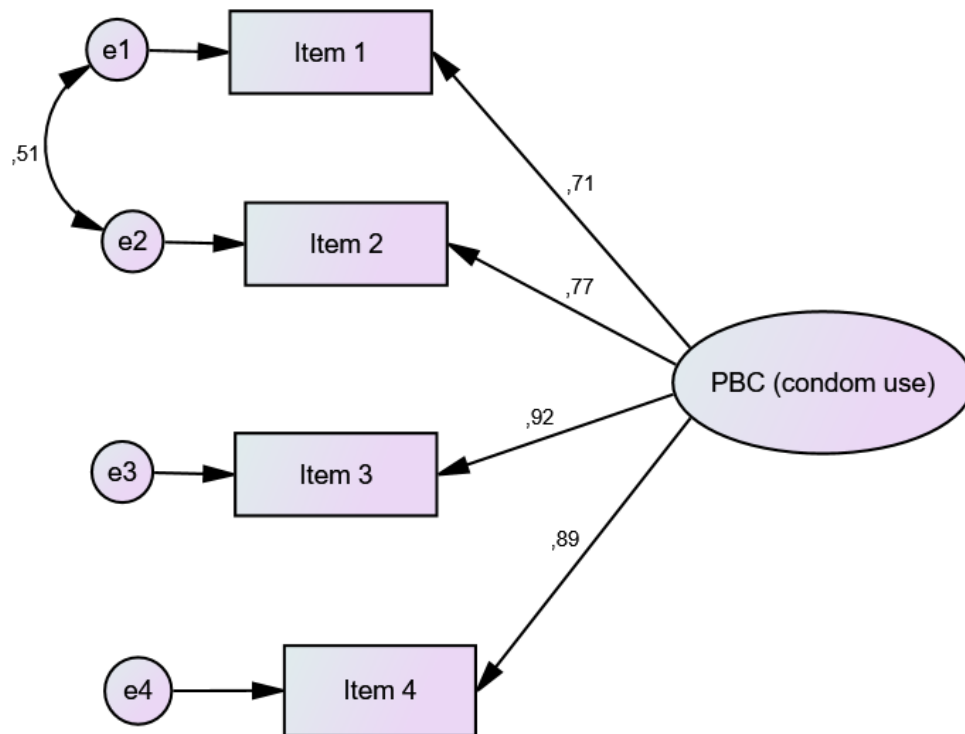


Figure A.13: Measurement model (Perceived control over condom use)

A.14 Positive attitude toward condom use

Items	Factor
1. Proper use of condoms enhances sexual pleasure	0.367
2. Condoms are the best way to protect myself from HIV.	0.984
3. Condoms are the best way to protect myself from other sexually transmitted infections	0.794

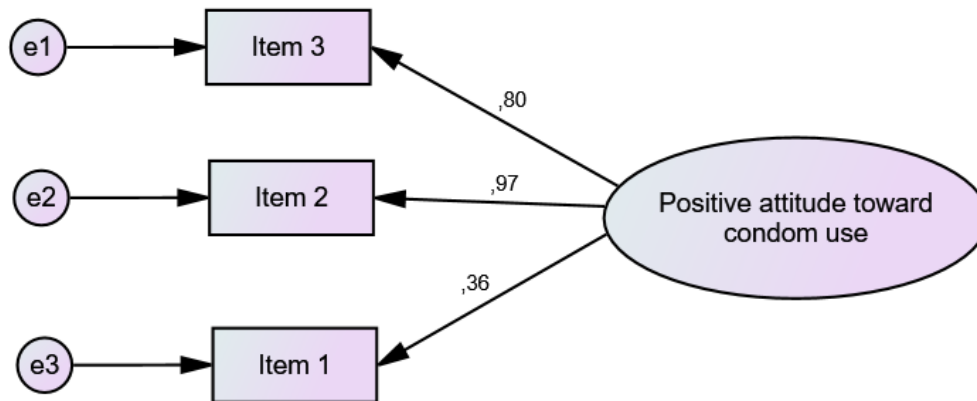


Figure A.14: Measurement model (Positive attitude toward condom use)

A.15 Negative attitude toward HIV testing

Items	Factor
1. I am afraid that if I were to be tested for HIV, my name would go into public records	0.590
2. I do not have time to get an HIV test	0.698
3. I would not consider getting an HIV test because I would be asked about things that I have done that could get me into trouble	0.771
4. I would be embarrassed if my friends found out I had decided to have an HIV test	0.727
5. People would assume I have HIV if I decided to get tested	0.777
6. I am afraid someone would find out I was tested for HIV	0.799
7. I would not get tested for HIV because I would be asked information that was too personal	0.738

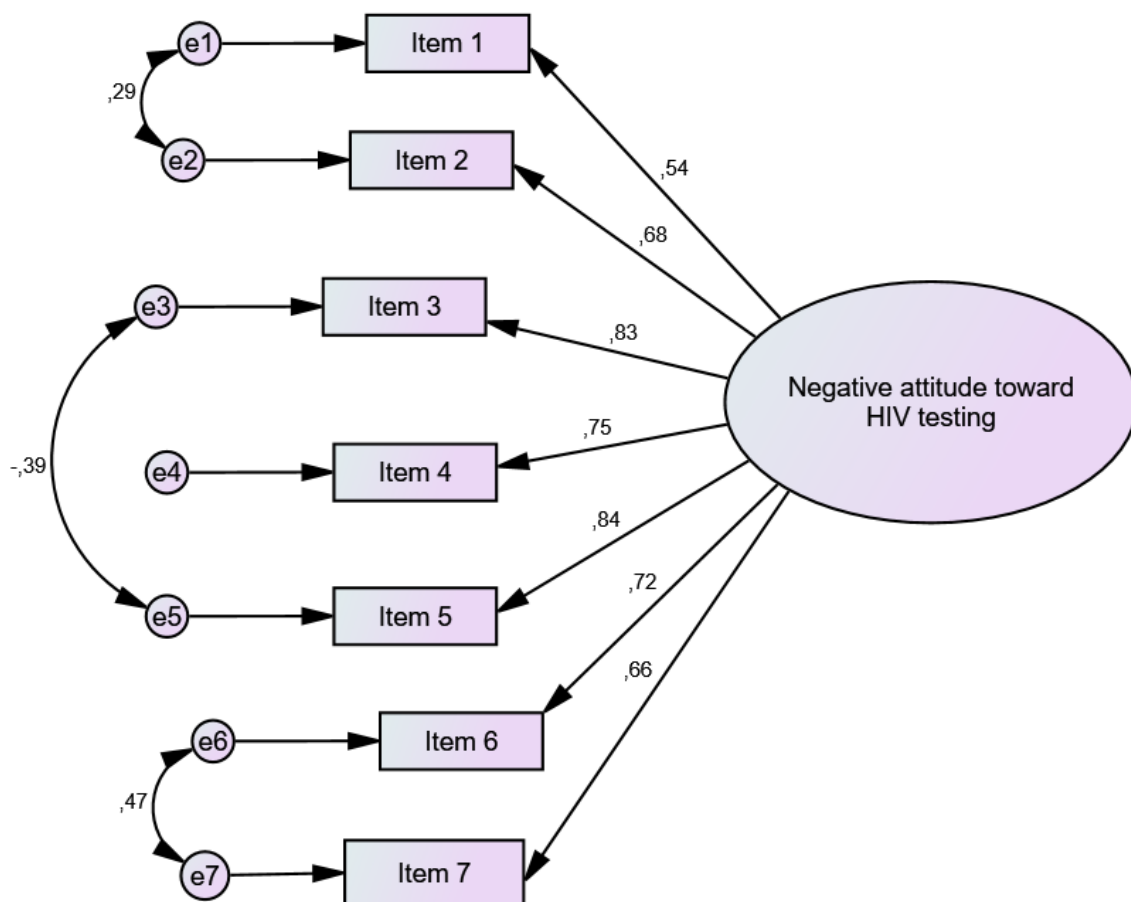
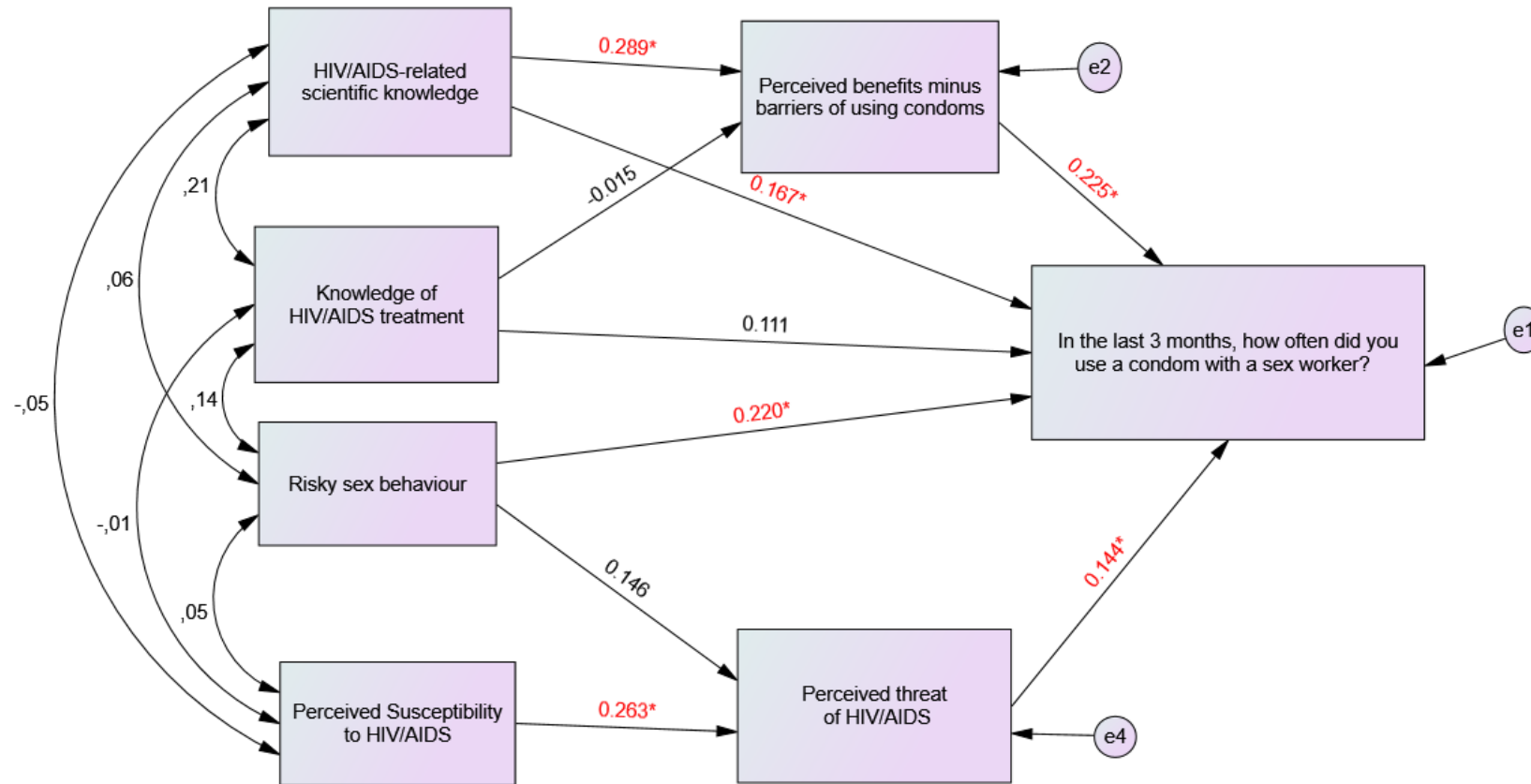


Figure A.15: Measurement model (Negative attitude toward HIV testing)

11 APPENDIX – Path Analysis

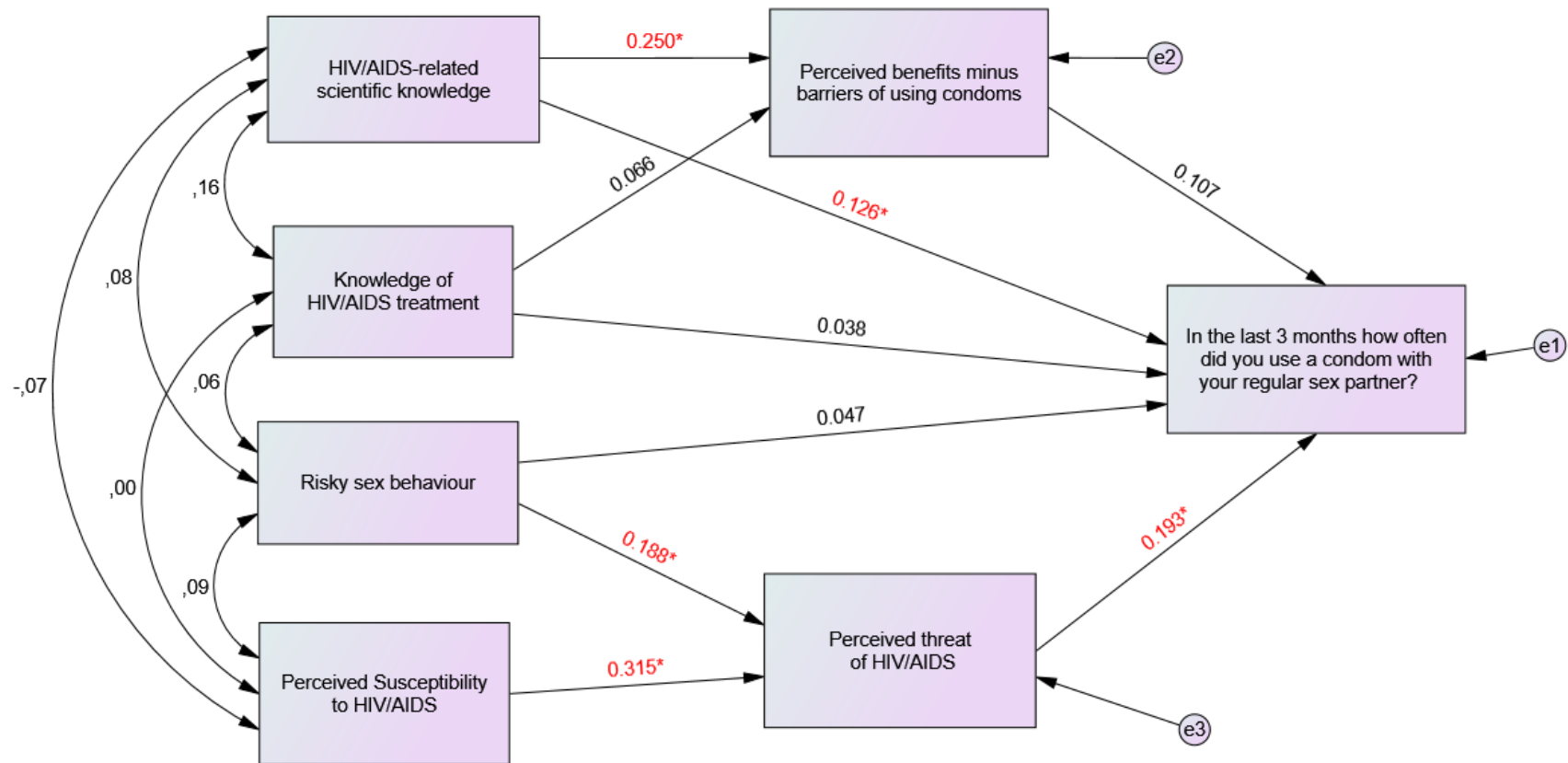
B.1 HBM (modified model): Consistent condom use with a sex worker



Standardized path coefficients with asterisks (and in red) are statistically significant at $p < 0.050$

$\chi^2 = 5.748$, $df = 6$, $\chi^2/df = 0.958$; CFI = 1.000; RMSEA = 0.000 ; Hoelter's CN = 442

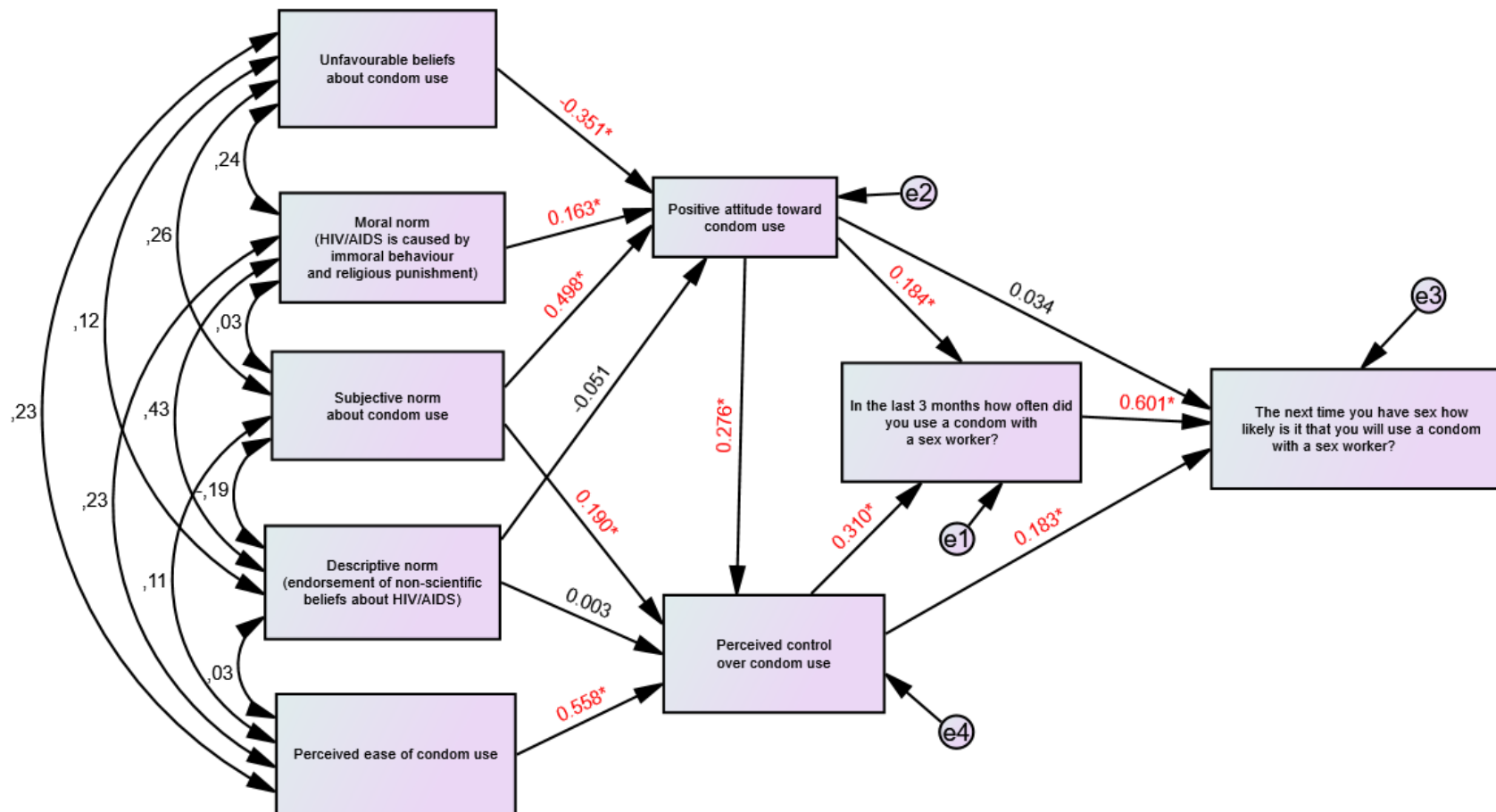
B.2 HBM (modified model): Consistent condom use with a regular partner



Standardized path coefficients with asterisks (and in red) are statistically significant at $p < 0.050$

$\chi^2 = 10.838$, $df = 6$, $\chi^2/df = 1.806$; CFI = 0.953; RMSEA = 0.051 ; Hoelter's CN = 480

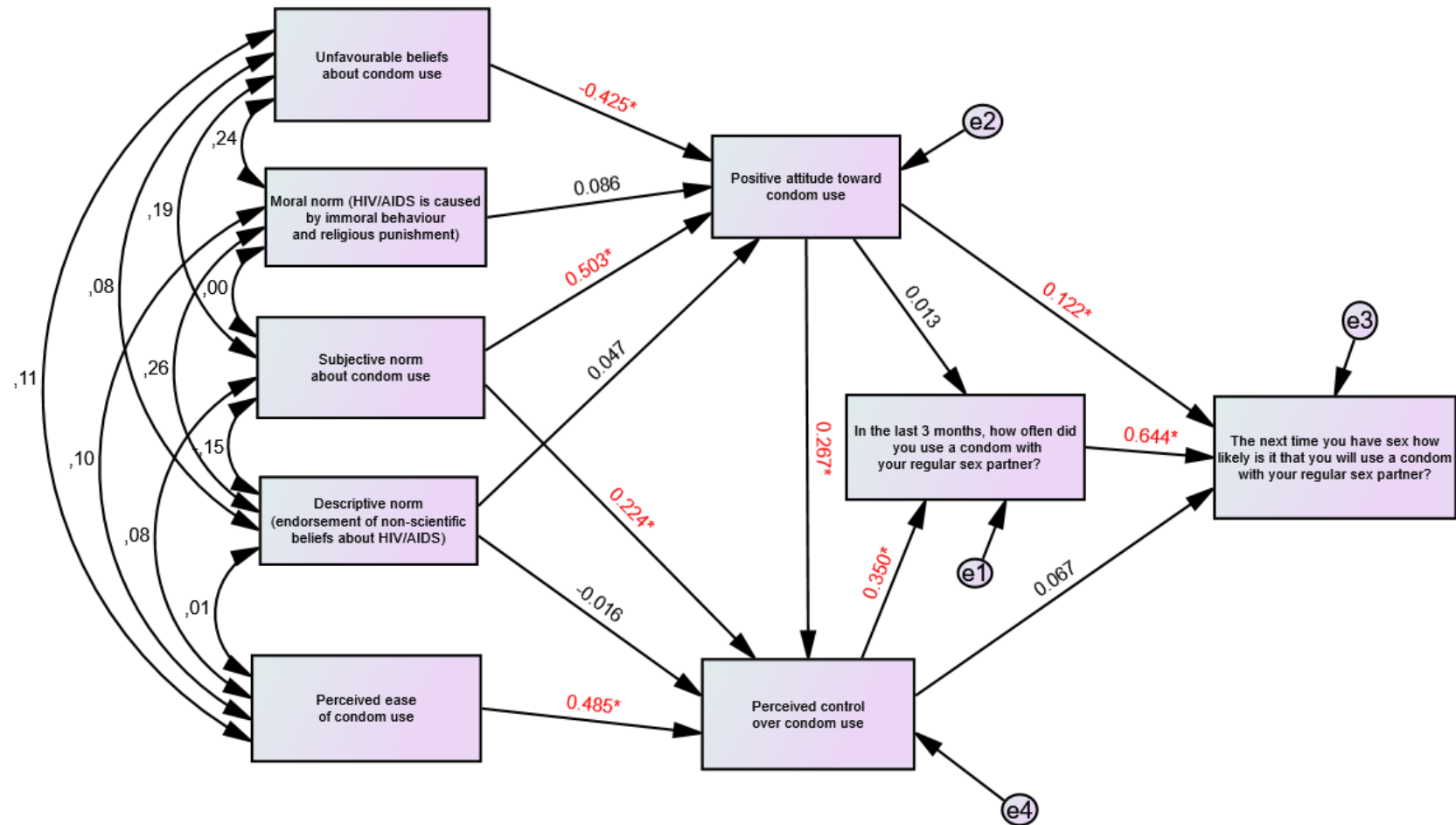
B.3 TPB (modified model): Intention to use a condom at next sex with a sex worker



Standardized path coefficients with asterisks (and in red) are statistically significant at $p < 0.050$

$\chi^2 = 14.679$, $df = 13$, $\chi^2/df = 1.129$; CFI = 0.995; RMSEA = 0.029 ; Hoelter's CN = 285

B.4 TPB (modified model): Intention to use a condom at next sex with a regular sex partner

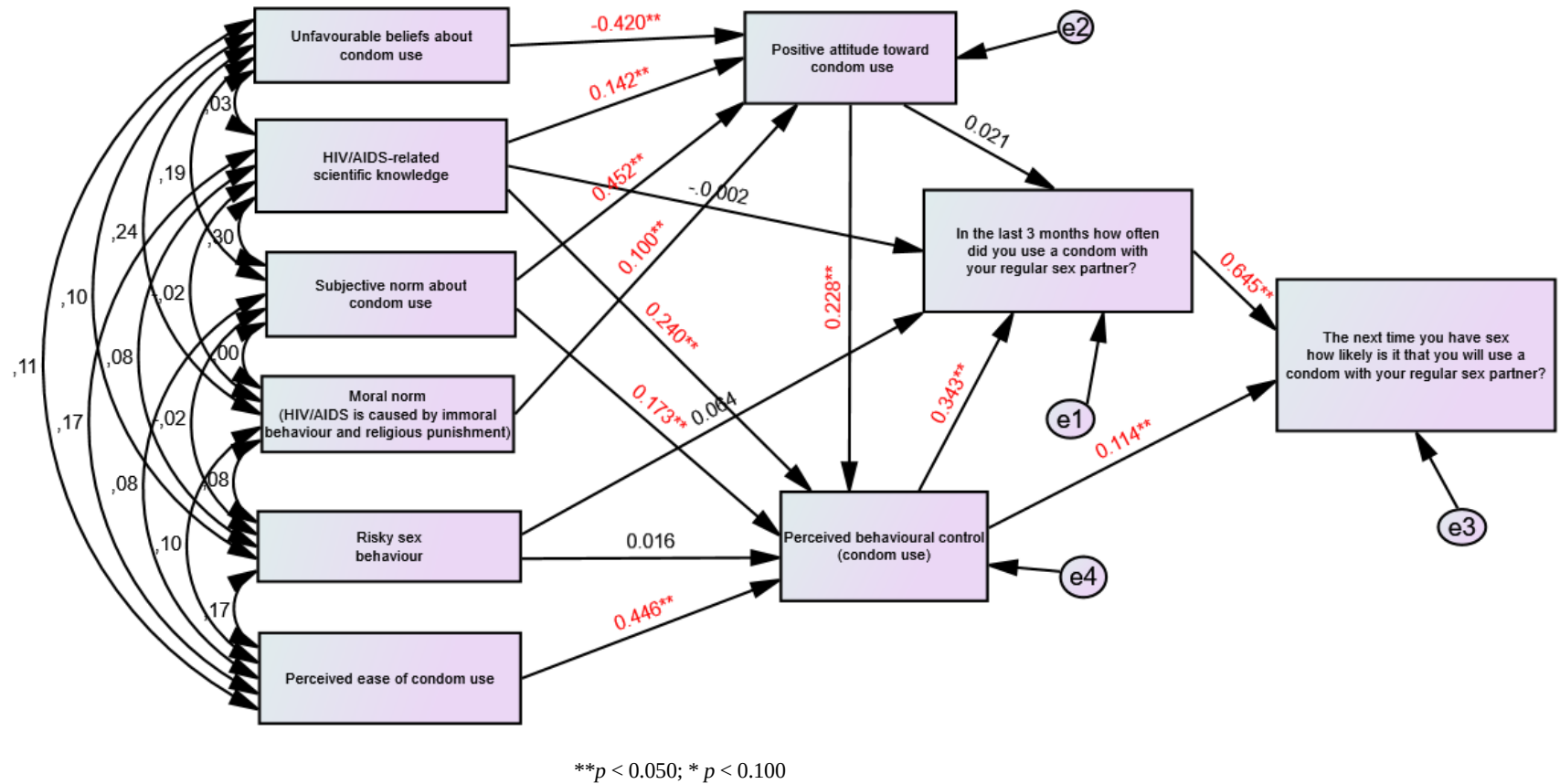


Standardized path coefficients with asterisks (and in red) are statistically significant at $p < 0.050$

$\chi^2 = 25.946$, $df = 13$, $\chi^2/df = 1.996$; CFI = 0.979; RMSEA = 0.057 ; Hoelter's CN = 330

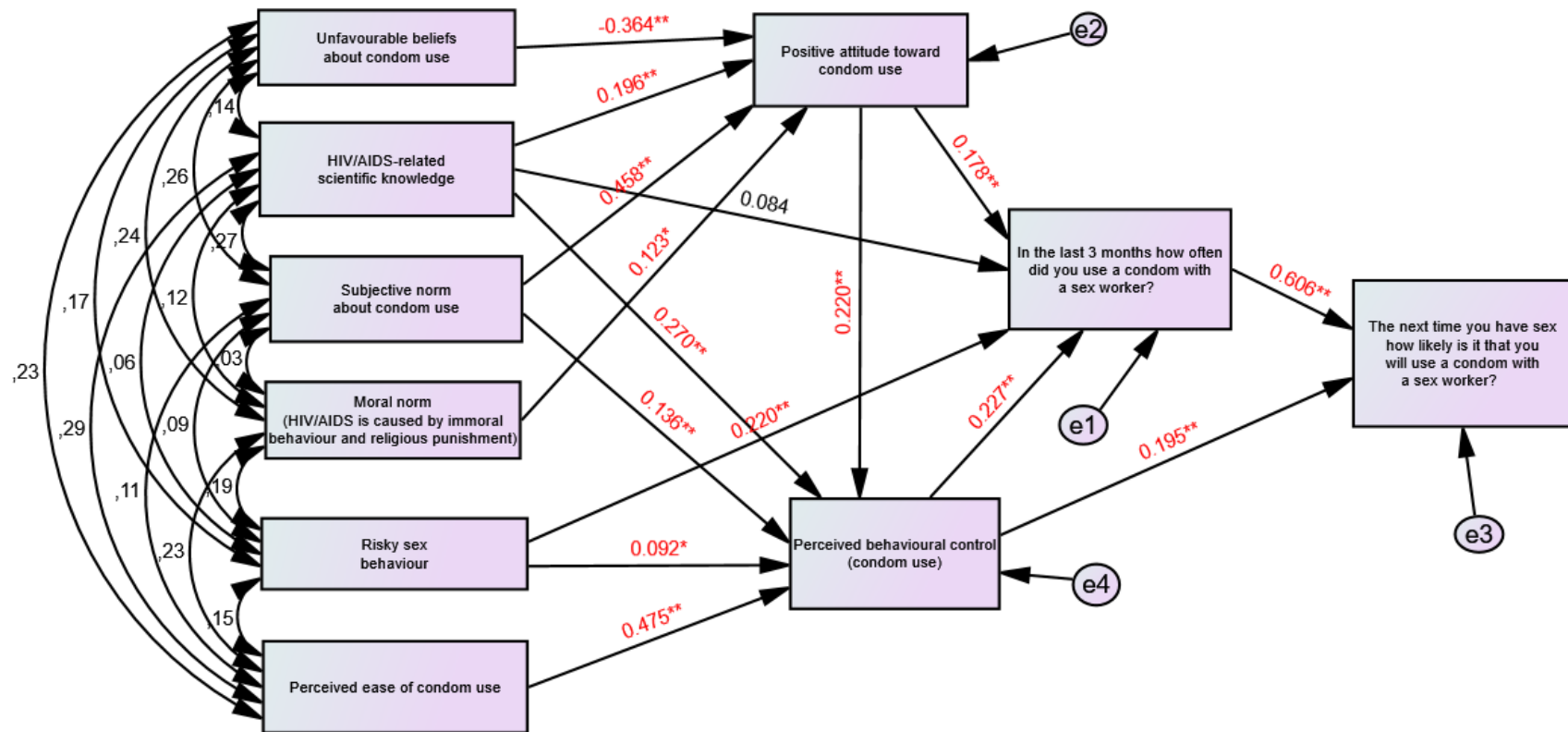
12 APPENDIX – Integrating the HBM & TPB

C.1 An Integrated model of Intention to use a condom at next sex with a regular sex partner



C.2 An integrated model of intention to use a condom at next sex with a sex worker

An integrated model of intention to use a condom (with a sex worker)
among male construction workers



$^{**}p < 0.050$; $^{*}p < 0.100$

13 QUESTIONNAIRE (English)

HIV/AIDS QUESTIONNAIRE

The purpose of this research is to understand the important health issues and health challenges of male workers in the construction industry. We are interested in male workers of all ages and job descriptions. The research is focused on the sector as a whole. It is not linked to the company that you work for, and the company will not see your responses to this survey. The overall purpose is to help promote better health and welfare for workers in the industry. We hope that the results of this study will assist in understanding and meeting the specific health needs of workers like yourself.

In this questionnaire we would like to ask you some questions about different aspects of your health and welfare. In some sections we ask about your attitudes and beliefs, and in other sections we ask about your behaviour. Please note that there are no right or wrong answers for any of these questions, only what you think and believe. We kindly request that you respond as honestly and openly as possible to the questions.

Your answers to all the questions will remain completely confidential, which means that we will not disclose them to anyone without your prior permission. This includes the company you work for or anyone else associated with the company. Also, when we do use the information, we will make sure that no individual person can be identified. We hope that this will help you feel more comfortable about giving us honest and complete answers for all questions.

In answering the survey, please be sure to complete all sections and every question in each section, as every question is important. We have researchers on standby to assist you if you have any queries on any question. Please note that the researchers can only help clarify the question, they cannot and will not tell you what answer to provide. Again, we emphasize that there are no correct answers to any question, we are only interested in your views and thoughts.

Please do not hesitate to ask any questions that you may have before we begin as well as during the survey.

We thank you for your time and co-operation in this important research and look forward to helping promote better health and health outcomes for you and your colleagues in the construction industry.

Please complete the section below to indicate that you voluntarily agree to participate in this research and that you have been properly informed that all your responses will remain entirely confidential and anonymous, and that no information about you will be provided to any third party without your prior permission.

Signature

Date

SECTION A: PERSONAL INFORMATION

In this section we would like you to tell us a little bit about yourself. There are no right or wrong answers. Please answer as openly as possible.

Please tick only one answer that applies to you for each of the following questions.

1. What is your age? _____ Years

2. What is your date of birth: _____ (day) _____ (month) _____ (year)

3. Please tell us about your current marital status. Please tick only one box.

	Single	Widowed	Separated	Divorced	Married/living with a partner in a marriage like relationship
What is your current marital status?	0	1	2	3	4

4. What is your current living situation at home? Please tick only one box.

Live alone	1
Live with other adult (s), no children	2
Live with other adults and children <18 years old	3
Live only with children <18 years old (no other adults)	4

5. Please tell us about all the household members that live with you at home. Please count only those people who live at the household for more than 15 days a month?

	Younger than 18 years	18 years and older
How many members live at home with you?		

6. Please indicate the highest level of education you have completed. Please tick only one box.

No formal school education	0
Completed primary school	1
Attended high school but did not complete matric	2
Completed matric	3
Attended university, college or technikon but did not graduate	4
Graduated from university, college or technikon	5

7. Please tell us about your race/ethnicity. Please tick only one box.

	Black African	White	Indian	Coloured	Other
a. What is your race/ethnic group?	1	2	3	4	5

8. What is your current work status, either for this firm or for sub-contractor? Please tick only one box.

Casual (less than 24 hours a month)	1
Labour Broker (TES) employee	2
Fixed term contract hourly	3
Fixed term contract monthly	4
Permanent hourly	5
Permanent monthly	6

9. What is your job description? Please tick only one box.

Contract Manager, Site Agent, Other Senior Management.	1
Engineer, Technician, Quantity surveyor, Foreman, Estimator.	2
Supervisor.	3
Administrator, Site Clerk.	4
Finance, Human Resource, Secretary, SHEQ staff.	5
Mechanic, Fitter and Turner, Auto Electrician, Boilermaker, Spray painter, Carpenter, Bricklayers	6
Construction Hand, Checker, Chainmen.	7
Construction plant operator i.e. grader, dumper, roller, cranes, etc.	8
Tea lady, General worker.	9

10. How many years (**in total**) have you worked in the construction industry?

Number of years: _____

11. In which Province is your home/village? Please tick only one box.

Mpumalanga	1
Limpopo	2

Gauteng	3
North West	4
Free State	5
KwaZulu-Natal	6
Northern Cape	7
Eastern Cape	8
Western Cape	9
Other (<i>specify</i>)	10

SECTION B: ALCOHOL CONSUMPTION

To begin with, we would like to ask you some questions about your use of alcohol. I will assist you in this section but you will have to fill out the answers yourself on the page. Please score each question with the number that applies to you.

The questions I am going to ask you relate to your alcohol drinking habits. A drink can be one normal size beer, a small glass of wine, a tot of spirits (brandy, whisky, etc.).

12.	Never [Skip to Q21]	Monthly or less	2 to 4 times a month	2 to 3 times a week	4 or more times a week
How often do you have a drink containing alcohol?	0	1	2	3	4

13.	1 or 2	3 or 4	5 or 6	7,8 or 9	10 or more
How many drinks containing alcohol do you have on a typical day when you are drinking?	0	1	2	3	4

14.	Never [Skip to Q21]	Less than monthly	Monthly	Weekly	Daily or almost daily
How often do you have six or more drinks on one occasion?	0	1	2	3	4

15.	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
How often during the last year have you found that you were not able to stop drinking once you had started?	0	1	2	3	4

16.

	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
How often during the last year have you failed to do what was normally expected from you because of drinking?	0	1	2	3	4

17.

	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?	0	1	2	3	4

18.

	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
How often during the last year have you had a feeling of guilt or remorse after drinking?	0	1	2	3	4

19.

	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
How often during the last year have you been unable to remember what happened the night before because you had been drinking?	0	1	2	3	4

20.

	No	Yes, but not in the last year	Yes, during the last year
a. Have you or someone else been injured as a result of your drinking?	0	2	4
b. Has a relative or friend or doctor or another health worker been concerned about your drinking or suggested you cut down?	0	2	4

SECTION C: DRUG USE

In this section we would like to ask you some questions about your use of drugs. Again, in this section I will assist you but you will have to fill out the answers yourself. Please score each question with the number that applies to you.

A table below is given as an indication of the possible drugs that you might be familiar with and to also give you an understanding of what constitutes drugs.

LIST OF DRUGS

(Note, Not Alcohol)

Cannabis	Ampheta-mines	Cocaine	Opiates	Hallucinogens	Solvents/ inhalants	GHB and other
Marijuana Hash Hash oil	Methampheta- mine Phenmetraline Khat Betel nut Ritaline (Methylpheni- date)	Crack Freebase Coca leaves	Smoked heroin Heroin Opium	Ecstasy LSD (Lisergic acid) Mescaline Peyote PCP, angel dust (Phencyclidine) Psilocybin DMT (Dimethyltryptam ine)	Thinner Trichlorethylene Gasoline/petrol Gas Solution Glue	GHB Anabolic steroids Laughing gas (Halothane) Amyl nitrate (Poppers) Anticholinergic compounds

PILLS – MEDICINES

Pills count as drugs when you take

- more of them or take them more often than the doctor has prescribed for you
- pills because you want to have fun, feel good, get “high”, or wonder what sort of effect they have on you
- pills that you have received from a relative or a friend
- pills that you have bought on the “black market” or stolen

SLEEPING PILLS/SEDATIVES			PAINKILLERS		
Alprazolam (Xanor)	Alprazolam	Phenobarbital	Aspirin	Sublimaze	Oxynorm
Butabarbital	Clomethiazole	Diazepam	Fentanyl	Methadone-	Hydrocodone
Chloral hydrate	Clonazepam	Stilnox - CR	Codeine- phosphate	hydrochloride	Cefalexin
Diazepam (Valium)	Halcion	Lorazepam	Morphine	Morphine	Ketoprofen
Dormicum	Imovane	Thiopental-	Hydromorphone-	Tramadol-	Buscopan
Flunitrazepam	Meprobamate	Sodium	hydrochloride	hydrochloride	Buprenorphine
Phenobarbital	Methaqualone	Triazolam	Dihydrocodeine-	Norflex	Tramadol-
	Mogadon -	Oxazepam	tartrate	Tramadol-	hydrochloride
	(Nitrazepam)	Zopiclone	Dextropropoxyphene napsilate	hydrochloride	
				Oxycodone	

Pills do NOT count as drugs if they have been prescribed by a doctor and you take them in the prescribed dosage.

21.

	Never [Skip to Q31]	Once a month or less	2 to 4 times a month	2 to 3 times a week	4 times a week or more often
How often do you use drugs other than alcohol?	0	1	2	3	4

22.

	Never	Once a month or less	2 to 4 times a month	2 to 3 times a week	4 times a week or more often
Do you use more than one type of drug on the same occasion?	0	1	2	3	4

23.

	0	1-2	3-4	5-6	7-more
How many times do you take drugs on a typical day when you use drugs?	0	1	2	3	4

24.

	Never	Less than once a month	Every month	Every week	Daily or almost every day
How often are you influenced heavily by drugs?	0	1	2	3	4

25.

	Never	Less than once a month	Every month	Every week	Daily or almost every day
Over the past year have you felt that your longing for drugs was so strong that you could not resist it?	0	1	2	3	4

26.

	Never	Less than once a month	Every month	Every week	Daily or almost every day
Has it happened over the past year that you have not been able to stop taking drugs once you started?	0	1	2	3	4

27.

	Never	Less than once a month	Every month	Every week	Daily or almost every day
How often over the past year have you taken drugs and then neglected to do something you should have done?	0	1	2	3	4

28.

	Never	Less than once a month	Every month	Every week	Daily or almost every day
How often over the past year have you needed to take a drug the morning after heavy drug use the day before?	0	1	2	3	4

29.

	Never	Less than once a month	Every month	Every week	Daily or almost every day
How often over the past year have you had guilt feelings or a bad conscience because you used drugs?	0	1	2	3	4

30.

	No	Yes, but not in the last year	Yes, during the last year
a. Have you or anyone else been hurt (mentally or physically) because you used drugs?	0	2	4
b. Has a relative or friend, a doctor or nurse, or anyone else, been worried about your drug use or said to you that you should stop using drugs?	0	2	4

SECTION D: YOUR FEELINGS IN THE PAST WEEK

We would like to ask you a few questions about how you were feeling in the past week.

Please answer as honestly as possible. Your answers will not be shared with anyone else.

31. During the last week...

Please tick only one answer for each statement.

	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or moderate amount of the time (3-4 days)	All of the time (5-7 days)
a. I was bothered by the things that usually don't bother me.	1	2	3	4
b. I had trouble keeping my mind on what I was doing.	1	2	3	4
c. I felt depressed.	1	2	3	4
d. I felt that everything I did was an effort.	1	2	3	4
e. I felt hopeless about the future.	1	2	3	4
f. I felt fearful.	1	2	3	4
g. My sleep was restless.	1	2	3	4
h. I was unhappy.	1	2	3	4
i. I felt lonely.	1	2	3	4
j. I could not "get going".	1	2	3	4

SECTION E: YOUR KNOWLEDGE ABOUT AIDS

In this section we would like to ask you what you know and think about AIDS and HIV. Once again, there are no right or wrong answers.

32. For each statement below, please tell us whether you think the statement is true, false or you don't know.

Please tick only one answer for each statement.

	False	I don't know	True
a. A person can get HIV by touching someone who has AIDS.	0	1	2
b. Showering or washing one's genitals/private parts after sex keeps a person from getting HIV.	0	1	2
c. Pulling out the penis before a man climaxes/cums keeps a woman from getting HIV during sex.	0	1	2
d. A woman can get HIV if she has anal sex with a man.	0	1	2
e. A person can get HIV by sharing a glass of water with someone who has HIV.	0	1	2
f. People are likely to get HIV by deep kissing, putting their tongue in their partner's mouth, if their partner has HIV.	0	1	2
g. A woman cannot get HIV if she has sex during her period.	0	1	2
h. There is a female condom that can help decrease a woman's chance of getting HIV.	0	1	2
i. A person will NOT get HIV if she or he is taking antibiotics.	0	1	2
j. Having sex with more than one partner can increase a person's chance of being infected with HIV.	0	1	2
k. A person can get HIV from oral sex.	0	1	2
l. Coughing and sneezing DOES NOT spread HIV.	0	1	2

SECTION F: TRADITIONAL BELIEFS

There are many views and beliefs about HIV and AIDS, and different people think and believe differently. In this section, we would like to know your views and beliefs about HIV and AIDS, regardless of where these come from. Please tell us honestly what you think and believe.

33. Please state what you think about the following statements.

Please tick one answer for each statement.

	False	I don't know	True
a. Spirits or supernatural forces cause AIDS.	0	1	2
b. A Sangoma or traditional healer can cure AIDS.	0	1	2
c. Traditional medicines can cure AIDS.	0	1	2
d. Sangomas or traditional healers are better than western doctors at curing AIDS.	0	1	2
e. A person can get rid of AIDS by having sex with a virgin.	0	1	2
f. People with HIV are bewitched or cursed.	0	1	2

SECTION G: ATTITUDE TOWARDS PEOPLE WITH HIV

In this section we would like to ask for your opinion about what you think is the reason why some people have AIDS and HIV while other people do not. Once again, there are no right or wrong answers.

34. Please tick one answer for each question:

	Yes	No
a. Do you Know someone with HIV?	1	2
b. Do you Know someone who has died because of HIV/AIDS?	1	2
c. Have you ever cared for someone with HIV?	1	2

35. Please tell us how much you agree or disagree with the following statements.

Please tick only one answer for each statement.

	Strongly Disagree	Disagree	Undecided (Neutral)	Agree	Strongly Agree
a. Getting HIV is a punishment for bad behaviour.	1	2	3	4	5
b. People with HIV have themselves to blame.	1	2	3	4	5

c. Person with HIV must have done something wrong to deserve it.	1	2	3	4	5
d. People with HIV should be ashamed of themselves.	1	2	3	4	5
e. I think less of someone because they have HIV.	1	2	3	4	5
f. I would not employ someone with HIV.	1	2	3	4	5
g. I feel uncomfortable around people with HIV.	1	2	3	4	5
h. I would not drink from a tap if person with HIV had just drunk from it.	1	2	3	4	5
i. If I was in public or private transport I would not like to sit next to someone with HIV.	1	2	3	4	5
j. I feel afraid to be around people with HIV.	1	2	3	4	5
k. I would not like to be friends with someone with HIV.	1	2	3	4	5
l. I would not like someone with HIV to live next door to me.	1	2	3	4	5
m. You can tell if a person has HIV just by looking at them	1	2	3	4	5

SECTION H: ATTITUDES TOWARDS CONDOMS

In this section, we would like to know how you think and feel about condoms. Please tell us how much you agree or disagree with the statements below. There are no right or wrong answers.

36. How much do you agree with the following statements about HIV?

Please tick one answer for each statement.	Strongly Disagree	Disagree	Undecided (Neutral)	Agree	Strongly Agree
a. Condoms are uncomfortable.	1	2	3	4	5
b. The idea of using condoms does not appeal to me.	1	2	3	4	5
c. Using condoms makes sex unenjoyable.	1	2	3	4	5
d. Proper use of condoms enhances sexual pleasure.	1	2	3	4	5
e. I would avoid using a condom if possible.	1	2	3	4	5
f. I just don't like the idea of using condoms.	1	2	3	4	5
g. Men who use condoms show concern and responsibility to their partner (s).	1	2	3	4	5
h. Using condoms is unmanly.	1	2	3	4	5
i. Condoms are the best way to protect myself from HIV.	1	2	3	4	5
j. Condoms are the best way to protect myself from <u>other</u> sexually transmitted infections.	1	2	3	4	5

k. A suggestion from a partner to use a condom means that he/she doesn't trust his/her partner.	1	2	3	4	5
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SECTION I: USE OF CONDOMS

In this section we would like to know how you feel about using condoms during sex. The condoms may be either for males or for females, and can be used for all types of sex (vaginal, oral and/or anal sex). All answers are totally confidential.

The option '*not applicable*' is given for when the question does not apply to you.

Please tick one answer for each question.

37. In the last **3 months**, how often did you use a condom with:

	Never	Rarely	Sometimes	Often	Always	Not applicable
a. Your regular sex partner?	1	2	3	4	5	6
b. Someone you did not know very well?	1	2	3	4	5	6
c. Someone you had just met the same day?	1	2	3	4	5	6
d. A sex worker?	1	2	3	4	5	6

38. Did you use a condom **the last time you had sex with:**

	Never	Rarely	Sometimes	Often	Always	Not applicable
a. Your regular sex partner?	1	2	3	4	5	6
b. Someone you did not know very well?	1	2	3	4	5	6
c. Someone you had just met the same day?	1	2	3	4	5	6
d. A sex worker?	1	2	3	4	5	6

39. The **next time** you have sex, how likely is it that you will use a condom with:

	Never	Rarely	Sometimes	Often	Always	Not applicable
a. Your regular sex partner?	1	2	3	4	5	6
b. Someone you did not know very well?	1	2	3	4	5	6
c. Someone you had just met the same day?	1	2	3	4	5	6

d. A sex worker?	1	2	3	4	5	6
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40. For the following statements about using condoms, would you say:

Please tick only one answer for each statement

	Strongly Disagree	Disagree	Undecided (Neutral)	Agree	Strongly Agree
a. It is difficult to make sure a condom is used every time I have sex.	1	2	3	4	5
b. I am confident I will be able to make sure a condom is used every time I have sex.	1	2	3	4	5
c. I am certain that I will be able to make sure a condom is used every time I have sex.	1	2	3	4	5
d. It is mostly up to me to make sure to use a condom every time I have sex.	1	2	3	4	5
e. I have control over whether I make sure a condom is used every time I have sex.	1	2	3	4	5
f. Making sure that I use a condom every time I have sex is beyond my control.	1	2	3	4	5

41.

	Never	Rarely	Sometimes	Often	Always
How often have you been forced into having sex with someone <u>without</u> using a condom	1	2	3	4	5

SECTION J: SEXUAL BEHAVIOUR SCALE

Here we would like to ask you a few questions that deal with your sexual habits and behaviour. Your answers will not be shared with anyone else.

42. At what age did you have any form of sex for the first time? _____ years.

43. What is the age of your regular sex partner? _____ years.

44. In the last 6 months:

Please tick one answer for each question.

	Never	Rarely	Sometimes	Often	Always
a. Have you exchanged money or gifts with a partner (who is not a sex worker) for sex?	1	2	3	4	5
b. How often have you had sex with a sex worker?	1	2	3	4	5
c. Have you had sex with a partner who was menstruating?	1	2	3	4	5

d. Have you had sexual relationships with more than one person at the same time?	1	2	3	4	5
e. How often have you left a social event with someone you just met?	1	2	3	4	5
f. How often have you gone out to taverns or bars/parties/social events with the intent of meeting someone with the intention of having sex with them?	1	2	3	4	5
g. How often have you had an unexpected or unanticipated sexual experience with someone?	1	2	3	4	5
h. How often have you had a sexual encounter you engaged in willingly, but later regretted?	1	2	3	4	5
i. How often have you had sex with someone you don't know well or have just met?	1	2	3	4	5
j. How often have you used alcohol before or during sex?	1	2	3	4	5
k. How often have you used drugs before or during sex?	1	2	3	4	5
l. How often have you used both alcohol <u>and</u> drugs before or during sex?	1	2	3	4	5
m. How often has your <u>partner</u> used alcohol before or during sex?	1	2	3	4	5
n. How often has your <u>partner</u> used drugs before or during sex?	1	2	3	4	5
o. How often has your <u>partner</u> used both alcohol <u>and</u> drugs before or during sex?	1	2	3	4	5
p. How often (that you know of) have you had sex with someone who has had many sexual partners?	1	2	3	4	5
q. How often (that you know of) have you had sex with someone who was also engaging in sex with others during the same time period?	1	2	3	4	5

45. Total number of sex partners in the last 6 months: _____ (please write number)

SECTION K: YOUR VIEWS ABOUT GETTING INFECTED WITH HIV

In this section, may you please tell us about how you feel about the risk of you getting infected with HIV.

Please answer as honestly as possible. Your answers will be strictly confidential.

Please tick one answer for each question or statement.

46.	Extremely unlikely	Very unlikely	Somewhat likely	Very likely	Extremely likely
What is your gut feeling about how likely you are to get infected with HIV?	1	2	3	4	5

47.	None of the time	Rarely	Some of the time	A lot of the time	All of the time
I worry about getting infected with HIV.	1	2	3	4	5

48.	Not concerned about	A little concerned about	Moderately concerned about	Concerned about a lot	Extremely concerned about
Getting HIV is something I am...	1	2	3	4	5

49.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
a. I am sure I will NOT get infected with HIV.	1	2	3	4	5
b. I feel I am unlikely to get infected with HIV.	1	2	3	4	5
c. I feel vulnerable to HIV infection.	1	2	3	4	5
d. There is a chance, no matter how small, I could get HIV.	1	2	3	4	5

50.	Zero	Almost zero	Small	Moderate	Large	Very large
I think my chances of getting infected with HIV are:	1	2	3	4	5	6

51.	Never thought about	Rarely thought about	Thought about some of the time	Thought about often	Thought about all the time
Getting HIV is something I have:	1	2	3	4	5

SECTION L: HIV TESTING

In this section we would like to ask you about your feelings regarding going for an HIV test. Please tell us how much you agree or disagree with the following statements. There are no right or wrong answers.

52. How much do you agree with the following statements about HIV testing:

Please tick only one answer for each statement

	Strongly Disagree	Disagree	Undecided (Neutral)	Agree	Strongly Agree
a. My friends would support my decision to get an HIV test.	1	2	3	4	5
b. I could talk to my friends about making the decision to get an HIV test.	1	2	3	4	5
c. My family would support me if I decided to be tested for HIV.	1	2	3	4	5
d. It would not bother me if someone I know sees me going to get an HIV test.	1	2	3	4	5
e. I could easily discuss HIV antibody testing with my family.	1	2	3	4	5
f. My friends would not treat me any different if I were tested for HIV.	1	2	3	4	5
g. I am afraid that if I were to be tested for HIV, my name would go into public records.	1	2	3	4	5
h. I do not have time to get an HIV test.	1	2	3	4	5
i. Anyone who is tested for HIV is disgusting.	1	2	3	4	5
j. HIV testing is not really confidential.	1	2	3	4	5
k. I would not consider getting an HIV test because I would be asked about things I have done that could get me into trouble.	1	2	3	4	5
l. I would be embarrassed if my friends found out I had decided to have an HIV test.	1	2	3	4	5
m. People would assume I have HIV if I decided to get tested.	1	2	3	4	5
n. I am afraid someone would find out I was tested for HIV.	1	2	3	4	5
o. I would not get tested for HIV because I would be asked information that was too personal.	1	2	3	4	5
p. My parents or family would be upset if they knew I was planning to get tested for HIV.	1	2	3	4	5
q. HIV testing information is kept very confidential by the medical staff that does the testing.	1	2	3	4	5
r. I trust the HIV counselors and nurses to keep my information confidential.	1	2	3	4	5
s. I can talk to my friends about making medical decisions.	1	2	3	4	5
t. My friends would look down on me if I were tested for HIV.	1	2	3	4	5
u. My friends would treat me badly if I were to be tested for HIV.	1	2	3	4	5
v. A suggestion from a partner to do an HIV test means that he/she doesn't trust his/her partner	1	2	3	4	5

SECTION M: AWARENESS AND KNOWLEDGE OF ARV

There are many views and beliefs about HIV/AIDS and ARV's, and different people think and believe differently. In this section, we would like to know your views and beliefs about HIV/AIDS as well as ARV, regardless of where these come from. Please tell us honestly what you think and believe.

Not all questions might apply to you, please see the instructions about which questions to answer when you give your responses.

53. Please tick one answer for each question:

	Yes	No
a. Have you heard about ARV medication?	1	2
b. Do you know where you can get ARV medication?	1	2
c. Do you know of someone on ARV medication?	1	2

54. If you answered "Yes" to **53a**, how did you hear about ARV medication for the first time?

Newspapers	1
Radio	2
Television	3
Church	4
Mosque	5
Clinic	6
Workplace	7
Friends	8
Family	9
Others (please indicate)	99

55. Please state what you think about the following statements.

Please tick one answer for each statement.

	False	I don't know	True
a. ARV medication can cure HIV/AIDS	0	1	2
b. A person will not get HIV if they are taking ARV	0	1	2
c. When you feel better you can stop taking your ARV medication	0	1	2
d. Persons who are taking ARV medication cannot spread HIV	0	1	2
e. Persons on ARV have to take the medication forever.	0	1	2
f. ARV cannot cure HIV/AIDS, but it can manage it	0	1	2

SECTION N: GENERAL HEALTH

To complete the survey, we would like to ask you a few questions about your general health. We understand some of the issues raised may be very sensitive, and we hope you will be able to provide

us with the answers as they are important for assessing your health status. Your responses will not be shared with anyone else.

Not all questions might apply to you, please see the instructions about which questions to answer when you give your responses.

Please tick only one answer for each question.

56. Do you have TB at the moment?

Yes	1	If “Yes”, please go to Question 57
No	2	If “No”, please go to Question 59

57. (a) Are you being treated for your TB?

Yes	1
No	2

(b) How many months have you been on TB treatment? _____

58. Are you currently taking your TB medicine?

Yes	1
No	2

59. Have you ever had TB in the past?

Yes	1	If “Yes”, please go to Question 60
No	2	If “No”, please go to Question 61

60. If your answer to **Question 59** was “yes”, did you finish your full course of treatment of TB medicine?

Yes	1
No	2

61. Have you ever had an STI (sexually transmitted infection) excluding HIV such as: blisters or ulcers on your genitals, redness and swelling of the genitals, cloudy yellowish & green discharge with a smelly odour, a lot of pain when passing urine, and pain and discomfort during sexual intercourse.

Yes	1	If “Yes”, please go to Question 62
No	2	If “No”, please go to Question 64

62. If your answer to **Question 61** was “yes”, how many times have you had an STI in the past?

Number of times: _____

63. If your answer to **Question 61** was “yes”, were you treated for the STI each time?

Yes	1
No	2

64. How many times have you been tested for HIV?

Never	
1 time	
2 times	
3 times	
4 times	
5 times	
6 times	
7 times	
8 times	
9 times	
10 times	
More than 10 times	

65. If you have been tested for HIV before, what were your reasons for testing?

I was sick	1
Health staff convinced me to test	2
I wanted to know my status	3
My partner asked me to test	4
Friends/Family convinced me to test	5
There was free and voluntary testing at the workplace	6
Other (<i>please specify</i>)	7

66. What was the outcome of your last HIV test?

HIV positive (HIV+)	1
HIV negative (HIV-)	2
I don't know	3

67. If you are HIV+, have you disclosed your status to anyone?

Yes	1
No	2

68. How long ago were you diagnosed HIV positive (HIV+)? _____

69. If you are HIV+, are you on ARV's?

Yes	1
No	2

70. If you are on ARV's, when did you start your treatment?

_____ (month) _____ (year)

71. Please complete this question if you are currently on ARV medication.

Please tick one answer for each question.

	No	Yes
a. Do you ever forget to take your medication?		
b. Are you careless at times about taking your medication?		
c. When you feel better, do you sometimes stop taking your medication?		
d. Sometimes if you feel worse when you take your medication, do you stop taking them?		

SECTION O: FOLLOW-UP INTERVIEW

72. We would like to follow up this research with an interview with some of the workers who have completed this survey. Would you be willing to be contacted for such an interview? If you are willing, please provide your cell phone number below so that we may be able to contact you. Your number will not be shared with anyone else.

Cell phone Number: _____

**Thank you for your participation.
Your co-operation is greatly appreciated.**

