

**IF YOU BUILD IT, WILL THEY BE PROTECTED?  
THE EVALUATION OF AN OCCUPATIONAL HEALTH  
AND INFECTION CONTROL CAPACITY BUILDING  
PROGRAM FOR HEALTHCARE WORKERS IN FREE  
STATE, SOUTH AFRICA**

by

Alexandre Liautaud

B.Sc. (Ag.Env.Sc.), McGill University, 2010

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF  
THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE

in

The Faculty of Graduate and Postdoctoral Studies

(Health Care and Epidemiology)

THE UNIVERSITY OF BRITISH COLUMBIA

(Vancouver)

April 2016

© Alexandre Liautaud, 2016

## **Abstract**

**Background:** Infection control and occupational health training among healthcare workers (HCWs) is insufficient in under-resourced systems. This is especially concerning in systems with high HIV and tuberculosis (TB) burdens where HCW exposure risk can be considerable. There is an urgent need to understand how to best develop and deliver effective capacity building programs for healthcare workers in these fields. This research examined a one-year certificate program in Free State, South Africa that aimed to empower HCWs to act as agents of change by building their capacity to conduct workplace-based HIV and TB prevention interventions.

**Methods:** A mixed method approach was utilized. First, quantitative data were collected from self-reported Likert-style questionnaires administered to HCWs pre, mid, and post enrolment in the program. Questionnaire components included reactions to the program, and learning assessments (i.e., Knowledge, Attitudes, Skills, and Practices [KASPs]). Additionally, individual interviews, participant observations, and group project evaluations were used in the analysis. Questionnaire data were analyzed using the Wilcoxon signed-rank test. Interview data were thematically coded and analyzed based on the Kirkpatrick framework. Projects were descriptively analyzed. Participatory observations supplemented and contextualized these data.

**Results:** Participants (n=32) were mostly female (81%) nurses (56%). Findings from the questionnaires demonstrated that pre to post mean scores improved in Knowledge (+12%, $Z=3.1$ , $p=0.002$ ) and Skills/Practices (+14%, $Z=-3.1$ , $p=0.002$ ). Attitudes scores did not change. Interview data revealed that participants had been empowered and showed attitudinal improvements regarding HIV, TB, infection control and occupational health. Project evaluations,

however, showed that participants had acquired only moderate-low proficiency in applying the subject matter to their interventions, although the projects did affect meaningful improvements in some workplaces. Participatory observations and interviews highlighted the resource-intensive nature of the program.

**Conclusions:** Workplace training can strengthen HCWs' occupational health and infection control KASPs. This capacity building initiative did result in the implementation of positive changes in workplaces, and empowered participants to be agents of change within their communities. However, the resources needed for this program, coupled with the low baseline skill levels of participants were challenges. When designing an intervention, baseline educational levels, institutional politics, sustainability, and resource effectiveness are important determinants of success.

## **Preface**

This study is the evaluation of a collaborative capacity building program between the University of British Columbia and the Centre for Health Systems Research & Development (CHSR&D) at the University of the Free State (South Africa) funded by the Global Health Research Initiative (GHRI), and covered by UBC Ethics Certificate number H10-01879. While the program was a collaborative effort, the imbedded evaluation (a product of which is this thesis) is an original intellectual product of the author, A. Liataud.

# Table of Contents

<b>Abstract.....</b>	<b>ii</b>
<b>Preface.....</b>	<b>iv</b>
<b>Table of Contents .....</b>	<b>v</b>
<b>List of Tables .....</b>	<b>ix</b>
<b>List of Figures.....</b>	<b>x</b>
<b>List of Abbreviations .....</b>	<b>xi</b>
<b>Acknowledgements .....</b>	<b>xii</b>
<b>Dedication .....</b>	<b>xiii</b>
<b>Chapter 1: Introduction .....</b>	<b>1</b>
1.1    Healthcare workers and infectious disease .....	2
1.1.1    State of the healthcare workforce .....	2
1.1.2    The effects of infectious diseases on healthcare workers .....	5
1.1.3    Importance of occupational health and infection control .....	8
1.1.4    Building capacity of the healthcare workforce in occupational health and infection control	13
1.2    South Africa .....	16

1.2.1	Historical and socio-economic-political context of the health system .....	16
1.2.2	HIV and tuberculosis in South Africa.....	18
1.2.3	The state of OH and IC in South Africa and some efforts underway .....	20
1.3	Background on Free State and its healthcare workforce .....	23
1.3.1	Description of the intervention .....	23
1.3.2	Rationale and objectives of this study .....	30
1.4	Conceptual framework.....	31
<b>Chapter 2: Methods .....</b>		<b>35</b>
2.1	Rationale for the mixed methods approach .....	35
2.2	Quantitative.....	36
2.2.1	Questionnaires.....	36
2.2.2	Knowledge, attitudes, skills and practices (KASPs).....	38
2.2.3	Reactions.....	40
2.2.4	Quantitative analysis.....	41
2.2.4.1	Variables .....	41
2.2.4.2	Data analysis .....	43
2.3	Qualitative.....	43

2.3.1 Individual interviews .....	44
2.3.2 Questionnaire items .....	45
2.3.3 Participatory observations.....	45
2.3.3.1 Group projects.....	46
<b>Chapter 3: Results.....</b>	<b>48</b>
3.1 Quantitative Results .....	48
3.1.1 Who were the participants?.....	48
3.1.2 Knowledge, attitudes, skills and practices and true/false Items.....	51
3.1.3 Reactions.....	53
3.2 Qualitative Results .....	57
3.2.1 Individual interviews .....	57
3.2.1.1 Participant interviews.....	57
3.2.1.2 Local South African mentors .....	65
3.2.2 Participatory observations.....	67
3.2.2.1 Group projects.....	69
<b>Chapter 4: Discussion.....</b>	<b>74</b>
<b>Chapter 5: Conclusion.....</b>	<b>91</b>

<b>Bibliography .....</b>	<b>93</b>
<b>Appendices.....</b>	<b>112</b>
Appendix A. Recruitment Brochure.....	112
Appendix B. Certificate Program photos .....	113
Appendix C. Questionnaires 1 - 5 .....	114
Appendix D. Interview Guides (Mid-program, Post-program, Mentors).....	151
Appendix E. Group Abstracts .....	158
Appendix F. Group 7 final Certificate Program presentation.....	165

## List of Tables

Table 1. Topics covered in the certificate program modules.....	27
Table 2. Self-rated item categories used in pre-mid-post questionnaires .....	39
Table 3. Reaction item categories of questionnaires .....	40
Table 4. Categories and sub-categories used in pre-mid-post questionnaire data analysis .....	42
Table 5. Overview of open-ended items in questionnaires.....	45
Table 6. Certificate Program participant characteristics.....	50
Table 7. Pre, mid, and post questionnaire results by category of items.....	54
Table 8. Pre, mid, and post questionnaire results (all KASPs Likert-style items combined).....	55
Table 9. Reaction results by period and program component .....	56
Table 10. Group project descriptions.....	71
Table 11. Group project results and key findings .....	73

## List of Figures

Figure 1. Capacity Building Program Timeline.....	28
Figure 2. Program Evaluation Framework (adapted from Kirkpatrick; Bullock et al.).....	32
Figure 3. Certificate Program evaluation components .....	38

## **List of Abbreviations**

HCWs: Healthcare Workers

HICs: High Income Countries

HIV: Human Immunodeficiency Virus

IC: Infection Control

KASPs: Knowledge, Attitudes, Skills and Practices

LMICs: Low and Middle-Income Countries

OH: Occupational Health

TB: Tuberculosis

WHO: World Health Organization

## **Acknowledgements**

To those, who despite my trying my hardest to not complete this thesis, stood by in their frustration and did not waver, thank you. I particularly thank Drs. Annalee Yassi, Jerry Spiegel, and Elizabeth Bryce for their academic support; as well as Génia, Jose, Olwyn, and the rest of my family for their encouragement. A special thank you is owed to Angeli for her exceptional helpfulness and support throughout the length of my degree.

I would be remiss to forget those at GHRI who had the wisdom to provide the funding that made this research possible; and the very welcoming group at CHSR&D, along with all the lively South African participants who left an enduring mark. To all of the above, thank you.

To E.L., the deeply loving and veritably strong woman who has shaped me into who I am today.

To P.L., the trailblazer that has incalculably expanded my horizons.

## **Chapter 1: Introduction**

Infection control and occupational health are essential components of a well-functioning healthcare system, protecting the health and providing safety to healthcare workers (HCWs) and patients. However, adequate and appropriate training in these fields among HCWs is insufficient in low-resourced systems (1,2) . This is an especially important concern in resource-challenged systems with high HIV and tuberculosis (TB) burdens where there is increased exposure risk to occupationally acquired infections. Infection control practices and occupational health training programs can minimize the risks associated with HIV and TB among HCWs but there is an urgent need to understand how to best develop and deliver effective capacity building programs for busy healthcare workers in resource-poor settings. This is the dilemma that drove this Master's thesis.

This introductory chapter is divided into three main sections. The first focuses on what is known about the extent and reasons for concern about the contracting of infectious diseases by HCWs; as well as providing an overview of the state of the healthcare workforce globally; how infectious diseases contributes to this state; and what has been done to address the concerns raised in the global context. The second provides an overview of how those issues influence the healthcare system in South Africa and strategies that have been employed to mitigate their negative consequences in South Africa in particular. The third examines these issues within the context of the Free State province, explaining the intervention that was designed to address specific issues identified and provided the rationale for this study.

## **1.1 Healthcare workers and infectious disease**

The sections that follow provide the global context within which South Africa's healthcare workforce operates. This context includes the current health of this workforce and the way this it is affected by infectious diseases. This context also covers the mechanisms in place to protect the healthcare workforce through occupational health and infection control efforts and as well as capacity building programs used to further the reach and efficacy of these efforts. A special focus is also given to capacity building initiatives that take place in LMICs (Low and Middle-Income Countries) and on those that focus on occupational health and infection control.

### **1.1.1 State of the healthcare workforce**

Concerns about weaknesses in the global healthcare workforce began to be expressed as early as the 1960's with regards to medical students migrating from the developing to the developed countries (3,4). By 2006, the World Health Report conservatively estimated that there were just over 59 million HCWs in the world, with an estimated 4.3 million HCW shortfall (1). This estimate was followed by a 2013 report that estimated a much larger shortage of 7.2 million HCWs worldwide, and that estimated a further increased shortage of 12.9 million workers by 2035 (5). This shortage is being experienced by both developed and developing countries (1). The reasons for these shortages are numerous, ranging from maldistribution of HCWs between and within countries and between private and public sectors. Other issues are specific to countries' development levels where high-income countries (HICs) are faced with baby boomer retirements among the healthcare workforce, reducing the supply of workers, while also experiencing ageing population distributions and longer lifespans increasing the demand for

HCWs (1). LMICs are faced with particularly severe HCW shortages caused by emigration and by the limited capacity to train HCWs. The 2006 report revealed that among the 192 countries examined, 57 had critical shortages (low human resources for health density, and low service coverage) – with South East Asia and sub-Saharan Africa being the most affected (1). Sub-Saharan Africa was noted to have 36 out of the (then) 46 countries at the “dangerous level” for HCW shortages. The global commitment to the Sustainable Development Goals (SDGs) in 2015 further highlighted the need for an adequate health workforce in Section 3c which aims to “substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries” (6). However, there is a need to understand and address the determinants and factors influencing the shortages of health workforce globally, especially in LMICs.

Although LMICs have the greatest burden of disease and hence the greatest need for HCWs, they often have the lowest human and financial resources. For example, in 2006 the African continent was estimated to have 24% of the world’s disease burden but only had 3% of the world’s HCWs and less than 1% of the world’s financial resources for health (1). This was a stark contrast to the Americas – including the United States and Canada – that were estimated to have 10% of the global disease burden but 37% of the world’s health workforce, and spending more than 50% of the world’s resources on health (1). Concern about HCW shortages in critical areas has persisted over the last decade (5), and was made worryingly evident during the recent Ebola crisis in West Africa (7). A similar misdistribution of HCW availability occurs such that in urban centers, where the population has a relatively higher income and where teaching hospitals are concentrated, there is greater HCW availability, while rural locations suffer from shortages (1).

Lastly, HCW maldistribution exists between private and public sectors in many countries, with South Africa – as will be discussed in the next section – being a particularly potent example in this regard. Factors that contribute to these maldistributions and health worker migration are numerous and are further discussed below.

Health workforce migration between and within countries has been recognized as a major contributor to the aforementioned disparities. There are both “push” and “pull” factors. The exodus of costly trained HCWs from LMICs who flow to HICs to help satisfy high demand, a phenomenon often referred to as “brain drain” (1,8,9), is exacerbating pre-existing healthcare inequalities. These circumstances have prompted the WHO to promote the WHO Global Code of Practice on the International Recruitment of Health Personnel (10) that discourages countries from actively recruiting HCWs from countries with shortages. However, without addressing the underlying determinants that make migration an attractive option (i.e. “push” factors), addressing only the “pull” factors will have limited effectiveness.

Progress has been made on many of the shortfalls in the global human resources for health described since the World Health Report 2006 (1), particularly on the availability of healthcare workers, especially skilled professionals (i.e., doctors, nurses and midwives) (5). Nevertheless, only 36.6% of the 186 countries assessed in a 2013 WHO report for the Third Global Forum on Human Resources for Health met or surpassed the recommended threshold of 594 skilled health professionals per 100,000 populations and 44.6% have not reached the minimal 228 skilled health professionals per 100,000 population threshold that was established in the World Health Report 2006 (5). The 2013 report also followed up with the 57 countries identified as having critical shortages in the World Health Report 2006; of these countries, 11 were excluded from

detailed analysis due to missing data points which highlights the need for accurate human resource information systems. Of the remaining 46 countries, 32 showed a net increase in total skilled health professionals. Unfortunately, for six of these countries, the increase in healthcare workers did not keep up with the increase in population, leaving only 26 countries with practical increases in healthcare worker density. Regrettably, less progress has been made on HCW working conditions and supports, quality of education and regulations, which are essential to worker retention (5). One way to contribute to the retention of HCWs and encourage new entries is to improve working conditions and jobs satisfaction by strengthening infection control and occupational health practices. The fear and stress of hospital acquired infections, specifically serious ones such as TB, is an important contributor to job dissatisfaction (11) and improving prevention and control measures would help address this issue.

### **1.1.2 The effects of infectious diseases on healthcare workers**

In addition to the human resource challenges, some regions of the world, most notably Sub-Saharan Africa, have been afflicted with the blight of HIV, and the resulting HIV/TB co-epidemic. These infections have affected every sector of society. Although the co-epidemic has come under some control, with new HIV infections and AIDS mortality decreasing (12), and with new TB infections decreasing and TB mortality stabilizing (13), the difficult issues of resource availability, access to care and stigma (14) still hamper the universal access to prevention, treatment, and care required to bring an end to the suffering caused by this regrettably mighty dual epidemic.

HIV prevalence data among HCWs is not well documented but the little evidence that exists comes from South Africa and shows that in 2002, the prevalence of HIV among HCWs was 15.7% overall and 20% in the 18 to 35 years of age group (15). This overall prevalence is similar to that of the general population in the same year (15.8 % among 15-49 years of age) (16).

HIV/AIDS also negatively affects HCWs' attrition rates and morale, and increases absenteeism (17). Studies from other Sub-Saharan Africa where the rates of HIV are also high have reported on the effects of this virus on their workforce. A 2004 workforce study for Zambia directly or indirectly attributed to HIV a 30 % loss of HCWs in hospitals and clinics in Lusaka in a single year (18). A report by the Kenyan Ministry of Health revealed the following reasons and proportions for absenteeism among Kenya HCWs: "Personal illness" (34%), "Unknown" (29%), "Personal –other" (17%), "Attending Funeral" (14%), "Nursing ill person" (6%) (19).

Considering the stigma around HIV (20), it could be assumed that a certain proportion of HCW reasons could be shifted from the "Unknown" and "Personal – other" categories to the "Personal illness" category.

The widespread prevalence of HIV/AIDS in this region has put already vulnerable HCWs at even greater risk, as in many cases the immune systems of the HCWs themselves are compromised by the virus. Adding the contagion of TB to this cocktail puts an already weakened workforce at a crippling disadvantage, vulnerable to one of the world's deadliest combinations of pathogens. The WHO estimates that, for those with HIV, the risk of developing TB is 26 to 31 times greater than for those without HIV and that among the 9.6 million new cases of TB in 2014, 1.2 million of them developed among HIV positive individuals (21). While HIV is not primarily a workplace disease, it puts HCWs at considerably greater risk for developing TB, as

HCWs are exposed to airborne TB, not only in the communities in which they live, but also by caring for undiagnosed or improperly treated TB patients. In 2011, Baussano et al. found that the annual TB incidence for HCWs in high incidence countries (>100/100,000 population) was 1,180/100,000 compared to only 311/100,000 in the general population (22). Multiple other studies support these findings that HCWs are at much greater risk for contracting TB. A 2006 systematic review of 51 studies on this topic from LMICs around the world by Joshi et al. (23) found that the attributable risk of HCWs contracting TB of a nosocomial nature ranged from 25 to 5,361 per 100,000/year. Additionally, the highest attributable risks were found in facilities that received the most TB patients. More recent studies, such as a nested case-control study in a tertiary teaching hospital in India by Mathew et al. (2013) found that high BMI (body mass index), having frequent contact with patients, and being employed in medical wards or microbiology laboratories increased the risk of contracting TB (24). The authors suggested the use to this information to target those HCWs at the highest risk for IC interventions.

While this section focuses on TB and to some extent HIV, healthcare workers are also at higher risk for other potentially serious infections such as hepatitis (25) and Ebola (26). Aside from the risk that patients may pose to HCWs, the risk that HCWs may pose to patients and their colleagues is to be considered, especially from HIV positive transmitters or receivers. A 2015 meta-analysis by Schepisi et al. partly examined this question in HICs and found that the risk of TB transmission from HCWs to patients was lower than the risks found from patient-patient transmission, patient-HCW transmission, or the risks in non-healthcare settings (27). Other studies have examined the infectiousness of tuberculosis by HIV positive individuals and found that they were less likely to spread TB than their HIV negative counterparts (28–30), unless the

tuberculosis was multidrug-resistant, in which case, the HIV positive individual could be considerably more infectious (31,32).

### **1.1.3 Importance of occupational health and infection control**

Infection control practices and occupational health programs can help prevent the spread of TB and reduce other nosocomial infections to patients and HCWs (2,14,33), yet exposures continue to occur; to give just one example, 3 million HCWs are occupationally exposed each year to HIV and hepatitis viruses (1). Universally recognized guidelines and codes of practice for infection control have been articulated by various organizations (33), including one jointly produced by the WHO, the ILO and UNAIDS to guide the improvement of access to HIV and TB prevention, care and support (2).

Infection control practices consist of Standard Precautions that treat every patient as potentially infectious and advise HCWs to conduct a risk assessment and use the appropriate safeguards which include hand hygiene (34–36), respiratory hygiene (35), cleaning and disinfecting (37), waste management (35) and where necessary, the use PPE (Personal Protective Equipment) such as gloves, facial protection, and gowns (35,36). There are also additional precautions which include Droplet, Contact and Airborne Precautions (35). To prevent infections acquired through any airborne pathogens such as TB, airborne precautions promote the use of respirators by healthcare workers, the segregation of patients in well-ventilated areas, and the use of medical masks on patients while patients are not isolated. Additionally, use of negative pressure or the appropriate use of natural ventilation to minimize airborne spread is also recommended (35,36,38). Unfortunately, these basic measures are often overlooked, with one of the causes

being the insufficient amount of time dedicated to infection control in educational institutions, where a lack of importance associated to these practices in the workplace (39) lead healthcare workers to be put at considerable risk.

The WHO Policy on TB Infection Control in Health-Care Facilities, Congregate Settings and Households (33) lays out the TB infection control measures that are essential components of the overall TB control, HIV control and health system strengthening strategies. The policy recommends actions at national, subnational and facility-level. At the facility level, the policy recommends that management identify and empower TB infection control coordinators, develop a facility-wide plan for the implementation of TB infection control measures, assess or reassess facility layouts for optimal infection control, conduct on-site surveillance for TB among HCWs (detection of active disease), establish an effective communication strategy, monitor and evaluate TB infection control measures, and be active in research efforts. As the WHO policy report (33) also covers, the basics of any facility TB infection control strategic plan should include: a) administrative controls b) environmental controls and c) PPE. Administrative controls include the rapid identification of patients and workers exhibiting signs of TB, isolating infectious persons, reducing potential spread of infective agents through cough etiquette and respiratory hygiene, and reducing the time spent in the facility. Administrative controls also include providing healthcare workers with package of prevention and care interventions (HIV, TB). Environmental controls include the use of effective ventilation systems and UV germicidal irradiation devices. PPE includes the use of particular respirators (N95). In order for all these necessary policies and practices to be put in place and adhered to, a healthcare workforce well

trained in TB infection control is required and the lack of this workforce is one of the major obstacles that needs to be addressed (33).

The noted in the Joint WHO-ILO-UNAIDS policy guidelines (2) infection control preventative measures are key to any occupation health strategies to protect HCWs (as well as patients); and these include primary prevention through tertiary prevention strategies. Primary prevention measures include actions taken to prevent exposures and include PPE and environmental controls but also include vaccinations and efforts to raise awareness of measures to protect against non-occupational exposures (community exposures such as safe sexual exposures). Secondary prevention attempts to reduce the chances that the disease will develop if there was exposure to the causative agent (for example, testing and treatment for latent TB infection, and post-exposure prophylaxis). If the disease has developed, tertiary prevention measures are used to reduce disability such as antiretroviral therapy or work accommodation for workers with HIV (2).

Regarding HIV and TB, it remains clear that the status quo in healthcare settings is not acceptable when “in several southern African countries, death from HIV/AIDS is the largest cause of [health] worker exit from the workforce (1).” The joint guidelines stress the importance of providing all healthcare workers with access to HIV and TB prevention, treatment, care and support. They provide recommendations to achieve this goal which range from: a) the introduction or reinforcement of policies, b) programs and interventions which encompass the provision of priority access to HIV and TB services for healthcare workers and their families, c) stigma reduction, d) effective occupation health services, e) effective infection control programs, f) HIV and TB training throughout the healthcare workers career continuum, g) effective HIV and TB communication strategies, h) adequate budgets and reasonable compensations (2).

Ensuring the existence and compliance with clear and consistent institutional policies can be just as important as or even more so than HCW infection control knowledge and attitudes, as described in a Canadian study by Yassi et al. (40,41). It is generally recognized that the occupational health (OH) specialty, irrespective of sector, remains undervalued (42,43), of particular concern in LMICs (44), such as many of the sub-Saharan countries (45,46). A study by Moyo et al. (2015) examining the OH and safety organization in South Africa, Zimbabwe, Zambia, and Botswana identified skills and knowledge deficits and called for increased OH and safety training and education for general medical practitioners, highlighting the need for capacity building and training programs (46).

Unfortunately, infection control and occupational health standards are not adhered to in many settings (47) and cooperation between the two fields is too often neglected, including in South Africa (48) – as discussed further below – where the success of these two are so highly interdependent. Sissolak's 2011 qualitative study in a Cape Town hospital found that nurses were unable to practice adequate TB-infection control practices due to deficient isolation facilities and PPE, and due to the lack of a TB-infection control policy. Furthermore, the study also found that appropriate TB-infection control practices were not followed because staff and patients had insufficient TB training, that there were communication barriers between staff and patients (differing languages, cultures etc.), and nurses had a tremendous workload (49). Mehtar also reported that one of the major reasons that HCWs in South Africa did not adhere to infection control practices was that they lacked the training and understanding of infection control principles, although they were found to have access to adequate protective clothing (47). A study by Baussano et al. found that in countries with high TB incidence, the introduction of TB

transmission control measures could decrease annual TB incidence in HCWs by 81% (22). In Sub-Saharan, such as where this study was based, hospital focus is often on infection control but some studies have also focused on occupational health practices, such as Manyele, Ngonyani, and Eliakimu's 2008 study, which examined OH practices among HCW in Tanzanian hospitals (50). They found several shortcomings, including inadequate amounts of OH and safety cadres, inadequate amounts of training, low adherence by HCWs to safety precautions, and that OH is given the least priority in hospitals in that country. The literature often discusses occupational health and infection control separately but the evidence suggests a need for close collaboration between these two fields. Each is an important component for the other to be most effective in accomplishing their *raison d'être* because in the healthcare workplace, they share the need to protect HCWs from acquiring and spreading infections (41,48,51–53).

While policy and nursing educational reforms, and increased resource allocation are essential to improve infection control and occupational health conditions in many low-resource settings, in the interim, there is a need to introduce an alternative mechanism to impart the knowledge and skills required by HCWs to implement and follow the WHO and ILO guidelines. To be effective, this alternative mechanism should be utilized to build the capacity of HCWs in IC and OH practices; one that addresses the deficiencies in policy, the medical education systems, and resource allocation. For such a challenge to be overcome, not only is increased OH and IC knowledge among HCWs required, but an increase in capacity to act by HCWs is required. With often disenfranchised HCWs, a process of capacity building and empowerment could help HCWs address some of these discussed challenges (54). The role of empowerment on HCWs has been described in one study as being “effective in fostering workers’ ability to initiate change in

the workplace (55) but for empowerment to be achieved, HCWs need to believe and expect that they can affect change (56).

#### **1.1.4 Building capacity of the healthcare workforce in occupational health and infection control**

The need to build capacity in infection control and occupational health in LMICs is undeniable, yet there are few interventions described in the literature addressing either of these, let alone the two combined. One notable exception was reported by Yassi et al. (2010) (57), in which a Canadian-Ecuadorian collaboration aimed to improve infection control and occupational health practices for reducing biological hazards in Ecuadorian hospitals. In their assessment of the hospital, the positive examples that they highlighted included the presence of a medical waste disposal programs and a good health information communication strategy. However, they found that HCWs lacked necessary access to even the most basic resources required for safe IC practices, such as soap and PPE. Many participants in their study erroneously thought that needles should be recapped, and over 75 % of them acknowledged not reporting needle-stick injuries. These findings led the authors to conclude that there is a need to regularly remind HCWs of key IC and OH messages. While some workplace modifications such as environmental controls may require costly capital investments and may be seen as too costly, there are some measures that can be implemented through a targeted training program to improve knowledge and skills in infection control practices using lower cost measures, such as opening windows and safely disposing of needles. As will be discussed in the next section in more detail, a 2012 study in a central academic hospital in the Western Cape, SA, found that while the daily cost of PPE

while treating a TB patient was USD\$0.99, the cost of treating a new TB patient was USD\$2373 (58). These data not only show that infection control practices can be cost-effective but that “cost” should not be used as the primary reason for deficiencies in the IC practices. There is a greater need not only for basic infection control training, but also to strengthen capacity by not only imparting knowledge and skills to HCWs but also to empower and enfranchise HCWs and their superiors to address these infection control and occupational health deficiencies. These challenges are recognized to exist throughout the sub-Saharan African region (59).

Nursing education in infection control practices has also been found to be lacking due to limited teaching time dedicated to IC and due to the out of date IC policies used in teaching; with existing staff, the severe staff shortages and quick staff turnovers lead to groups of staff who were practicing but had never received designated IC training (39). While universities are still outputting insufficiently trained staff in IC, alternative education models must be considered to fill the gaps, such as IC specific training programs. In the international collaboration with Ecuador mentioned earlier, a training program was offered to OH and IC personnel in three facilities in Ecuador, divided into three phases: workplace hazard identification (results of which were noted above), training in IC and OH, and hospital based-project implementation (57).

Overall, the authors concluded that the model they followed was a successful one for building OH and IC capacity among HCWs, but emphasized that more robust evaluations are necessary, as other studies have reported (51). A literature review of infection control education/interventions by Ward (2011), examined 39 studies from around the world (over half in USA, UK, Canada), and found that strong evidence on the efficacy of training programs for improving IC practices and reducing infections is still lacking (60). She also found that evidence

is also lacking on the effectiveness of various training approaches. The results from this study also support the need for capacity building programs that include robust evaluation components. A review of the literature for more ambitious interventions reveals that many infection control (60) and occupational health (61) training intervention studies that have been conducted but that the majority of these are restricted to brief, surface-level, and narrowly focused knowledge and skills training, and result in effects that are too often short-lasting (60,61). The diminishing retention of the knowledge, attitudes and practices with time was observed by Suchitra and Devi in a 2007 paper (62), where they described an infection control training program and the immediate subsequent improvement in knowledge, attitudes and practices among HCWs. The evaluative measure was repeated at 6, 12, and 24 months and the authors concluded that the degree of improvement declined as time progressed. These findings highlight the need for occupational health and infection control interventions that have impacts long after would-be trainees have forgotten the information imparted on them. To reach such a goal, it is argued that HCWs need to be empowered to care for and protect themselves and their community of HCWs. The process of empowerment not only requires that HCWs acquire a sense of agency but that contextual factors allow this agency to be implemented (63), as in the case of infection control practices, where it was found that knowledge, without corresponding environmental factors supporting them, does not translate into practice (64).

To summarize, there is a great need to reinforce and build the capacity of HCWs in the fields of occupational health and infection control throughout LMICs. Fulfilling this need requires the appropriate training with rigorously conducted evaluations so that the results can be disseminated

through the literature and add to the body of world knowledge, ultimately leading to good quality integrated IC and OH applied throughout healthcare systems worldwide including in LMICs.

## **1.2 South Africa**

This section provides an overview of the situation lived by healthcare workers in South Africa. It explains the way South Africa's historical and social, economic and political context has led to this current state. This section also expands on the burden of HIV and tuberculosis experienced in South Africa by its population and its healthcare workers in particular. It ends with reflecting on some of the training in OH and IC recently offered in South Africa.

### **1.2.1 Historical and socio-economic-political context of the health system**

The history of South Africa is the result of a complex mix of colonial, apartheid, and post-apartheid periods. The apartheid and post-apartheid periods are particularly important to understanding the state of South African society and its health system. During the apartheid period, the country experienced extreme racial discrimination, very high income inequalities, the devastation of families, contrived labour migrations, and perpetual violence (65). The educational and health systems, which are the focus of this study, were also severely affected by this period and were left with deep scars that have persisted into today's post-apartheid period. Before this current period, the health and education systems were expressly segregated by race, during which non-white health and education services were systematically underfunded and undermined resulting in systematic disempowerment of the majority people and their institutions (65).

This legacy has greatly affected the education levels of workers in the healthcare system and throughout society, rendering in “most individuals emerging from secondary (and often tertiary) education with limited numeracy, literacy, and problem solving skills (66)” – considerably limiting worker capacities (66,67). These factors together, shaped the persistent maldistribution of HCWs, their poor skill level, their disenfranchisement and their substandard, inadequately staffed and inadequately resourced work environment (66). The HIV/AIDS epidemic in South Africa was greatly aggravated by the Apartheid policies described above, but were also set back at times by misguided HIV/AIDS denialism or what has been referred to as “incompetence” with respect to the then president, Thabo Mbeki and his minister of health (66,68). The impact of HIV/AIDS on South Africa as it navigated its transition to majority rule thus greatly jeopardized the achievement of improved health equity in this period (69).

Furthermore, the post-Apartheid South African government commitment to austerity policies that accompanied South Africa’s integration into the global economy, severely limited any increases in public spending (70). This led to an intensification of social and economic disparities in post-Apartheid South Africa (71). In the context of a health system meeting unprecedented challenges but with restricted budgets, concerns over issues such as senior management inexperience and lack of proper training combined with the general problems of understaffing have been noted as reasons for some of the difficulties that the health systems is undergoing (66).

### **1.2.2 HIV and tuberculosis in South Africa**

In South Africa, the HIV, TB and the HIV/TB co-epidemic have aggravated public sector health workforce issues in three ways: 1) dramatically increasing the need for healthcare service provision to the population in its already overburdened health system, 2) further weakening and reducing the number of HCWs, as many HCWs are themselves afflicted by the infections, and 3) further incentivizing the HCWs to emigrate to countries that may provide them with better living and working conditions. Each of these factors is examined further below:

First, South Africa is one of the countries in this region that has been the hardest hit by the HIV/AIDS pandemic. In 2012, an estimated 17.9 % of adults aged 15 to 49 were infected with the HIV virus (72) and although the country comprises of only 0.7% of the world's population, it shouldered the burden of 17% of global HIV infections (73). HIV/AIDS had shifted health service utilization patterns in South Africa where young and usually healthy populations had increasing needs for services that they would not have had prior (65). The total number of people living with HIV/AIDS increased from 4.09 million in 2002 to 5.51 million in 2014 (16).

The HIV/TB co-epidemic requires a considerable input of health resources. South Africa experiences among the highest number of deaths from HIV and TB of all countries worldwide – creating a heavy burden on its health system. Tuberculosis holds a similarly disheartening place in South Africa; in 2013 the TB incidence rate was estimated at 1000 per 100,000 (74), a 400% increase over the past 15 years (75). In comparison, the incidence rate in most high income countries is less than 10 per 100,000 per year (74). Highlighting the impact of the co-epidemic, of the new TB infections, over 50% occur in HIV infected patients (76), and overall, 70% of

tuberculosis patients are co-infected with HIV (75). Indeed TB is the leading cause of death of HIV infected individuals (76). These two interrelated but complex infections heavily strain the South African healthcare system and its workers. The 2003 study by Shisana et al. found that between 1997 and 2001, an estimated 13% of HCW deaths in South Africa were caused by HIV/AIDS, TB and other related illnesses (15).

Second, the shortages of the health workforce in South Africa's public health sector have been well documented (1,5). Despite the 2006 World Health Report (1) suggesting that South Africa's number of doctors, nurses and midwives (combined) was above that of most African countries, this is a country whose healthcare sector remains underfunded and understaffed despite some progress made since the arrival of a 2011 strategic plan that had focused on human resources for health (1,5). The shortages are most acutely seen when comparing the private and public sectors and the urban and rural areas. When examining the private-public divide, we see that a growing proportion of HCWs are leaving the public sector to work in the private sector; between 1989 and 2007, the proportion of doctors working in the public sector decreased from 38% to 30% and the corresponding proportion of nurses decreased from 79% to 42% (77). This disparity is even worse when considering the rural areas, where the majority of residents are poor and rely almost exclusively on the public health sector for care (78) but only have access to 12% of South Africa's doctors and 19% of its nurses, while they comprise over 43% of the country's population (79). In South Africa, there were only 121 professional nurses per 100,000 people in 2013 (80) - considerably less than a country such as Canada which has a strong public sector and has 948 nurses per 100,000 people (80). The fact that many healthcare workers are themselves infected with HIV (15), further aggravates the situation.

Third, South Africa is also, unwittingly, a large exporter of HCWs to high-income countries. The 2006 World Health Report reported that 37% of South Africa's home country doctors had left to one of eight OECD countries (1). Although the volumes have reduced in recent years, in many cases, HCWs are still choosing to emigrate to HICs (5,9,81). In turn, South Africa receives healthcare workers from the neighbouring southern African countries (5), for whom working conditions are even worse than in their countries of origin. HCWs leave, as is their right to do so, to find better opportunities for themselves and their families. However, in many cases, they leave because of they are overworked, overstressed, demoralized and poorly protected against occupational hazards such as exposure to infectious diseases but also injuries and violence (1,9) . They are overworked because they are too few taking care of too many in a country so burdened by the co-epidemic that public clinics and hospitals are constantly stretched beyond capacity. They are overstressed and demoralized because they constantly are dealing with death, that of their patients and of their colleagues, in a time when medications are – at least theoretically – available to help the vast majority of those affected by HIV/TB. One of the reasons for which they are forced to bear witness to the suffering of their colleagues is that even basic infection control practices are often not applied in their workplaces, and in many cases insufficiently taught in educational institutions (49).

### **1.2.3 The state of OH and IC in South Africa and some efforts underway**

International policies and guidelines exist regarding OH and IC; and South Africa also has laws, regulations and policies governing these areas. Stemming from the 1993 Occupational Health and Safety Act, South Africa has enacted the "Regulations for Hazardous Biological Agents" that

mandates that in conjunction with Health and Safety Committees, employers train and inform employees who could potentially be exposed to hazardous biological agents on these regulations and that they establish a medical surveillance program to establish workers health status, maintain workers in safe working environments based on their particular health needs, assure workers are receiving suitable medical treatment when necessary, and monitor the effectiveness of control measures. In addition employers must ensure that workers are immunized, have access to appropriate personal protective equipment, and have received the appropriate education and training required for safety (82,83). Policies, specific to TB and HIV, also exist such as the "Draft National Infection Prevention and Control Policy for TB, MDRTB and XDRTB" (84). It recognizes the additional risk of contracting TB that HCWs face, and particularly HIV positive HCWs who are immunocompromised, and recommends increasing awareness of TB in HCWs, increasing access to voluntary HIV counseling and testing, and the appropriate use of personal respiratory protection (for example, N95 respirators). Additionally, the South African Department of Labour has published a "Code of Good Practice on Key Aspects of HIV/AIDS and Employment" (85) that aims to prevent workplace discrimination of workers living HIV by provides guidelines for employers on: creating non-discriminatory workplaces; addressing HIV testing, confidentiality and disclosure; granting equitable worker benefits; handling dismissals; and handling grievances. Although basic infection control training is required for all healthcare workers, a 2005 Western Cape, South Africa hospital audit revealed that in smaller hospitals (<200 beds), less than 10% of healthcare workers have received formal training in infection control (up to 32% and 40 % in 200-400 bed hospitals and >400 bed hospitals, respectively) (47). In the same audit, 22% of nurses and 5% of doctors interviewed had received 3 hours or

less of training and only 1% of nurses/general assistants had received between three and five hours of infection control training. Favourably, the study found that adequate infection control policies were present but that urgent infection control training was required.

A 2015 study (86) revealed that even recent medical graduates from one of South Africa's most prestigious university graduated "lacking adequate skills" to practice infection prevention and control. Graduates cited the following as the reasons for this situation: the lack of leadership, of management support for IC, and of financial resources, along with challenges with, human resources and with the structural and institutional atmosphere. They ultimately expressed a need to obtain more knowledge and skills for personal protection practices and for IC program design and evaluation (86). These graduates felt that their learning could have been more complete if it had included more problem-based teaching and practical clinical experience (86). One program to improve IC was instituted in 2005 at Tygerberg Hospital in Cape Town, South Africa, It initially focused on its own hospital but has expanded to receive student from the country and the continent (39). The approach this program followed culminated to a "Postgraduate Diploma in Infection Prevention and Control (PDIC)," consisting of two-year part-time training divided into five ten-week modules that each included two-week contact sessions and eight weeks for log booking and project writing within the trainees' workplaces. Trainees were assigned mentors to support them during their workplace components. This program had strict entry criteria but also offered a six-month introductory course that included components similar to those the Diploma Program but in a more condensed format (39). While there are sporadic efforts at improving occupational health and infection control throughout the country, the reports are anecdotal and have not been systematically evaluated.

### **1.3 Background on Free State and its healthcare workforce**

Free State was chosen for this project because of its high level of need as discussed below, but also because the assessment of the international-national research team members was that there was a good climate for positive change, including a provincial occupational health nurse who was keen to build skills for workplace program implementation and evaluation, as well as local university support and provincial health department support (87). The HIV prevalence in Free State (in adults, 15-49 years old) was the third highest in the country at 20.4% (2012) (88); and the antenatal HIV prevalence was 32.0% (89). The reported incidence of tuberculosis that year was 724 cases per 100,000, which is lower than the national average. The TB cure rate was 73.5%, which is below the government target of 80% (90). Importantly, in 2012, the Free State counted just over 91 nurses per 100,000 population, the lowest in the country (91).

#### **1.3.1 Description of the intervention**

The joint WHO, ILO, UNAIDS guidelines “provide guidance on how to accelerate the implementation of policies and programs to deliver evidence-based measures and services related to HIV and TB to the health workforce (2),” but there is no consensus on what these programs should include and how best to implement them.” This capacity building program allowed us to explore possible answers to these questions.

The Certificate Program was launched within a collaboration between Canadian and South African researchers that aimed to address, at least in part, the colossal HIV and tuberculosis burden faced by the South African healthcare worker. The program focused on building the capacity of occupational health and infection control functions in the Free State province of

South Africa, with a view to possible scale-up if found to be successful. This program was initially part of a much larger grant proposal that was focused on HIV prevention research and aimed to build the capacity of university-based researchers, along with that of healthcare practitioners. With only a small proportion of the funds having been granted, the project was limited to the latter group and the researchers attempted to keep to the original purpose of the program, as presented in large grant proposal.

The Certificate Program recruited occupational health and infection control practitioners as well as participants who had responsibility in occupational health/infection control such as occupational health and safety committee members, managers, health program coordinators, and health students. The recruitment of participants was facilitated by the researchers' local counterparts at the Centre for Health Systems Research & Development (CHSR&D), a research unit within the University of the Free State, and by officials at the Free State Department of Health. They contacted managers and senior managers of health facilities across the province to promote this initiative and to gain their support and allow them to encourage participants to join the program. Recruitment also took place through the distribution of a recruitment brochure (see Appendix A) across local facilities. As part of the requirement to join, prospective participants were required to send a letter of interest, a CV, and a letter of support from their employers.

The program resembled a condensed version of the Tygerberg Hospital Diploma Program discussed previously (39), but with the important difference of integrating occupational health and infection control, so the focus was not just mainly protecting patients, but very explicitly on protecting the workforce. The Free State program also aimed to train practitioners in conducting evaluations of their efforts. The Free State Certificate program consisted of three four-day face-

to-face modules and workplace-based group projects. Prior to the first module, participants were sent documentations and readings that included an overview of infection control and occupational health guidelines, as well as other relevant materials. Each module had a different focus. The first module focused on knowledge and skill-building using a combination of didactic presentations and problem-based learning. Attitudes were also targeted although less time was dedicated to this aspect. At the first module's end, participants were grouped together based on workplaces or positions and were asked to prepare a project proposal in time for the second module. The resulting project proposals were reviewed by multiple multidisciplinary Canadian and South African mentors, who provided feedback and recommended amendments based on their expert knowledge and assessment of feasibility.

While the first module used didactic learning in the form of presentations by experts as well as problem-based learning exercises, the second module was more focused on project-specific work, in which groups worked directly with the mentors whose expertise corresponded most to the project topic; there were also general presentations on topics that could be applied to all the group projects. Guest lecturers focused on filling gaps in knowledge, attitudes, skills and practices (KASPs) that could not be presented due to time constraints in the first module or that were identified as requiring attention during program monitoring. Groups also formally presented their projects to their colleagues and mentors, who again offered feedback.

The third and final module heavily focused on completing the data analysis for the group projects, the results interpretations, and the presentations. Groups worked closely with their mentors throughout the modules and then presented their near-final presentations to their colleagues and the full group of mentors. The last day of the module was dedicated to the

graduation ceremony during which the participants presented their projects to a large audience of stakeholders from the province and country, as well as their friends and family (a photo from the graduation ceremony is available in Appendix B). Table 1 lists the topics that collaborating experts presented to the participants.

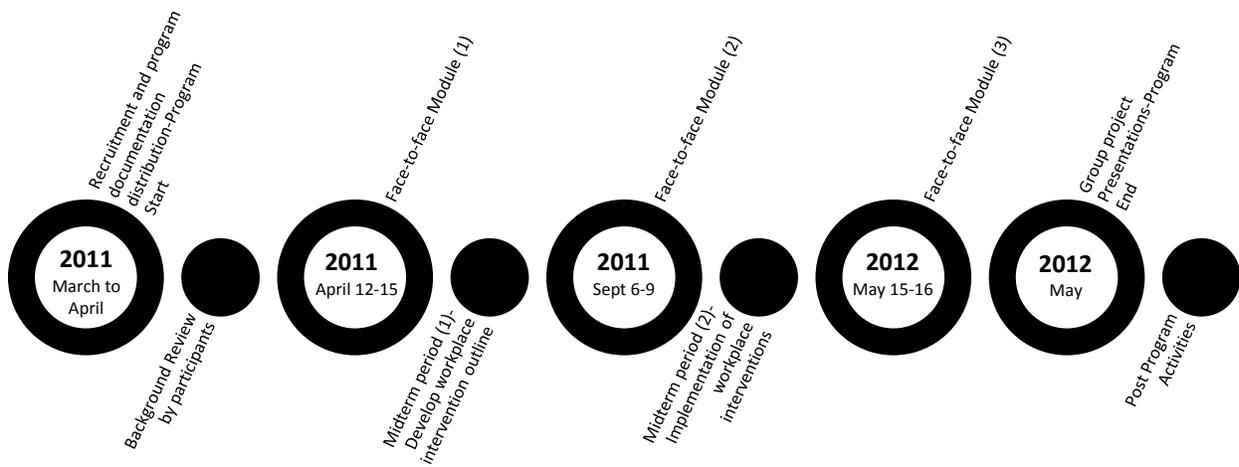
**Table 1. Topics covered in the certificate program modules**

<p><b>Module 1-Introduction to Infection Control and Occupational Health, and Planning Workplace Interventions</b></p>
<ol style="list-style-type: none"> <li>1. Occupational health practices and program development</li> <li>2. Basics infection control</li> <li>3. Basics of HIV and tuberculosis prevention, diagnosis, treatment, care and support</li> <li>4. Healthcare workplace HIV programs</li> <li>5. Ethico-socio-cultural issues in workplace HIV and tuberculosis research</li> <li>6. Survey design and administration</li> <li>7. Basic program planning and evaluation</li> <li>8. National and international guidelines on occupational health</li> <li>9. Preparing and conduction focus groups and key informant interviews</li> <li>10. Occupational health legislations, policies and programs</li> <li>11. Instruction to excel and basic statistical methods (including odds ratios)</li> <li>12. Conducting occupation health and HIV studies in the healthcare setting</li> <li>13. Logic framework analysis and planning for impact</li> <li>14. Power relations in workplace and the role of the unions</li> </ol>
<p><b>Module 2-OH and IC Project Implementation, Management and Evaluation</b></p>
<ol style="list-style-type: none"> <li>1. Designing, implementing and evaluating an intervention: designs and steps</li> <li>2. Components of tuberculosis prevention and infection control programs</li> <li>3. Effective workplace HIV and TB programs in the healthcare sector</li> <li>4. Planning and evaluating workplace programs</li> <li>5. Roles of OHS (Occupational Health and Safety) program and employee trust of the OHS department</li> <li>6. HIV programs in the workplace: lessons from other sectors</li> <li>7. Technical challenges in HIV and TB screening testing and treatment in the workplace</li> <li>8. The role of the lab in tuberculosis infection control programs</li> <li>9. Questionnaire administration</li> <li>10. Focus group design</li> <li>11. Developing a budget and timeline</li> </ol>
<p><b>Module 3-Stigma, TB Screening and Preparing Projects for Presentation</b></p>
<ol style="list-style-type: none"> <li>12. Stigma</li> <li>13. TB screening, diagnosis and treatment protocols for health workers: challenges and tools</li> </ol>

The expectation at the onset of the program was that each group would use the KASPs taught in the modules (and pre-module 1 package) to design, implement and evaluate an intervention in their respective workplaces. Projects were expected to address already identified or newly identified gaps in occupational health/infection control practices, environmental arrangements, and/or policies/procedures.

A timeline illustrating the program from its inception and recruitment to the graduation ceremony is shown in Figure 1. It is important to note that some follow-up work continued after the graduation that could be considered as also strengthening the capacity building, and interactions are still continuing at the time of this thesis defence. However, the value of these networks and ongoing collaborations notwithstanding, this study focuses on assessing activities and interactions that occurred within the timeframe of the Certificate Program itself.

**Figure 1. Capacity Building Program Timeline**



*The program's community-based learning (CBL) and in-service philosophy*

Community-based pedagogy was designed to play a central role in achieving the goals of the Certificate Program. The method was meant to reinforce the learning acquired during the in class modules. The community in this case was the community of healthcare workers and healthcare support staff (cleaners, security guards etc.) who worked in the facilities served by the trainees.

Linked to CBL, this program also rests on an in-service learning method. All participants were supported by their employers to participate in this program while continuing their regular work duties and with no loss of pay. Furthermore, the program encouraged participants to apply the practical component of the program to their work duties.

As a capacity building program, the intervention was designed to a) improve the KASPs of professionals in charge of infection control and occupational health and b) channel program components to make policy and procedural changes in the organizations from whence trainees came. Implicitly, the intervention also had the goals of building the capacity of our partner researchers in South Africa.

A central objective for this program was indeed “capacity building.” As Crisp, Swerissen, & Duckett contend (2000), capacity building initiatives can only bring about change if they tackle issues from bottom-up and top-down organizational approaches at once as well as utilizing partnership and community organizing approaches (92). This program endeavoured to do that by a) engaging in a “top-down organizational approach” by framing this training program within a large international-national collaborative project (93) designed, in this instance, to bring province-wide institutional change to occupational health and infection control practices and

procedures;

b) employing the “bottom-up organizational approach” by providing KASPs training to healthcare workers on infection control and occupational health practices; as well as

c) a North-South-South “partnership approach” by building links amongst Canadians, South African national experts at the National Institute of Occupational Health (NIOH), local researchers with CHSR&D, as well as the Free State Province Department of Health;

d) using a “community organizing approach” to empower participants by driving their own projects based on their perceived needs.

### **1.3.2 Rationale and objectives of this study**

Considering the challenges previously discussed, there is an urgent need to understand how to best develop and deliver an effective capacity building program for healthcare workers that address the unique occupational hazards which are HIV and TB in the context of resource constrained environments such as South Africa. The overarching goal of this research is to understand if this training program can be a model for improving the health of HCWs in high HIV and tuberculosis burdened contexts. This was evaluated by determining the extent to which:

- 1) participants acquired and improved KASPs related to occupational health and infection control in the workplace,
- 2) participants demonstrated the application of those KASPs in their workplace interventions, and
- 3) workplace interventions were able to affect meaningful impacts in their workplace.

In addition, it was aimed to determine the extent of which the program built capacity among the health workforce in other ways, as well as determine if the program was sustainable, and document lessons learned in the implementation of a workplace-based training program.

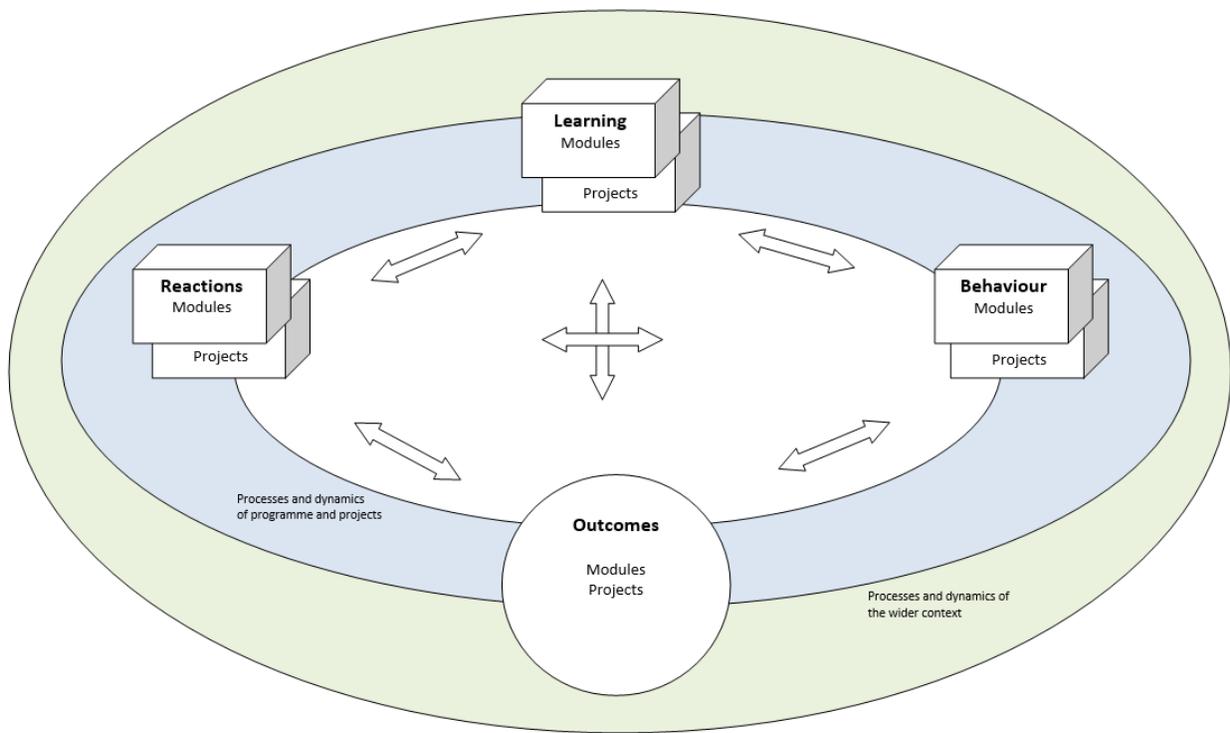
#### **1.4 Conceptual framework**

The evaluation of the program was guided by an overarching adapted Kirkpatrick framework (94) for assessing training programs. This framework includes the original Kirkpatrick components of *Reaction, Learning, Behaviour, Results* (95) but also adds a layer recognizing the environmental and institutional context associated with a training program such as this one.

The Kirkpatrick framework or adapted versions, are commonly used for evaluations of health training or capacity building interventions (94,96,97), including in South Africa (98). One of the criticisms of the framework has been that each of the framework's components does not necessarily flow in the hierarchical order set out by Kirkpatrick (i.e. 1. Reaction → 2. Learning → 3. Behaviour → 4. Results). Where Learning, can lead to Results or outcomes directly and where there can be feedback between the perceived success or failure of outcomes and how change in behaviour can be correspondingly reinforced or abandoned (94,99). An additional drawback of the framework is that it implies that Learning and Behaviour cannot be Outcomes in and of themselves (94). Critiques such as these have led to adapted Kirkpatrick frameworks. The framework used here (see Figure 2) takes into account that components of the framework can be linked and that Learning or Behaviour changes as the consequence of an intervention can be outcomes in and of themselves. This adapted framework assessed: a) **reactions** to the module's content and teaching methods and reactions to the projects; b) **learning** of KASPs regarding HIV

and tuberculosis transmission and prevention, occupational health and infection control policies and guidelines, research methods, program implementation and evaluation methods, ethics, and anything else participants identify they have learned; c) **behaviour** changes in work practices, application of knowledge, skills and practices; d) **outcomes** that originate from the participants' reactions, learning, behaviour and attitude changes and their projects. In addition, the adapted framework, considers the four original components of the Kirkpatrick model within the context of the processes and dynamics of the program, projects and the wider context of the partnership and institutional frame.

**Figure 2. Program Evaluation Framework (adapted from Kirkpatrick; Bullock et al.)**



As depicted in Figure 2, each of the two major components of the Certificate Program (modules, group projects) are to be assessed within each of the adapted Kirkpatrick model's levels and are necessary components to the Program's success. The modules were where foundational attitude and knowledge on HIV, TB, IC, OH, policies, guidelines, skills and practices were taught while the projects are where this foundation was built upon through action-learning (100), where participants applied their learnings in workplace-based projects. Although modules and projects could be separately assessed according to Kirkpatrick's four levels, their interrelatedness would make this distinction artificial and misleading. For example, infection control knowledge and practices imparted during modules could result in behaviour changes in individual participants but this knowledge could also be used as part of a group project intervention designed by participants to improve infection control behaviours (practices) among a large group of hospital staff, enhancing the participant's learnings on infection control knowledge and practices by the application of these in their workplace. In this example, the distinction between the module learning and project learning is blurred – while the former may have introduced the topic, the latter complemented and reinforced it.

In some ways, the research undertaken for this Master's thesis could be considered a form of community-based participatory research, in that the author was at the same time a researcher observing the process in the community of healthcare workers, but also an active participant in developing and implementing the intervention that was the subject of study, which itself was training in the implementation and evaluation of workplace-based interventions. Acknowledging the challenges of using community-based participatory research, one of the goals was to use its guiding principles as a conduit to maximize our capacity building efforts and the long-term

outcomes of the program. Cornwall and Lewkes (101) describe the many variants of this mode of research, such as community-based research, participatory research, and participatory action research, but they all have some elements in common. They are action oriented rather than focused on building theoretical understanding alone; they shift away from what Biggs (102) called contractual participation and emphasize collegiate participation with consultative and collaborative modes of participation in between; they draw heavily on the Freirean (Paulo Freire) approach which posits the importance of shifting the power away from the researcher and on to the participants (103).

## **Chapter 2: Methods**

A mixed method approach was utilized to meet the research objectives. Quantitative data were collected from Likert-style questionnaire items that were administered to program participants and analyzed at three time points during the program: pre, mid, and post. Through these questionnaires reactions to the program were measured and changes in Learning (KASPs) were assessed. The same metrics of Reactions and Learning (KASPs) were also assessed through qualitative data acquired from individual interviews, project evaluations and participatory observation. Behaviour and Outcomes were assessed through these qualitative data as well. Lastly, all data were triangulated in order to provide a comprehensive evaluation of the Certificate Program.

### **2.1 Rationale for the mixed methods approach**

In the science of public health and epidemiology, methods used to capture the effects and results of health interventions has shifted away from a strictly quantitative approach paradigm (104). What was once seen as the alternative paradigm, qualitative approaches were not considered able to render ‘accurate’ enough results for the field of epidemiology, a field dominated by the ‘harder’ science of medicine. The qualitative approach is one which recognizes that researchers cannot be objective, that there are multiple ‘truths’ and that researchers needs to acknowledge this reality in order to understand an issue as fully as possible (104). The shift that has occurred in public health was to recognize that qualitative methods could contribute to the field more than quantitative researchers had believed (105). This resulted from the recognition that not all important variables could be captured quantitatively, and that the personal experiences and

interpretations from an individual viewpoints could fill gaps left behind by strictly quantitative methods (105). It was also recognized that quantitative methods could be ineffective when used to study complex multifaceted studies (105). For these reasons, a shift towards mixed qualitative and quantitative methods took place, allowing each approach to complement the other in order to form a comprehensive approach to a study (104). Within this context, this study used a mixed method approach to allow for a greater understanding of the dynamics affecting the program and its results. Questionnaires were used throughout the program that included complementing quantitative and qualitative items. As the focus of the periodic questionnaires was heavily towards quantitative measures, individual interviews were added to help fill the gaps in the types of data obtained from participants. Participatory observations and descriptive project evaluations added richness to these data.

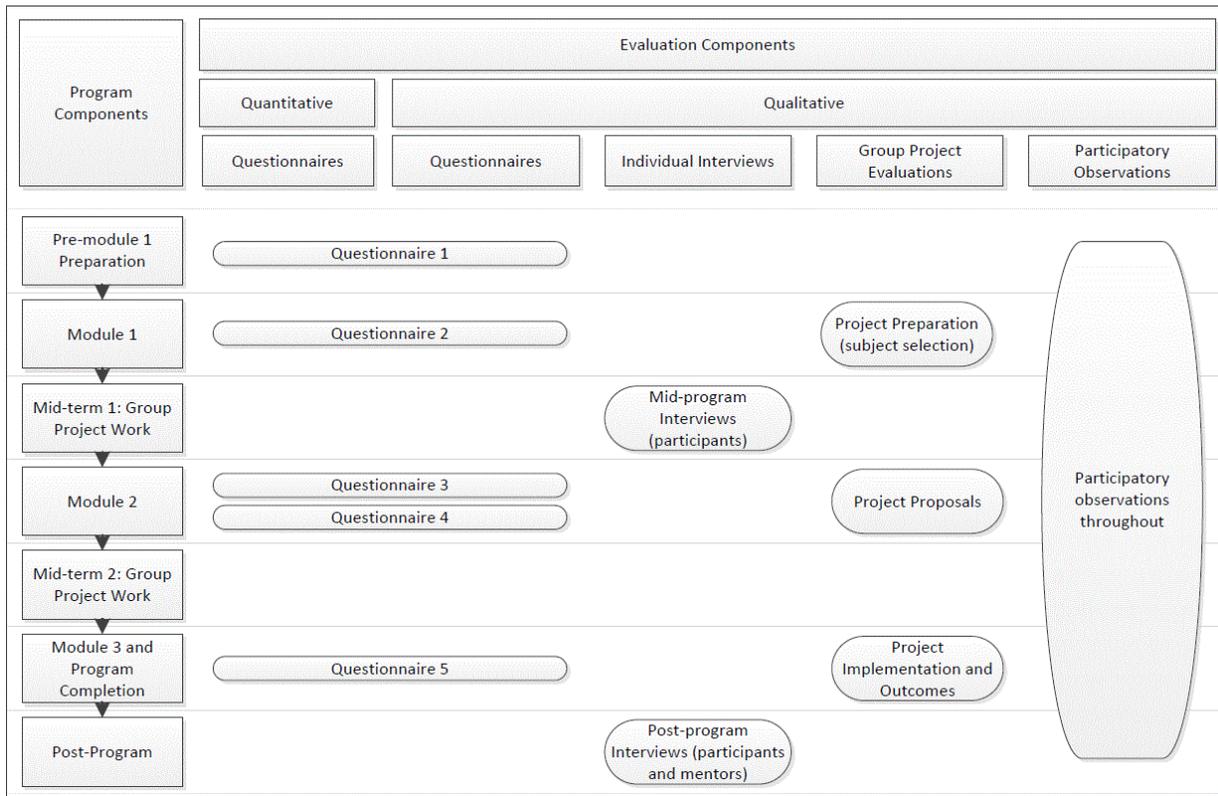
## **2.2 Quantitative**

### **2.2.1 Questionnaires**

Quantitative methods were used to assess changes in KASPs. Data were collected through self-administered questionnaires (found in the Appendix C) using a pre-test, mid-test and post-test design. Questionnaire items were Likert-style self-assessments in addition to a limited amount of True/False (T/F) items to assess actual versus self-assessed knowledge as reflected by the Likert-style items. Evidence suggests that self-assessed measurements are a valid method to ascertain Learning (106). To add validity to these results, the study used the mixed method approach to triangulate results with the KASPs questionnaires items.

Five questionnaires were administered to program participants as seen in Figure 3. The questionnaires were administered at each of the three modules of the program as discussed in the Description of the Program section of the Introduction. Questionnaires 1 and 2 constituted the “pre” evaluation, Questionnaire 3 and 4 constituted the “mid” evaluation and Questionnaire 5 was the “post” evaluation. To assess KASPs, a total of 48 Likert items and eight True/False items were used in each of the pre, mid, and post program questionnaires, 24 items assessed knowledge, eight items assessed attitudes, and 16 items assessed skills/practices. Additionally 62 Likert-style items assessed reactions across all questionnaires. Questionnaire items were chosen based on the literature and input from senior researchers in the relevant fields. Questionnaires were reviewed by four senior researchers (two Canadian, two South African), who were also involved with the program; the questionnaires were piloted by one graduate student and one mentor who had worked extensively with healthcare participants such as those in this program.

**Figure 3. Certificate Program evaluation components**



Note: March, April 2011 (Pre-module 1 Preparation); April 12-15, 2011 (Module 1); September 6-9, 2011 (Module 2); May 15-16, 2012 (Module 3); May 17, 2012 (Program Completion); May 2012 (Post-Program Activities)

### 2.2.2 Knowledge, attitudes, skills and practices (KASPs)

The self-rated knowledge questions were divided into six categories (see Table 2). The appropriateness of the items were reviewed and piloted along with the questionnaires. The participants were asked to rate their knowledge on the various topics listed below and their possible answer set ranged between “1” corresponding to “Very little knowledge” and “5” corresponding to “Very good knowledge.”

**Table 2. Self-rated item categories used in pre-mid-post questionnaires**

<b>Questionnaire categories (by domain)</b>	<b>Number of items</b>
<b>Self-rated knowledge Categories</b>	<b>24</b>
a) Occupational Health and Infection Control	7
b) HIV/AIDS	3
c) Tuberculosis	5
d) International guidelines related to HIV and TB in the healthcare workplace	2
e) Workplace health research in a healthcare setting	2
f) Policy and Legislation	5
<b>Self-rated Skills and Practices Categories</b>	<b>14</b>
a) Occupational Health and Infection Control	4
b) Research	10
<b>Attitudes</b>	<b>8</b>

The self-rated skills questions were divided into two categories: a) occupational health/infection control and b) research. In this set of questions, participants were asked to rate their perceived skills in performing various activities related to research, occupational health and infection control practices. The answer set ranged from 1 through 5, “1” corresponding to “Very low” and “5” corresponding to “Very high.”

The attitudes category consists of eight uncategorized questions. Here, participants were asked to rate on a scale of one to five how much they agreed/disagreed with various statements related to their attitudes towards HIV/AIDS, TB and occupational health and research procedures. An answer of “1” corresponded to “Strongly disagree” and an answer of “5” corresponded to “Strongly agree.”

The true or false section consisted of eight uncategorized questions. The questions covered knowledge on occupational health, infection control, worker rights, HIV/AIDS, TB, and privacy/confidentiality.

### 2.2.3 Reactions

Reactions to each module and midterm periods were measured in post-module questionnaires, with the exception of the pre-course reactions which were collected prior to Module 1, along with the baseline KASPs assessment (“pre questionnaires”). As with the KASPs items, a review of reaction items was done along with the questionnaire review to ensure the relevancy of the items. Reactions questionnaire categories for each of the program components are available in Table 3. To measure reactions, participants were asked to rate their reactions on a scale of 1 through 5, where “1” corresponds to “Strongly disagree” and “5” corresponds to “Strongly agree.”

**Table 3. Reaction item categories of questionnaires**

Sub-categories	Number of items	Source
<b>Pre-course</b>		
a) Documentation	2	Q1
b) Readings	3	Q1
<b>Module 1</b>		
a) Presentations	2	Q2
b) Problem exercises	2	Q2
c) Reflections and discussion	2	Q2
d) Module overall	2	Q2
<b>Midterm period 1</b>		
a) Group work (team work)	5	Q3
b) Employer and other workplace actor support	4	Q3
c) Work with mentors and graduate students	5	Q3
<b>Module 2</b>		
a) Presentations by mentors	2	Q4
b) Presentations by participants	3	Q4
c) Working with mentors	4	Q4
d) Overall module	5	Q4
<b>Midterm period 2 and Module 3</b>		
a) Module 3	3	Q5
b) Mentors	7	Q5
c) Group projects and program	11	Q5

## **2.2.4 Quantitative analysis**

Prior to explaining the methods of analysis, it is worth noting that the literature is very divided on the best method for analyzing ordinal data, and often, analyses often employ inappropriate methods that should normally be reserved for cardinal data (107). Although some studies have shown that parametric tests can sometimes be just appropriate as non-parametric tests (108), due to the small size of the population, and the propensity for this type of data to be skewed, non-parametric tests were preferred for the analyses in this study.

### **2.2.4.1 Variables**

For the analysis, sum scores were created to form composite variables. Composite variables are a summation of related ordinal items based on the associated value of individual responses.

Several composite variables were created, following the major categories that were already integrated in the peer-reviewed questionnaire structure, these were: a) self-rated knowledge, b) self-rated skills/practice and c) self-rated attitudes, d) a combination of the latter three together, and e) reactions. Additional composite variables were also created based on sub-categories of items. These sub-category composite variables were summed from thematically similar items that belonged to the self-rated knowledge category (as was part of the questionnaire structure) or when thematically similar items were found in both the self-rated knowledge category and the self-rated skills/practices categories, these were also summed. To ensure that only similar items were summed into composite variables, this process was verified and corroborated by a recent PhD graduate in Healthcare and Epidemiology. A full list of the composite variables that were

used can be found in Table 4 (variable that include both self-rated knowledge and practice are identified by “SRK + SRS in parentheses).

**Table 4. Categories and sub-categories used in pre-mid-post questionnaire data analysis**

<b>Categories</b>	<b>Number of items</b>
a) Self-rated knowledge (SRK)	24
b) Self-rated skills/practice (SRS)	16
c) Attitudes	8
d) True/False (knowledge)	8
e) Certificate Program Reactions (modules, projects, mentors)	62
f) Total self-rated composite (SRK, SRS, attitudes)	48
<b>Sub-categories</b>	
g) Occupational Health and Infection Control (SRK + SRS)	11
h) HIV (SRK)	3
i) TB (SRK)	5
j) HIV/TB (SRK)(combination of items “h” and “i”)	8
k) Policy, Procedures and Guidelines (SRK)	7
l) Research (SRK + SRS)	15

Additionally, for the analyses, training variables were combined into a single dichotomous variable where participants having answered yes to three or more (out of five) of training items in Questionnaire 1, were categorized as having had training, while the remaining participants were categorized as not having had training. Age groupings were also modified to allow for a wider range of analysis options; the 20 to 29 age group was combined with the 30 to 39 age group (due to low participant counts in narrower age groupings).

For ease of interpretation, individual item scores and composite score for all categories and sub-categories were converted to percentages, where a score of one hundred is equivalent to having answered all the items with the maximum possible value (“5” in the case of Likert-style items and correct in the case of true/false items). Missing data were handling in two ways: where

participants had completed less than 50% of a questionnaire, their questionnaire result was excluded; otherwise, missing data were imputed.

#### **2.2.4.2 Data analysis**

The focus of the analysis was on the main and sub-categories, although individual items were also analyzed. The first main category that was analyzed was the total self-rated composite score where descriptive statistics (mean, SD) were cross-tabulated with participant background information for the pre-mid-post score results. The non-parametric Wilcoxon signed-rank test was applied to identify if significant differences existed between questionnaire results and the varying backgrounds. Subsequently, the same methods were used to analyze the significance between the pre, mid, and post test results for the remaining categories (excluding reaction scores) and sub-categories without cross-tabulating with background information (see Table 4 for the list of these). Reaction score were only compared by descriptive (mean, SD) cross-tabulations by participant background information. Where p-values were obtained, significance was established at a p-value of less than 0.05 and where necessary to adjust for the problem of multiple comparisons (as when using the Wilcoxon signed-rank test), a Bonferroni correction was applied, for an effective significance of p-value less than 0.017. Data analyses were performed using IBM's SPSS Version 22 (109).

### **2.3 Qualitative**

In this section, the qualitative data that were collected are described and include individual interviews from participants and mentors, open-ended questionnaire items, participatory observations, and descriptive project evaluations.

### **2.3.1 Individual interviews**

Individual interviews were utilized to provide a richer analysis of participants' and mentors' experiences within the research program. Recognized individual interview techniques were used (110), following semi-structured interview guides. The aim was twofold: 1) to collect feedback that could inform the adaptation of the remainder of the program to the needs of participants, and 2) to understand how and if the objectives of the capacity building program were met.

Participants were invited to participate in voluntary one-on-one interviews with this monitoring and evaluation researcher at two time periods: midterm (i.e., between Modules 1 and Module 2) and final (i.e., upon completion of the program). The aim was to interview all program participants in the midterm and final evaluations. Additionally, mentors were interviewed upon program completion based on convenience sampling of South African mentors. Interview guides were developed based on current prevailing themes in the literature and with input from both Canadian and South African collaborators (two of each). Interview guides can be found in the Appendix D. A researcher's bias is unavoidable while conducting interviews (111), but to limit its effects, the researcher attempted to follow the interview guides and only diverged from the guides to prompt for additional details.

The data resulting from the interviews were verbatim transcribed into QSR International's Nvivo 10 Software (112). Initial open coding was utilized for the initial inductive coding in Nvivo to generate a coding tree. The first ten transcripts (random order) were split and coded with a second researcher (recent PhD graduate in Healthcare and Epidemiology). Codes from each were then compared, and differences were reconciled through discussion and referring to the literature. Themes were categorized to reflect the interview guides. Thematic content analysis was used to

identify key emerging themes (113) and combine them. These were then applied to the Kirkpatrick framework to reflect four thematic areas: 1) Learning 2) Behaviour 3) Outcomes and 4) Reactions. These results were then synthesized and key quotes were extracted to add saliency.

### 2.3.2 Questionnaire items

In addition to the quantitative items, self-administered questionnaires included various types of open-ended questions. These items assessed portions of the Reaction, Behaviour, and Results domains of the adapted Kirkpatrick model. Table 5 includes an overview of the open-ended questions from all five questionnaires. Results from this section were integrated with those from individual interviews because the content was found to be considerably overlapping.

Consequently, the same analysis method was applied to these results; answers were coded integrated into the already existing themes that emerged from the individual interview analysis.

**Table 5. Overview of open-ended items in questionnaires**

Item overview	Number of items	Source (items from source)
Expectations	3	Q1 (2), Q3 (1)
Format/Content	9	Q3 (2), Q4 (3), Q5 (4)
Group dynamics	2	Q4
Mentor involvement	2	Q4
Learning/ Skill attainment	3	Q4 (1), Q5 (2)
Project success	1	Q5
Comments	12	Q1-4 (1 each), Q5 (7), Q6 (1)

### 2.3.3 Participatory observations

I was an active participant in the program; I was responsible not only for the program monitoring and evaluation but also to provide support during the program modules and to support

participants in the design, implementation and evaluation of their workplace projects. I traveled to Free State province, South Africa on two occasions for the durations of three and four months respectively, where I visited five hospitals, two clinics, one psychiatric complex, one central laundry facility, and the Free State Department of Health central office, across three districts. On the first occasion, I provided support during Module 2 of the program and supported participants in the implementation of their projects, in addition to conducting the first series of individual interviews. My second visit began shortly before Module 3 of the program, where I supported participants in the completion of their data analysis and the synthesis of their project presentations, provided support during Module 3, and remained beyond the program completion to conduct the second set of individual interviews.

Participant observations complemented the data acquired from questionnaires, interviews and project evaluations. The “participant as observer” stance allowed me to interact as a supportive group mentor and an explicit researcher (114). Although limitations exist with the participants’ perception of confidentiality that may bias data, this enabled me as the researcher to gain rapport, have insights into group dynamics and witness the practical successes and challenges of the program in real time. Detailed field notes were collected daily and analyzed using a “wide” and “narrow” perspective to understand viewpoints of individual participants and the context on the whole program and healthcare system (115).

#### **2.3.3.1 Group projects**

A descriptive approach was used to evaluate the group projects at their distinct phases: planning, implementation, and evaluation. To this aim, the primary project documentation was collected

and examined (i.e., draft and final subject proposals, draft and final proposal presentations, draft and final presentations, and draft and final abstracts). Group project members, objectives, settings, methods, and results were synthesized and tabulated. The overall evaluation took place within the frame of participatory observations. Projects were also indirectly evaluated within the adapted Kirkpatrick framework. The questionnaires completed in-modules included project reaction items; the individual interviews included questions on the learning, behaviour, and outcomes; and the participant observations also supported in assessing the four Kirkpatrick levels.

## **Chapter 3: Results**

Mirroring the organization of the Methods Chapter, the results are presented for the quantitative and qualitative analyses respectively.

### **3.1 Quantitative results**

The quantitative results section begins with a description of the participants and presents the results from the quantitative portion of the self-administered pre, mid, and post program evaluation questionnaires that addressed the Reactions, Learning and Behaviour components of the adapted Kirkpatrick framework, beginning with the latter two.

#### **3.1.1 Who were the participants?**

The demographic characteristics and occupational profile of the program participants are displayed in Table 6. This table shows that most participants were female (81%), and aged between 40-49 years of age (44%). The majority (66%) of participants named their workplace affiliation to be one of the two academic public hospitals in Bloemfontein, Pelonomi Regional Hospital and Universitas Academic Hospital, while the rest were affiliated either with the Free State Department of Health, a clinic, one of the smaller district hospitals, an NGO, the University of the Free State or the Free State Psychiatric Complex. While most participants were expected to be IC or OH professionals; only 56 % were from those fields. Most participants were based in the Bloemfontein area but a few were based in smaller urban areas or more distant rural areas. The majority (56%) were also healthcare professionals (nurses for the most part) at these hospitals.

Their background training responses show that most participants had never received training in how to plan, implement or evaluate workplace programs (75%); most had not received any training related specifically to tuberculosis (59%) either. The majority did undergo HIV specific training (75%) and occupational health training (73%). An even number of participants underwent some form of infection control training as those who did not. Of the 32 participants who began the program, only four (13%) had exited the program by Module 2 (at the latest) – all four being from the Free State Department of Health.

**Table 6. Certificate Program participant characteristics**

<b>Participant Characteristics</b>	<b>n (%)</b>
<b>Total Participants</b>	32
<b>Age</b>	
20-29	1 (3)
30-39	8 (25)
40-49	14 (44)
50-59	9 (28)
<b>Gender</b>	
Male	6 (19)
Female	26 (81)
<b>Workplace</b>	
Department of Health	6 (19)
Pelonomi Hospital	8 (25)
Universitas Hospital	13 (41)
Other	5 (16)
<b>Occupation</b>	
Healthcare Professional	18 (56)
Community Level	3 (9)
Hospital Admin/Tier 1 Management	6 (19)
District/Provincial/Academic	5 (16)
<b>Workplace Intervention training</b>	
Yes	8 (25)
No	24 (75)
<b>HIV specific training</b>	
Yes	24 (75)
No	8 (25)
<b>Tuberculosis specific training</b>	
Yes	13 (41)
No	19 (59)
<b>Occupational Health specific training</b>	
Yes	20 (63)
No	12 (38)
<b>Infection control specific training</b>	
Yes	16 (50)
No	16 (50)

### **3.1.2 Knowledge, attitudes, skills and practices and true/false Items**

The overall results from all the Likert-style items combined – knowledge, attitudes, skills, practices (KASPs) – are shown by category and sub category of items in Table 7 (that also includes the true/false questionnaire items) and are then presented by participant characteristics in Table 8.

When examining pre, mid, and post questionnaire results overall (KASPs Likert-style items) by participant characteristics, and when applying a Bonferroni correction ( $p < 0.017$ ), only a few characteristics were found to have effected a significant difference between pre and post scores. These only include a significant increase in score among females (+10%,  $Z=3.0$ ,  $p= 0.002$ ); among Universitas affiliated participants (+14%,  $Z= 2.6$ ,  $p=0.009$ ); among healthcare professional (+12%,  $Z= 3.0$ ,  $p=0.003$ ); and among those who reported having had some training in three of the five training items (+7%,  $Z=2.7$ ,  $p=0.007$ ). No significant changes were seen by age group. Interestingly, across all participant categories, the increase in scores between the pre and mid questionnaires was greater than the increase between the pre and post questionnaires. In some cases, a statically significant decrease in scores was observed between mid and post questionnaires. These results will be discussed in the next chapter.

When considering all participants, but looking at specific categories of items (see Table 7), attitudes were not found to have statistically changed throughout the program. Participants' scores for attitudes were already high at baseline ( $\mu$  [SD]: 85% [1.6]). Knowledge, skills and

practices scores, however, statistically increased between pre and post questionnaire results, reaching a peak at the mid-program questionnaire (as was discussed above), accounting for the observations noted in Table 7. Mean scores for knowledge items as a whole increased from 68% (SD 14.6) to 80% (SD 9.6) between the pre and post program questionnaires ( $Z = 3.1$ ,  $p = 0.002$ ). The mean score for the skills and practices items also increased significantly and it is worth noting the low point from which it started ( $\mu$  [SD]: 57% [2.3]) before settling at 71% (SD 12.4) in the post program questionnaire ( $Z = 3.6$ ,  $p = < 0.001$ ).

Among the six sub-categories assessed, five of them showed a significant improvement between pre and post questionnaires. Among these, the *occupational health policies, procedures and guidelines*, and the *research/program implementation* sub-categories had the lowest (<60%) starting score, with mean scores of 59% (SD = 18.6) and 53% (SD=14.9) (respectively). Each significantly improved to a mean of 71% (SD =13.2) and 69% (SD = 13.2) (respectively). As noted earlier, when comparing overall questionnaire results by participant characteristics, a larger and more significant difference was seen in sub-categories when comparing pre and mid questionnaires results, then when comparing pre and post results.

As shown in Table 7, the true/false item results showed a similar pattern between the pre, mid and post scores, but the increase seen between pre and post scores was not found to be significant among these items. Only the increase in scores between the pre and mid-program evaluation questionnaires was found to be statistically significant ( $Z=3.7$ ,  $p= 0.001$ ).

### **3.1.3 Reactions**

The reaction results covering the eight components of the program show that scores for seven of these eight were between the high seventies and high eighties in percentage points (the components are shown in Table 9, along with the results). The Reaction component that stands out for being low is the reaction to the Certificate Program as a whole, where scores were in the low sixties ( $\mu$  [SD]: 63.0% [9.8%]); a finding that will be discussed in the next chapter. As a whole, these results show a favourable to very favourable reaction to the program.

**Table 7. Pre, mid, and post questionnaire results by category of items**

<b>Category of items</b>	<b>Pre-Post Z (p-value)</b>	<b>Pre (N = 32) μ (SD)(%)</b>	<b>Mid (N=30) μ (SD)(%)</b>	<b>Post (N=24) μ (SD)(%)</b>	<b>Pre-Mid Z (p-value)</b>	<b>Mid-Post Z (p-value)</b>
<b>Main categories</b>						
Knowledge	<b>3.1 (0.002)</b>	67.8 (14.6)	86.5 (9.5)	79.7 (9.6)	<b>4.5 (&lt;0.001)</b>	<b>-3.2 (0.002)</b>
Skills/Practice	<b>3.6 (&lt;0.001)</b>	57.0 (2.3)	76.3 (11.6)	71.4 (12.4)	<b>4.6 (&lt;0.001)</b>	<b>-2.6 (0.008)</b>
Attitudes	0.1 (0.930)	84.9 (1.6)	85.8 (8.9)	81.5 (12.3)	1.2 (0.240)	-1.8 (0.079)
True/False	1.9 (0.054)	68 (18.2)	85.4 (18.9)	74.5 (17.9)	<b>3.7 (&lt;0.001)</b>	-2.2 (0.028)
<b>Sub-Categories</b>						
Occupational Health/IC	2.0 (0.050)	72.8 (17.9)	87.2 (12.1)	81.7 (9.3)	<b>4.0 (&lt;0.001)</b>	<b>-2.9 (0.004)</b>
HIV	<b>2.5 (0.013)</b>	82.3 (14.6)	93.3 (9.3)	91.1 (12.4)	<b>3.4 (0.001)</b>	-1.1 (0.270)
Tuberculosis	<b>2.9 (0.004)</b>	68.9 (19.4)	90.5 (10.2)	82.7 (15.3)	<b>4.4 (&lt;0.001)</b>	<b>-2.6 (0.010)</b>
HIV/TB Co-Infection	<b>2.7 (0.007)</b>	67.5 (23.7)	92.7 (9.8)	81.7 (18.6)	<b>4.1 (&lt;0.001)</b>	<b>-2.7 (0.007)</b>
Occupational Policies, Procedures and Guidelines	<b>3.2 (0.002)</b>	59.2 (18.6)	81.5 (13.7)	71.3 (13.2)	<b>4.5 (&lt;0.001)</b>	<b>-3.0 (0.002)</b>
Research/Program Implementation	<b>3.8 (&lt;0.001)</b>	52.5 (14.9)	73.7 (13.1)	69.4 (13.2)	<b>4.7 (&lt;0.001)</b>	-1.9 (0.063)

Z scores and p-values are the result of the Wilcoxon-signed rank test.

**Table 8. Pre, mid, and post questionnaire results (all KASPs Likert-style items combined)**

Characteristics	Pre-Post Z (p-value)	Pre (N = 32) n μ (SD)(%)	Mid (N=30) n μ (SD)(%)	Post (N=24) n μ (SD)(%)	Pre-Mid Z (p-value)	Mid-Post Z (p-value)
<b>Age</b>						
20-39	2.2 (0.030)	9 60.9 (9.6)	9 80.9 (10.2)	8 78.1 (10.7)	2.5 (0.110)	-0.6 (0.575)
40-49	1.4 (0.161)	14 72.0 (10.7)	12 83.2 (7.6)	8 77.0 (8.0)	<b>2.6 (0.009)</b>	-2.1 (0.035)
50-59	2.3 (0.021)	9 65.7 (5.5)	9 84.8 (6.4)	8 76.5 (8.9)	<b>2.7 (0.008)</b>	<b>-2.4 (0.017)</b>
<b>Gender</b>						
Male	1.6 (0.109)	6 69.4 (9.2)	5 83.2 (6.9)	3 79.4 (8.4)	2.0 (0.043)	-0.5 (0.593)
Female	<b>3.0 (0.002)</b>	26 66.5 (10.4)	25 82.9 (8.4)	21 76.9 (10.5)	<b>4.1 (&lt;0.001)</b>	<b>-2.9 (0.004)</b>
<b>Workplace</b>						
Department of Health	-	6 77.0 (11.6)	4 87.1 (2.5)	1 83.8 (-)	1.1 (0.273)	-
Pelonomi Hospital	2.4 (0.180)	8 64.8 (6.4)	8 86.5 (6.4)	7 83.1 (4.5)	<b>2.5 (0.012)</b>	-2.2 (0.027)
Universitas Hospital	<b>2.6 (0.009)</b>	13 65.1 (8.4)	13 81.4 (8.9)	13 73.6 (9.2)	<b>3.1 (0.002)</b>	-2.6 (0.009)
Other	1.1 (0.285)	5 63.8 (12.5)	5 78.1 (8.4)	3 76.9 (10.8)	1.8 (0.080)	-0.5 (0.593)
<b>Occupation</b>						
Healthcare professional	<b>3.0 (0.003)</b>	18 65.1 (8.3)	18 81.4 (8.3)	17 76.3 (9)	<b>3.6 (&lt;0.001)</b>	-2.6 (0.009)
Community Level	-	3 68.2 (8.5)	2 84.0 (11.5)	0 -	1.3 (0.180)	-
Hospital Admin/Tier 1 Management	1.2 (0.248)	6 70.7 (12.4)	6 87.4 (6.6)	6 78.1 (9.1)	2.0 (0.046)	-2.2 (0.026)
District/Provincial/ Academic	-	5 69.1 (15.2)	4 82.9 (7.9)	1 87.5 (-)	1.8 (0.068)	-
<b>Training</b>						
Yes	<b>2.7 (0.007)</b>	16 70.0 (10.9)	15 83.2 (8.3)	12 76.8 (9.6)	<b>3.4 (0.001)</b>	-1.7 (0.099)
No	2.0 (0.410)	16 64.2 (8.7)	15 82.8 (8)	12 77.7 (8.6)	<b>3.1 (0.002)</b>	<b>-2.7 (0.007)</b>

Z scores and p-values are the result of the Wilcoxon-signed rank test.

**Table 9. Reaction results by period and program component**

Characteristics	Program lead-up and module 1			First midterm and module 2			Second midterm, module 3 and overall program				
	n	Pre-Module 1	Module 1	n	Midterm period 1	Module 2	n	Midterm period 2	Module 3	Certificate Program	Mentor
		μ (SD) (%)	μ (SD) (%)		μ (SD) (%)	μ (SD) (%)		μ (SD) (%)	μ (SD) (%)	μ (SD) (%)	μ (SD) (%)
<b>Overall</b>	32	80.4 (12.0)	79.3 (10.2)	30	88.9 (6.7)	85.2 (5.3)	24	84.8 (10.6)	87.8 (10.3)	63.2 (9.8)	82.7 (7.0)
<b>Age</b>											
20-39	9	75.6 (19.5)	76.9 (14.1)	9	93.0 (5.4)	84.9 (4.4)	8	80.0 (13.9)	93.3 (6.2)	63.2 (11.1)	80.9 (9.8)
40-49	14	81.4 (7.0)	79.3 (7.4)	12	85.6 (3.3)	84.7 (5.7)	8	90.0 (5.4)	79.2 (12.1)	60.7 (8.9)	82.0 (4.7)
50-59	9	83.6 (7.6)	81.7 (10.3)	9	89.3 (9.1)	86.2 (6)	8	84.4 (9.4)	90.8 (6.1)	65.7 (9.9)	85.2 (5.6)
<b>Gender</b>											
Male	6	78.0 (6.6)	79.2 (10.9)	5	86.0 (2.8)	81.2 (6.7)	3	88.3 (2.9)	77.8 (10.2)	59.1 (4.4)	78.8 (1.3)
Female	26	80.9 (13.0)	79.3 (10.3)	25	89.5 (7.1)	86.0 (4.7)	21	84.3 (11.2)	89.2 (9.8)	62.9 (10.2)	83.3 (7.3)
<b>Workplace</b>											
Department of Health	6	83.3 (7.3)	74.2 (8.9)	4	86.7 (3.9)	82.5 (2.5)	1	100.0 (-)	100.0(-)	62.9(-)	86.3(-)
Pelonomi Hospital	8	80.0 (11.3)	83.1 (10.8)	8	91.3 (5.9)	88.0 (6.8)	7	85.7 (8.9)	86.7 (12.2)	61.2 (11.8)	85.7 (5.7)
Universitas Hospital	13	79.4 (16.2)	77.7 (11.3)	13	89.7 (8.1)	84.8 (4.4)	13	81.9 (11.8)	88.2 (10.2)	64.6 (9.8)	80.8 (7.9)
Other	5	80.0 (4.9)	83.5 (4.9)	5	84.7 (3.8)	84.0 (5.8)	3	90.0 (0.0)	84.4 (7.7)	61.9 (8.7)	82.9 (5.1)
<b>Occupation</b>											
Source Provider	18	77.6 (14.3)	79.3 (11.6)	18	90 (6.1)	85.9 (4.6)	17	82.7 (10.9)	86.3 (11.7)	61.5 (9.5)	81.5 (7.4)
Community Level	3	85.3 (4.6)	85.8 (3.8)	2	86.7 (4.7)	86.0 (8.5)	0	-	-	-	-
Hospital Admin/Tier 1 Mngt	6	87.3 (9.3)	81.7 (7.0)	6	87.8 (10.5)	84.7 (8.1)	6	90.0 (8.9)	91.1 (5.4)	66.7 (10.5)	85.2 (5.8)
District/ Provincial/Academic	5	79.2 (1.8)	72.5 (8.8)	4	86.7 (3.9)	82.5 (2.5)	1	90.0 (-)	93.3 (-)	71.4(-)	87.5(-)
<b>Training</b>											
Yes	16	78.0 (14.8)	79.4 (11.4)	15	90.7 (7.6)	83.9 (4.8)	12	82.1 (12.2)	92.8 (5.3)	64.8 (8.8)	81.3 (7.7)
No	16	82.8 (8.2)	79.2 (9.3)	15	87.1 (5.3)	86.5 (5.6)	12	87.5 (8.4)	82.8 (11.9)	61.7 (10.8)	84.2 (6.2)

## 3.2 Qualitative results

This qualitative results section presents the results from the individual interviews, open-ended questionnaire items, participatory observations and the group projects.

### 3.2.1 Individual interviews

#### 3.2.1.1 Participant interviews

As noted in the previous chapter, a total of 51 interviews were conducted over two time periods with program participants and mentors. The midterm evaluation included interviews with 27 of the 32 participants who had initially attended Module 1. The final interviews consisted of interviews with five of the main South African mentors, as well as 19 of the original participants, all of whom had also been interviewed in the midterm evaluation.

#### *Reactions*

Participant reactions to the program and its various components were mixed but predominantly conveyed satisfaction with the program. One of the reactions most often mentioned was “eye-opening,” where participants recognized the value of the material they were being taught and the contribution of the program to their workplaces. A hospital nurse demonstrates this reaction in the following quote:

*I've never been involved in such a constructive research programme, because the ones we did at university or the ones that I was involved in were not this huge, this project is really huge for the future.”*

The most often cited challenge was with limited time availability, including during the modules, and the time available to conduct their projects in their workplaces, either because their

management had not allocated enough time or because participants felt that they could not take enough time off from their own work responsibilities because of the high workload or scheduling conflicts with their colleagues.

Other comments addressed the need to further involve the organizations' management in the program to introduce and run the program within already established channels for employee training. It was felt that both of these suggestions would add weight and credibility to the group projects and recommendations. There were also positive examples of management involvement as an NGO project manager described regarding her project: *“this project has made me come closer to my manager, especially the deputy director. They so supportive and so interested in what I am doing.”*

Many comments were made about the way the program was conducted (as was prompted), the most notable of which was the constructive criticism that too many mentors were involved with each group and that these mentors did not always agree with each other and sometimes gave contradicting instructions to participants. Additionally, many participants reported that the modules (particularly the first and somewhat the second module) contained too much information for participants to process and that the pace in those modules should either be reduced, or extra time should be added to them.

### *Learning*

The three major themes that emerged under the Learning domain were: a) general knowledge, skills and practices, b) infection control and occupational health knowledge and skills, c) research and workplace intervention knowledge and skills.

General knowledge and skills learning was most often described as “improved,” “updated,” “acquired,” where participants felt that their HIV and TB knowledge were particularly improved – ranging from updating disease and treatment information, and disease prevention information and skills to filling gaps on knowledge for TB/HIV co-infection.

Responses indicated that their learning improved infection control and occupational health knowledge, skills and practices by providing practical information that was easy to uptake in the workplace. Participants reported that the training allowed them to better identify workplace hazards, gaining new knowledge and reinforcing knowledge they had once learned, and emphasized the importance of infection control practices in the workplace. Many participants discussed renewed importance of personal protective equipment (PPE) and environmental controls. Also, participants discussed a new appreciation for how infection control was not only for patients but was directly related to occupational health. Of note, many participants discussed how the knowledge they acquired through the trainings was practical and could be directly applied to their workplace settings as illustrated in the following quote from an assistant manager of nursing at a hospital during the midterm interview:

*“After we talked about TB so much and about cough etiquette, I went to the department and I asked for posters on TB. When we cough, we follow the etiquette now and [we are] also opening the windows when we sit in an office. Information from the course was useful.”*

Concerning research and implementation of research skills many participants highlighted the value of demystifying the research process and giving them confidence to do research. For example, learning about research methods such as ethics, qualitative and quantitative methods, and intervention design allowed them to identify and measure problems in the workplace. Many

participants discussed these points in the context of allowing them to provide support for their recommendations with evidence, and empowering them in the process to teach themselves and others. When asked about their experience with research prior to the training, many participants felt their knowledge had been none to minimal at best. After the training, participants reported improved confidence to understand research and implement programs although many also felt they could not do this without further support. Some participants also felt more confident about discussing research with researchers and management.

### *Behaviour*

Under the behaviour domain, respondents raised changes in two major themes: the first around information exchange, mentorship and collaboration; and the second around individual level infection control and occupational health. In addition to knowledge related to diseases, IC and OH, another prevailing theme from participants was the acquisition and utilization of interpersonal skills. Many participants felt that they benefited from the promotion of teamwork and interacting with diverse participants. They discussed the advantages of learning from peers and mentors, navigating team dynamics, learning from the variety of experiences from other participants, and engaging stakeholders such as managers and unions. Additionally, participants discussed the improvement and obtainment of computer skills for communication.

Aside from reporting the development and use of interpersonal skills and communication skills, participants also reported to have put into practice many of the infection control and occupational health skills that they learned as a result of the modules and their projects. These changes reflect individual level changes and that have implications for changes in the workplace. They reported

improved infection control behaviours among themselves and their colleagues by using correct personal hygiene and PPE procedures and by advising and promoting these to their colleagues. Participants also reported that they were more aware of environmental and procedural hazards regarding infection control practices. In some case, they intended to implement or advocate for the use of tools, such as workplace auditing tools to identify potential hazards and to implement procedural controls to help contain the risk of the spread of infections, such as employing cough registers in their ward or designating appropriate sputum collection areas. Participants also discussed how they would improve occupational health practices by improving HIV/TB testing and treatment practices and by increasing OH and safety staff awareness on the importance of confidentiality. A number of participants reported that they had communicated their ideas for infection control and occupational health improvements to management and that they were awaiting feedback.

### *Outcomes*

As per participant responses, the outcome domain was divided into three major themes: a) application of knowledge in the workplace, b) barriers to starting/implementing workplace interventions, and c) attitudes.

In addition to individual level changes reported, participants also reported changes in practices and procedures at the institutional level for infection control and occupational health practices. Many participants reported that they were able to make changes in their workplaces or that they recommended to their management corrective measures for issues that they identified in the workplace and that these recommendations were accordingly applied. Reported changes in the

application of knowledge generally fell into one of two categories, infection control measures and practices and occupational health measures and practices. Infection control measures and practices that were reported to have changed revolved around the way they: collected sputum samples, wore PPE (their ability to wear PPE, choice of PPE to wear, and method with which they wear PPE), used environmental controls, and managed patients (by separating coughers, registering coughers, testing all patients for HIV/TB). In one case, a few participants reported that as an infection control measure, fabric curtains covering the windows were removed from the bronchoscopy area and were replaced by shading the windows. In another case, a geriatrics nurse at a hospital described the way they conducting new IC training and had changed their ward procedures for patients in the waiting room:

*“I have already given the [new] in-service training in the ward on TB and IC. Normally, we didn't isolate the patients that were coughing. [Since] the workshop, now we are isolating them and we take the sputum. If they are positive they will start treatment and remain in isolation. We didn't isolate until this course and we would also sometimes discharge patients that have a cough without testing. Now if there is a cough, they get tested”*

Reported occupational health related practices revolved around increasing the staff utilization of the OH clinic services, particularly for HIV and TB testing. This change is reflected in this hospital chief professional nurse's statement:

*“Now with the project, people are aware that if they have those signs, they can come to the clinic and get screened for TB. Because after the project has been introduced to them, they are coming for that. Not just the employees in the Certificate Programme, but also other employees. Because it has been introduced to them in the meetings so that's why the response is there [now].”*

Another salient occupational health action that was reported to have had immediate positive health impact (the issue of confidentiality notwithstanding), is described below by a hospital operational manager nurse:

*“I do have staff members who are HIV positive but I know how to deal with them at the moment in the workplace because of the course that we attended. I've got one staff member who is HIV positive, who I decided to take out from pulmonology where patients come in coughing. I decided [that] for her health, so that she cannot contract any disease, [to move her] to a cleaner department. This [staff member] is no longer booked off as sick as much as she used to be.”*

When asked about barriers to beginning and implementing workplace interventions, participants' responses fit into two major themes, barriers related to: 1) time, resources and logistics and 2) institutional capacity. The majority of the participants felt competing priorities, both professionally and personally, hindered the capacity for them to develop and implement a workplace intervention. Additionally, resources such as Internet, laptop availability and cell phone airtime were discussed as barriers. Logistically, meeting other group members to develop interventions was a challenge. Concerning institutional capacity, dominant themes emerged around the difficulty of obtaining support and approval from management for projects, poor facility infrastructure, and staff shortages already straining existing service provision. An example where the infrastructure was cited as an issue was with the poor infrastructure of the occupational health clinic; it was expressed that it lacked adequate space within the hospital to implement the proposed project and lacked the privacy requirements to conduct the proposed interventions ethically. A few participants raised issues about the “implementability,” sustainability and feasibility of interventions that were proposed among participants. This is well illustrated in the following quote from a professional nurse at a hospital:

*“What we want from this project is huge. Our objective is huge. We need to train managers, inform employees about the project and the occupational health services offered, [implement] the cough register [and the] attendance letter and some of those things are not going to happen. It's not feasible at all. I don't know whether people will be interested in all that.”*

Another outcome that was often raised by participants is the program's role in changing their attitudes by: a) empowering them and elevating their morale, confidence and motivation, and b) by increasing their awareness. Participants reported that the knowledge and skills had: empowered them to voice their opinions and take actions; built their confidence to discuss and present their findings from the projects and subsequent findings; and built their confidence to engage in further research and project design and implementation. An increase in job satisfaction and morale was also reported. Additionally, some participants reported a greater willingness to use the OH clinic of their hospital and to promote its use.

Regarding awareness, participants reported an increase in their own awareness in importance of matters such as TB and HIV- including stigma - in the workplace, the use of research to assist them in their job, and the link between infection control and occupational health, as seen by this hospital infection control nurse's quote:

*“Before we used to say, me, the infection control nurse, deals with patients, the occupational nurse deals with the HCW. It's only now, if I identify a hazard, I involve both the patient and the HCW. In other words, I had a demarcation that [it] does not involve me if it [concerns] a HCW, it is [an] occupational health problem, it is not my problem. (she laughs...). That's why I didn't even want to do [this] occupational health course. I only identify now with this programme; that it's very important for IC and OH [to work together].”*

In addition to changes in participant awareness, it was reported that awareness was also raised among other staff members who were the recipients of the participants' interventions with regards to proper infection control and PPE practices.

### **3.2.1.2 Local South African mentors**

A total of 5 South African mentors, all from Free State, participated in interviews after the Certificate Program ended; mentors from the national level were not interviewed, nor were Canadian mentors. When the local mentors were asked to describe the strengths and weaknesses of participants, many mentors discussed the value in training participants that were working “on the ground.” They also used words such as experienced, motivated, committed and energetic. The mentors generally expressed the view that participant’s weaknesses were mostly related to not having sufficient baseline knowledge in research methods, writing and computer skills. Other emerging themes were related to lack of time to participate in the training and unequal distribution of work amongst participants in the groups.

The mentors described many strengths and weaknesses of the modules and projects of the Certificate Program. Mentors felt that participants enjoyed the material in the modules and that it was presented in a way that fostered the development of research skills. However, they discussed many weaknesses they perceived in the modules. For example, many mentors felt that the modules could have benefited from more structure, coordination, and time to present. They described feeling insufficiently prepared to present information because they were unaware of the level of depth and detail to present. Some mentors felt this lead to a level of information in the modules that was too complicated for participants to understand. Some mentors discussed the need for the modules to foster critical thinking skills and accommodate the varying baseline knowledge levels of the participants.

Concerning the projects many mentors discussed of the projects as being a great opportunity for participants to use the practical skills learned with the potential for Certificate Program projects to be developed into longer-term projects. A dominant theme related to weaknesses in the projects that mentors described included there being too many mentors to provide direction to the participants. Many mentors discussed how they were unaware of their roles, what was expected of them and within what timeframe it was expected. Mentors discussed the way this uncertainty resulted in conflicting guidance on how to proceed with participants. Mentors felt it was a time intensive role and they were in need of more structure.

When mentors were asked about their perceptions of the impact of the program on participants and the workplace, the dominant theme that emerged was related to an increase of knowledge and its application. Many mentors felt that it improved participants' knowledge specific to HIV and TB, research methods and occupational health and infection control. Mentors felt that this, in turn, improved participants' confidence, credentials, and morale.

Concerning the impact that the program had on the workplace, many mentors also reported positive impacts such as increased awareness of occupational health and infection control and increase participants' power to improve their safety in their workplace. Many mentors, however, highlighted the necessity of an increased and more supportive role by management in making lasting changes in the workplace and expressed uncertainty around the long-term impacts of the program on participants and the workplace, a period beyond that of the program evaluation.

When mentors were asked about the advantages and disadvantages of the Canadian-South African collaboration, many mentors were positive. Emphasizing how the Canadian partners

brought skills, knowledge and resources that would have otherwise made this training impossible. They felt it was a strong collaboration with good communication and that it improved their standing to have international collaborators. Disadvantages discussed by mentors with respect to the collaboration included working with partners in different time zones and reconciling expectations concerning time frames within two different working styles.

### **3.2.2 Participatory observations**

The close working relationship with Canadian and South African researchers and mentors provided this author with a helpful lens from which to make participant observations of the program as a whole. These observations were particularly helpful in understanding the dynamics of the program. Of course, as discussed in the Methods chapter, these advantages come with limitations in the form of biases that I, as a researcher and as an active participant in the program, will inevitably have. Among my initial observations, at the onset, the majority of the participants seemed to be intimidated by the program, as could be seen by their anxiety as I arrived to meet them in their respective groups or when I came to conduct my initial individual interviews (that some thought was an examination of some sort).

When it came to using computers and computer software, I could see that many were woefully unprepared and in most cases, it was one or two group member who were adequately proficient in using the software's who took on the role of communicating with mentors and researchers, as well as writing, preparing presentations, and analyzing data (the extent to which they did).

Some participants shared with me that they were participating in this program in order to improve their job prospects. Others participants shared with me, with some resentment, that they

believed that there were some who were only in this program “for the certificate it will offer,” but had little to no interest in applying the learning that would emerge from the program itself.

The participants may have had a low interest levels in the program for other reasons; a couple of participants shared with me that they only joined the program because their managers had strongly recommended that they join but that they were not interested. In other cases, participants were under the impression that the program was going to be focused on different aspects of HIV and tuberculosis, and they were disappointed to find out that the program would focus on infection control and occupational health rather than the more clinical aspects.

For many participants, it seemed that they were having trouble grasping many of the topics and materials related to research and workplace intervention methods. The impression given was that more time should have been given to each topic during the modules and that additional resources should have been provided.

With the technological difficulties and the sometimes overwhelming material, the end result was that most groups were led by one or two stronger voices in the groups. In some cases, this was also due to the hierarchy of the group members, where in one instance, a ward manager was grouped with staff from this same ward, leaving a power dynamic heavily tilted towards the manager.

More generally, among many groups there was an atmosphere of uncertainty at every step of their projects. Often, participants were deferring decisions to mentors and researchers because they did not seem to trust that they would come up with what was expected of them. There was a strong impression that participants wanted to please the mentors and researchers, and would

rather just be told what to do and how to do it. Participants also seemed to defer their decisions to a single or couple of group members that held a superior position in the institutional hierarchy.

Regarding the mentorship, observations have made it clear that participants and groups required a large amount of time and resources to assist them with their understanding of some of the materials, and with much their workplace-based intervention projects.

### **3.2.2.1 Group projects**

A description of the group projects is provided in Table 10 and a summary of the project results and key findings is shown in Table 11 and all the group abstracts are available in Appendix E. The eight group projects took place in six distinct settings, where 544 participants (participants of program participants) were surveyed or directly received an intervention. The projects yielded results affecting positive improvement in individual and organizational IC and OH awareness and practices but these positive results were not achieved without much mentor support.

Group project documentations showed that participants had significant difficulties in each distinct phase of their projects (planning, implementing, evaluating). A review of the group project proposals showed that participants did not have a good understanding of what was expected of them for the project component of the program. Most projects originally proposed by participants were too ambitious or beyond the scope of the program and mentors were required to considerably rework these to try to make these more realistic.

In the implementation phase of the projects, the main challenge shifted to the low skill level of participants, where participants needed significant support to apply the qualitative and

quantitative methods that were devised (in most cases by the mentors). In the evaluation phase of the projects, participants nearly entirely relied on mentors to conduct data analyses and synthesis where needed. It was also revealed that some groups had not understood the evaluation portion of the projects. In one case, a group had collected pre-intervention data on infection control practices but not post-intervention data, not realizing its necessity. It is important to note that it was in conducting these projects that many of the participants used MS Word, MS Excel or Google search for the first time. Overall, program mentors were obligated to heavily support participants by dedicating large amounts of time at every phase of the projects but these efforts were recompensed with significant project achievements.

The complexity of the projects varied greatly, with some projects setting very measurable objectives while others had more complex objectives, sometimes moulded by mentors to be stepping stones for larger future collaborative projects between the Canadian and South African mentors and researchers. Through participatory observations, it was apparent that those groups with the most measurable objectives were most confident, had the least difficulty with their projects, and learned the most.

**Table 10. Group project descriptions**

<b>Group</b>	<b>Participant #</b>	<b>Project Setting</b>	<b>Target group</b>	<b>Topic/Objectives</b>	<b>Interventions</b>	<b>Methods</b>
<b>1</b>	4	Large Regional Hospital: Pelonomi Hospital	Hospital HCWs	Improving utilization of workplace HIV/AIDS program for HCWs at Pelonomi Hospital	- Assess HCWs views on the OH services and HIV stigma (n=344)	- Self-administered questionnaires
<b>2 &amp; 3</b>	3	Bloemfontein and Welkom	DOTS supporters in two distinct areas	Reducing the risk of DOTS supporters acquiring TB during home visits in Bloemfontein and Welkom	- Two day training (informed by baseline questionnaires)(n=23)	- Pre-post design - Self-administered questionnaires - Face-to-face interviews - PPE audits
<b>4</b>	7	Bronchoscopy theatre of a large Teaching Hospital: Universitas Hospital	Unit patients and HCWs	Creating a safe environment for patients and staff in the Bronchoscopy theatre at Universitas Hospital	- Training session (informed by baseline questionnaires) (n=14) - Informational pamphlet produced and distributed - Environmental risk assessment	- Planned as pre-post design but post evaluation never took place - Pre-post IC practices' observations - Self-administered questionnaire on TB transmission and PPE use
<b>5</b>	4	Medical Out Patient Department at a large Regional Hospital: Pelonomi	Department HCWs	Investigating TB infection control knowledge, practices and environment in the	- Assess TB IC practices (n=21)	- Self-administered questionnaire - Environmental and administrative audit

<b>Group</b>	<b>Participant #</b>	<b>Project Setting</b>	<b>Target group</b>	<b>Topic/Objectives</b>	<b>Interventions</b>	<b>Methods</b>
		Hospital		medical outpatient department at Pelonomi Hospital		checklist
<b>6</b>	1	Thebe District Hospital	HCWs in 11 high-risk departments in the hospital	Blood and body fluid exposure in the workplace	- Assess BBF exposures knowledge and HCWs knowledge and attitudes towards OH and IC services (n=74)	- Self-administered questionnaire (n=74)
<b>7</b>	7	Large Teaching Universitas Hospital	Hospital HCWs	Strengthening the occupational health clinic for the management of TB and HIV in the healthcare workplace at Universitas Hospital	- Assess the feasibility of implementing a cough registry (n=n/a)	- Stakeholder consultation - Information sessions - Development of tools (cough registry and permission slip) - Operational manager training - Development of procedures - Monitor OH clinic traffic for TB services
<b>8</b>	2	Large laundry facility	Laundry facility workers	Infection control and workplace safety: Knowledge and practices in a large laundry facility	- Assess the IC, safety, and OH services' knowledge and practice of workers (n=68)	- Self-administered questionnaire (individual interviews where required due to illiteracy) (n=68)

HCWs (Healthcare workers); OH (Occupational Health); IC (Infection Control); DOTS (Directly Observed Treatment, Short-Course); PPE (Personal Protective Equipment); TB (Tuberculosis); BBF (Blood Body Fluids).

**Table 11. Group project results and key findings**

Group	Results and Key Findings
1	<ul style="list-style-type: none"> <li>- HCWs under-utilized the OH services because of stigma, potential breaches of confidentiality and lack of awareness</li> <li>- Training recommended for OH services staff</li> <li>- Awareness campaign among HCW to promote the OH services and reduce workplace stigma</li> </ul>
2 & 3	<ul style="list-style-type: none"> <li>- Low baseline knowledge on IC, use of PPE and hand hygiene practices</li> <li>- Administrative controls and use of personal protective equipment were lacking</li> <li>- Training successfully improved TB knowledge, attitudes, and beliefs regarding TB IC</li> <li>- Recommended regular refresher in-service training and improved access to PPE</li> </ul>
4	<ul style="list-style-type: none"> <li>- Intervention successful in imparting appropriate IC practices (compliance improved from 46% to 83%)</li> <li>- Identified environmental risks: overcrowding, poor ventilation, and lack of hand-washing supplies</li> <li>- Implemented lasting solutions for some of these risks</li> </ul>
5	<ul style="list-style-type: none"> <li>- Low knowledge of PPE and hand hygiene was found (53% answered PPE question incorrectly)</li> <li>- A commendable number of model IC practices were observed</li> <li>- Environmental audit identified required sputum collection improvement and environmental control improvements for the spirometry room</li> <li>- Very low proportion of HCWs are annually screened for TB</li> </ul>
6	<ul style="list-style-type: none"> <li>- Nearly 30% of respondents had not been fully vaccinated for Hepatitis B</li> <li>- Moderate to low awareness of the OH and IC services</li> <li>- Very low knowledge of BBF exposure</li> <li>- HCWs with less than 6 years of experience reported significantly higher amounts needle stick/BBF exposures</li> <li>- Targeted training/review/supervision recommended</li> </ul>
7	<ul style="list-style-type: none"> <li>- Over 12% increase in OH clinic visits</li> <li>- HCW sputum collection increase from 1 to 22 over the previous period</li> <li>- Concerns raised about confidentiality with using a cough register</li> </ul>
8	<ul style="list-style-type: none"> <li>- Questionnaire results indicated that 85% of participants did not wear N95 masks when required, 72 % of did not wear eye protection when required, and 37 % did not adapt their procedures when working with infected linen</li> <li>- 15% of workers were not vaccinated for Hepatitis B</li> <li>- Discrepancies between knowledge and practices were identified</li> <li>- The necessity for additional training in IC and safety practices was revealed</li> </ul>

HCWs (Healthcare workers); OH (Occupational Health); IC (Infection Control); PPE (Personal Protective Equipment); TB (Tuberculosis); BBF (Blood Body Fluids).

## Chapter 4: Discussion

The main findings from this research were that: 1) the initiative being studied did indeed result in participants' acquiring and improving KASPs in specific domains of infection control and occupational health practices, at least to some extent; 2) participants were indeed able to successfully demonstrate the application of those KASPs in their workplace interventions, again to various extents; and 3) workplace interventions were able to affect meaningful impacts in their workplaces to varying degrees. However, the study also found that: 4) there were considerable challenges encountered in implementing the capacity-building model adopted – related to the insufficient foundation of the participants to undertake what was expected without much more time and resources than the program was able to provide; 5) while improvements in interpersonal skills, teamwork and group dynamics were seen by most participants as having been an important outcome of this program, much more work was still needed in this regard, particularly in considering power relations, institutional challenges and difficulties in engaging key stakeholders; and 6) different work styles and role ambiguity within the international-national-local mentor group hindered optimal efficiency in providing the assistance needed.

The implications of these findings are that the program built capacity among the health workforce by improving knowledge and skills and empowering healthcare workers but that the sustainability of this particular program was limited, and the program is likely not generalizable to other settings with healthcare workers of similar backgrounds but less international support. The program provided lessons for the implementation of a workplace-based training program related to the baseline knowledge and computer skills of participants that should be taken into consideration in participant selection. It also indicated the need to perhaps consider targeting the

subject matter more narrowly; creating mechanisms for even greater management involvement throughout the process, and strengthening the ongoing monitoring of power relations and team dynamics. A study on establishing IC training programs at a South African hospital by Mehtar, Marais and Aucamp (2011), reported that the instructors avoided the use of computer or web based learning because of participants' lack of access or proficiency with computers (39). Considering that the aims of this program included training in program evaluation (and the funding source- the specific call issued by the Global Health Research Initiative - required that research skills be built in the LMIC, not just clinical skills), avoiding computer use may not have been possible but reducing their necessity or setting a minimum computer and software proficiency requirement at entry could have helped in this regard. The Mehtar, Marais and Aucamp's study also documented tension between management and IC practitioners, where one of their challenges in establishing an IC training program was the lack of involvement of senior management in modifying inappropriate or out of date nursing procedures which was necessary requirement for HCWs to be able to adhere to correct IC processes (39).

The hospital IC training program described above, not only offered an advanced diploma program for IC practitioners but also offered an introductory course on IC for healthcare managers. The impact of this course was reportedly "profound," resulting in strengthened IC staffing structures and the reinforcement of the provincial IC committee (39). These positive results from training management suggest that training programs such as the one studied in this thesis should consider including a concurrent training program for managers, approaching the problems from the top and bottom. A New Zealand OH study by Olsen (2012) also supports the idea that management and stakeholders needs to be targeted, along with having OH practitioners

working to implement and maintain OH and safety systems independently (43). The Olsen study relays three primary strategies employed by OH practitioners to involve management and stakeholders. Their preferred method (thought to be most effective) was the ‘knowledge strategy’, imparting to stakeholders the relation between exposures and consequences, and what could be done about it. They also used an ‘audit strategy’ which uses audits as a means to involve stakeholders, and least frequently used was the ‘regulation strategy,’ attempting to relate rules and regulations. Findings from those studies and the evaluation from this Certificate Program reinforce the need for management involvement and that the most effective approach may be to focus on increasing management knowledge of IC and OH.

### *1. Improved Knowledge, Attitudes, Skills, and Practices (KASPs)*

Regarding participant KASPs, the triangulated results from this study largely found that participants acquired and improved their KASP related to infection control and occupational health practices; KASPs are a basic requirement for professional competency in a field (116). These results are in line with other IC and OH programs published in the literature. Uwakwe (2000), examined a seven-week educational program that aimed to improve knowledge and attitudes on HIV/AIDS and compliance with universal precautions at a Nigerian University (117). The study used a problem-based participatory approach and included lectures, seminars, multimedia presentations and discussion sessions. That study found that the intervention on 68 registered nurses (with 73 controls), significantly imparted knowledge in some domains compared to pre intervention and control group scores but found less success in improving attitudes. For example, for a question on ‘Breast Milk’ as a likely transmission mode, pre to post intervention scores significantly increased from 84% to 92% ( $\alpha = 0.05$ ). On perceived utility

of using household bleach in the handling of contaminated blood, scores significantly increased from 94% to 99% ( $\alpha = 0.05$ ). Universal precaution scores were generally high at baseline and did not significantly improve over time. Attitudes, also did not show significant improvement, but remained generally low to somewhat-low at both pre and post-tests. These results and those from other interventions that have taken place in the past 20 years (118,119), are consistent with what was found in this study where our pre-post questionnaire results found significant increases in knowledge but no change in attitudes. The participants in this program (81% female, median age of 40-49), were a reasonable reflection of the healthcare workforce, and the demographic profile of the group overall suggested that the experience of participants in this program is likely a reasonable representation of what could be expected of similar initiatives in similar settings.

## *2. Workplace interventions: application of Knowledge, Attitudes, Skills, and Practices (KASPs)*

Although questionnaire results showed that participants' KASPs statistically improved in most tested topics, the triangulated data suggests that these improvements were relatively modest. While reported improvements in knowledge, skills, and practices scores between pre and post questionnaires were substantial and significant, the initial baseline scores were considerably low; and results from the interviews, projects and participatory observations provided some nuance to questionnaire results. Participants may have rated themselves high in particular topics at the beginning, but when discussing and applying these KSPs with mentors or other participants during the implementation of their projects and in the in the third module, they realized that they had not quite grasped some of the KSPs material on which they reported to have had a strong understanding. The fact that scores went up in the midterm evaluation and then went down again,

suggests that participants may have realized when they came to apply their learning that they actually had not learnt as much as they had thought. This finding resonates with what was found by Sitzmann et al. (2010) in a study that examined predictors of knowledge self-assessment score. They explained that as trainees receive external feedback that does not conform with their believed or expressed assessments, they re-evaluate these to more accurately align with their experiences (120). They also suggest that as trainees have more opportunities to interact with other trainees (such as during group projects), and as trainees have to apply what they have learned that they may begin to readjust their own perceptions of their knowledge relative to that of others and to their ability to apply the knowledge. It was also noteworthy that the biggest gains were amongst those who already had good baseline knowledge, which supports the conclusion that it is useful to target these programs to participants who have the right background to be able to understand and implement the knowledge and skills being taught.

### *3. Workplace interventions: meaningful impacts*

With respect to attitudes, although results did not display any statistically significant change in the questionnaires, many participants did display or report improved attitudes towards infection control and occupational health related to HIV and tuberculosis, as shown in some of the quotes provided. There were also overwhelming reports of an increased feeling of confidence and empowerment. Empowerment among HCWs is known to be an important component of job satisfaction (121–123), organizational commitment (122,123), health and wellbeing (121,123), and ultimately, recruitment and retention (123). Empowerment is essential to a capacity building effort by affirming or reaffirming to HCWs that they can, and have the ability affect change (56). In the New Zealand study by Olsen (2012) mentioned above, interviews were conducted with ten

OH and safety practitioners to better understand the strategies they employ to affect change in the workplace (43). It was found that these OH practitioners “had a political agenda aimed at creating a better working environment and that most of them want to create change and see themselves as initiators of change (43).” This quote epitomises the empowerment aim that is part of the capacity building aim of this program. The OH and IC practitioners that were part of the program did not express such a degree of confidence, direction, and motivation at the onset but as the program progressed, many expressed, to some degree, that they were indeed moving towards such a state.

#### *4. Challenges in the capacity building model*

Regarding the application of the learning material, as with the acquisition of KSP, some level of divergence was found between participants’ reported comfort with skills and practices on one hand, and the participants’ actual application of the material. While some participants reported a high degree of comfort with conducting another workplace-intervention (as was done for their projects), participatory observations suggest that without the considerable mentorship provided, they may have considerable difficulty in achieving this goal. Ward's 2011 review of 39 studies found evidence that in many infection control training programs, knowledge increased post-intervention, but a corresponding improvement in practices often did not follow (60). This divergence between what was reported by participants and what was observed is common (124) and underlines the importance of using mixed methods in evaluating programs such as this one.

### *5. Institutional considerations*

The degree of impact of the program and its projects on different workplaces varied. In some cases, projects were limited to establishing baseline KASPs in the healthcare workforce served by the trainees and creating larger IC and OH awareness. In other cases, needs assessments were conducted and deficiencies in IC and OH practices were identified. Some projects went further and demonstrably increased some components of KASPs or made administrative or environmental improvements such as improving procedures and practices in a department with management support, serving as a model nationally and internationally. One project, by an occupational health nurse based in a rural area, was later published in an international peer-reviewed journal (125); another project was presented at a national symposium in South Africa and is now being discussed as a model for other provinces within South Africa (the latter project's abstract is available in Appendix E, and its final Certificate Program presentation is available in Appendix F). Identified factors that contributed to the varying degree of success of a group and their projects were background and training of team members, leadership among the team, workplace setting, and level of involvement/buy-in (empowerment, as discussed above), and complexity of the projects.

The implications of these findings are that a certificate program such as this one can successfully build capacity among HCWs and their institutions. Many important advances were made with respect to new policies and programs, for example, the process of conducting needs assessments and identification of IC and OH deficiencies in various workplaces to provide recommendations and inform policy decisions; and a feasibility study for a cough registry program and the subsequent development of tools and procedures for the detection of TB among HCWs and

concomitant training of operational managers in the use of these tools and procedures.

Nevertheless, the largest share of built capacity was confined to individual participant capacity and with sustainability being an important factor in capacity building as described by Crisp (2000) (92), this program proved to be unsustainable because of the heavy human and monetary resources that it required.

A substantial amount of resources had to be used to support the participants with their projects. One of the reasons for this requirement, as mentioned above, was the low initial KASPs level that participants had upon joining the program. The most notable deficiency was with respect to data collection, design, analysis, and interpretation, the bulk of which, for most of the projects, had to be driven by the mentors given time constraints. While the program was too resource intensive to reoccur on any periodic basis, it must be recognized that at the initial stages of a new IC and OH training program taking place in a low-resource environment (financial and human), large outside resources may be required (39,126), incurring a large upfront cost but laying down the foundation until local expertise is strengthened to the point of being able to deliver the training themselves (39). Regarding low resources, it has also been recognized that the human resources for OH are lacking in South Africa, irrespective of sector. South Africa's density of qualified and accredited occupational medicine specialists is 0.07 per 100,000 population (31 specialists) (46,127), compared to Canada's 0.20 per 100,000 population (52 specialists) (128).

Returning to the resource intensiveness of this program, it should also be considered that English was not the first language for many participants. Although this dimension was not measured or enquired about in this study, Mehtar, Marais and Aucamp's 2011 paper on establishing IC training programs in South Africa, found that it was necessary to adapt the training to take the

limited English language skills into consideration by incorporating more visual, practical, group discussions and class interactions into the training (39). This program did incorporate many of these teaching methods, although some of the modules relied more heavily on the traditional lecture format.

### *6. Implementations challenges*

The program provided other lessons learned in the implementation of a workplace-based capacity building program for infection control and occupational health in a high HIV and TB burdened country. The most significant lesson learned was that for such a program to be successful, it cannot rely so heavily on external resources. This is not a unique finding, and indeed partnership models are actively being discussed in the literature in this regard (93). This program required too many human resources in the form of group mentors, local university involvement, national level partners and international support to be sustainable as an ongoing program or to be scaled up. This challenge could potentially be somewhat alleviated by reducing the number of participants and narrowing the selection criteria for participants to include only those who have substantial infection control and occupation health roles and responsibilities. The training program studied here attempted to reach the greatest number of participants and accepted all those who applied with their manager's support, even those participants whose occupational positions were not directly related to the subject matter targeted by this training program. It should also be considered that perhaps fewer mentors could have been recruited for this program. Many participants reported, in their reactions to the program and its components, being confused by multitude of mentors and their sometimes conflicting guidance. While this program may have provided participants with too much choice, the problem is usually the

opposite, with too few skilled and knowledgeable IC practitioners and trainers to conduct the necessary trainings (39). These participants still largely acknowledged benefiting from this training program but among these participants, the benefits were mostly confined to their personal learning and growth, and not wider institutional capacity. Another method that could be used to reduce the resource requirement of the program is to ensure that program goals and objectives are commensurate with participant knowledge and skill level. For example, considerations on the extent to which the program relies on the participants' use of computers, software, and the web needs to be carefully considered in crafting capacity building programs.

To contain the resources-intensiveness of the program, it is also necessary for the researchers and mentors to adjust their expectations to the ability of their participants. When the mentors revised the project proposals, their considerations may have still gone beyond what was suitable for the participants, crafting proposals to lead to outcomes that would be meaningful to the international community but possibly losing sight of what would be best for training participants to do their own jobs better. Importantly, the funding source for the program required that the program mandate was to build research capacity for HIV prevention efforts (129); as such, the mentors felt that even had they wanted to focus more directly on training, for example, on how to select, don and doff personal protective equipment, or how to diagnose TB, the focus still had to be on program design, implementation and evaluation. This focus was still a very important one; building the ground-level research receptor capacity is a necessary part of the structure of an organization that enables the uptake of new research findings and adapt them to their particular organization (130). Building program design, implementation and evaluation capacity among

healthcare practitioners would also be beneficial for any future research projects that may be undertaken by the Canadian-South African collaborative.

Nevertheless, in the case of North-South partnerships such as this one, the issue of the Northern partners overly directing agendas is one that has been long discussed (131) and that researchers must actively take into consideration throughout their partnerships. This issue raises an interesting nuance that is part of the empowerment discourse. While empowerment can refer to conferring power onto others (as in this context), the concept contains the inherent risk that those who are meant to empower never really relinquished a part of their power onto those they are attempting to empower, remaining in control of the relationship, and defining its terms (54) . Where “continually stating [that] ‘we need to empower this or that group’ creates and reinforces a world of professional practice in which [less]professional groups are incapable of their own powerful actions (54),” or are not in control. Perhaps at times, this describes how the Northern mentors may have been interacting with the participants, exercising too much direction, and not letting them exercise enough critical thinking. Organizers of future capacity building programs need to take care to consider the balance that they want to strike between wielding their power to produce the desired results and letting participants take control but sometimes leading to sub-optimal results. Given that the provincial executive of the Department of Health and the CEOs of all the participating hospitals had been invited to hear the results produced, the mentors wanted to ensure that the presentations were high quality, even if this meant having the Northern team play a larger than optimal role. As the Northern mentors were not interviewed for this study (albeit three of them are on this thesis committee), there has been no systematic attempt made to analyze the reflections on this from their perspective.

Program implementation specific lessons were also learned, many of which concern the program delivery methods such as whether a consistent and single mentor allocated to each group may have worked better than the multi-scale interdisciplinary mentorship design. There is considerable divergence in practice internationally and in different settings with regard to mentorship. Regardless of the type of mentorship, there is ample evidence to suggest that mentoring is beneficial in this context, as found by Eby et al.'s meta-analysis (2008) (132) but to the question of whether multiple mentors per group is more effective than a single mentor, the little evidence found on multiple mentorship was a 1999 study by Baugh & Scandura that examined workplace mentorships (133). Its results suggest that two mentors could more beneficial to a single mentees by providing a wider range of perspectives, but that this duality also increased the likelihood of these mentors providing conflicting information to mentees. The study also concluded that in the case of a single mentee, having more than two mentors was more detrimental than beneficial (133). If a training program is to include multiple mentors per group, the latter study emphasised the importance of communication between the mentors, and ensuring that they have a good consensus on the training objectives in order to improve the congruence of communications and avoid providing conflicting information to a mentee

Another point that merits discussion is whether the program could have secured even greater management support by being more explicit in the management letter required in the recruiting process about the time commitment required for participants and ensuring its approval by management. Evidence shows that supportive management, and the implementation of appropriate policies is perhaps even more important than infection control knowledge and attitudes for improving safety in the workplace (40,41).

Finally, whether the program was overly ambitious for the resources available, such that there should have been less material and complexity for the time and resources allotted, is an issue that will always be context-specific but also one that has been observed in other limited resources settings (126). South Africa's unique history of Apartheid, followed by policies of neoliberalism that further exacerbated disparity and deprived the public education and health systems of much-needed resources, must factor into this analysis

As written about in the introduction, one-time training programs have often been found to have a limited effect on IC and OH training that is lasting in time. This point supports the design and objectives of this program, that attempt to build HCW capacity and to empower them to protect themselves and those in their HCW community, in much the same way that health promotion "[enables] people to increase control over, and to improve, their health (134)."

#### *Strengths of this study*

A major strength of this study was that it was conducted in an environment where IC and OH practices and knowledge of HIV and TB are critical components of affecting change in workplace interventions, and, as such, there was a high degree of cooperation and interest in this Master's thesis research. The mixed method approach provided a rich dataset from which to not only measure the programmatic outcomes but also understand determinants of successes and challenges throughout the program. Additionally, repeating the evaluation questionnaires at three time intervals and the individual interviews at two time intervals allowed for an in-depth chronological analysis of the impact of the program. This also allowed the researchers and mentors to tailor the intervention to meet the needs of participants as the training progressed.

Additionally, as the program was able to recruit and maintain a wide variety of HCWs ranging from managerial, nurses, academic, and the provincial health department, this allowed us to understand the effectiveness of the training on diverse cadres. Mentorship participation from Canada and South Africa was a strength not only of the Certificate Program but also to this Master's study because it contributed a diverse range of expertise and allowed the research to have improved consideration of the local context. Lastly, this research was conducted at a critical time period in the height of the HIV/TB co-epidemic where best practices for infection control and occupational health in the workplace could have the most impact for protecting the HCWs; as such, what was learned in this study could have high impact.

While many IC and OH trainings have been described in the literature, they have tended to focus on specific knowledge, attitudes, skills and practices that are necessary to follow IC and OH guidelines, and have often neglected to consider the upstream factors that lead HCWs to falling back to inappropriate IC and OH practices. Of these studies that have endeavoured to consider and address these factors, many have failed to conduct robust evaluations. This study adds to a limited literature by provided a strong evaluation of a capacity building model that endeavoured to address some of the upstream factors that have led to the weaknesses found among the HCWs. Additionally, the study adds to the limited literature on OH and IC, as many studies have remarked (42) and called for the need for more evaluative, rather than descriptive studies (42).

### *Limitations*

One of the most important limitations of this study is that it did not explicitly measure the efficiency of the program, a component that, along with effectiveness, is crucial to any

sustainable capacity building program (135), in comparison with other models. Efficiency implies a relationship between inputs (e.g., time, money, human resources) and outputs (e.g., KASPs, empowerment, and procedure alteration) and can be divided into two main types: technical, and allocative efficiency. Technical efficiency is concerned with either the minimizing of inputs, the maximizing of outputs, or a combination of both. Allocative efficiency is concerned with optimizing the way inputs are allocated to produce outputs that are of most value to a given system, such as a community (136). The limitation discussed here is concerned with the latter form of efficiency which raises such questions as: was this training model the most efficient way to effectively “build the capacity of occupational health and infection control functions in the Free State province of South Africa?” While this study documented that this program was resource-intensive, it did not attempt to ascertain how the results obtained would compare to those which could be obtained in a different program that is less resource-intensive. Further research should take care to include such a comparison in its evaluation because if enough inputs go into a program, desired outputs will result but the crucial question is whether the amount of inputs justify the outputs (135) and this can only be ascertained if either a cost-benefit or cost-effectiveness analysis is conducted, and/or a comparison is conducted among different models.

Another point to consider is that there is some debate on the reliability of using self-rated measurements of KASPs and the use of this tool might be considered a limitation of the study (120). However, there is evidence that supports the reliability of self-rated questionnaires (106,137) and its common usage (138,139), and it can be argued that as the program’s aim was to build capacity and empower participants, the participant’s self-perceived learning may almost

be as important as their actual learning. For example, whether the participants judged their knowledge or practice had actually improved or whether they only realized that they actually already had that knowledge or that that where already able to perform certain tasks, the goal of building capacity was achieved. A set of true/false knowledge question was also included in the pre-mid-post questionnaires to complement the self-rated knowledge items of the questionnaires. These true/false items correlated in the direction and magnitude with the self-rated items. Additionally, Sitzmann et al. (2010), have explained that some ways of obtaining more accurate knowledge self-assessments for training are to: provide trainees with multiple external feedback points, employ a mix of instruction techniques, include interpersonal and practical components in the training, focus on point-in-time knowledge as opposed to perceived knowledge change, and repeat assessments at multiple time points (120). All of these measures were part of the evaluation that was used in this study, reinforcing the validity of self-assessment items used here. During the interviews, it was noticed on several occasions that participants seemed to want to give the answers they thought was desired. This "response bias" is common in any research involving human participants (140). In this case, and in the case of self-rated questionnaire items, the mixed method approach helped to overcome some of these limitations by complementing the participants' responses with field observations and projects evaluations.

Another point to be made about the questionnaires is that the lack of thorough validity checking and piloting may have resulted in some oversights. Results from the post-program questionnaire showed that Reactions to the overall Certificate Program were substantially lower than responses to all other Reaction categories. A review of the items that formed the Certificate Program category showed that it was only in this category that some items were worded such that the

most negative/disapproving answer on a scale of “1” to “5” would be “5,” opposite to the way that the rest of the questionnaires items were structured, where a “5” represented the most positive/approving answer. These negatively framed item responses were converted to their mirror opposite (to render them equivalent to the rest of the positively framed questions) but, despite this, response scores remained very low for these items only, bringing down the entire mean scores for the overall Certificate Program Reactions. Such an oversight should have been remarked through a thorough validation and piloting exercise of the questionnaires.

## **Chapter 5: Conclusion**

A workplace-based capacity building certificate program can impart improvements in HCWs' IC and OH KASPs that can be directly applied to their workplaces. Additionally such a program is able to affect meaningful change within workplaces through the agency of empowered participants leading workplace interventions. Such improvements on a personal and organizational level contribute to increasing HCW health and well-being through improved recognition, job satisfaction, morale, and safety in their workplaces. By improving IC and OH practices, such a program could also help reduce nosocomial infection, and increase HIV and TB care leading to a healthier, more resilient healthcare workforce. This study also provides evidence that may support other IC and OH training programs in high-risk, low resource settings outside of Free State province.

Future collaborative capacity building programs of this international nature should ensure to invest energies into not only obtaining approval from relevant senior management but also into securing their buy-in. To the extent of considering a parallel management training for IC and OH. Future programs should also consider limiting participants to those who could benefit the most based on minimum required baseline competencies, and based on those who could affect the most change in their organization – a part of the process that southern partners may best be positioned to decide. Mentorship for trainees is critical but must be carefully planned and executed, taking into account the potential unfamiliarity of the trainees with the material and process. Careful consideration of program resource utilization is perhaps the most important.

The success of this program for building IC and OH capacities among HCWs was tempered by resource considerations and the necessity for sustainability. In order for such programs to be successful in the long term, a set of basic requirements are needed such as a strong knowledge and skill foundation among participants, appropriate organizational resources and equipment, and strong national and regional policies and guidelines. Lastly, the overall context – with its unique historical, political and economic realities must figure prominently in the planning of such programs.

## Bibliography

1. World Health Organization. The World Health Report 2006: Working together for health. Geneva; 2006.
2. WHO, ILO U. Joint WHO-ILO-UNAIDS policy guidelines on improving health workers' access to HIV and tuberculosis prevention, treatment, care and support services [Internet]. Geneva; 2010. Available from: [http://whqlibdoc.who.int/publications/2010/9789241500692\\_eng.pdf](http://whqlibdoc.who.int/publications/2010/9789241500692_eng.pdf)
3. GISH O. Medical Education and the “Brain Drain.” Med Educ [Internet]. 2009 Jan 29 [cited 2016 Mar 19];3(1):11–4. Available from: <http://doi.wiley.com/10.1111/j.1365-2923.1969.tb01587.x>
4. Gish O, Godfrey M. A reappraisal of the “brain drain”—With special reference to the medical profession. Soc Sci Med Part C Med Econ [Internet]. 1979 Mar [cited 2016 Mar 16];13(1):1–11. Available from: <http://linkinghub.elsevier.com/retrieve/pii/0160799579900200>
5. World Health Organization. A Universal Truth: No Health Without a Workforce [Internet]. World Health Organization; 2013 [cited 2014 Jun 23]. Available from: <http://www.who.int/workforcealliance/knowledge/resources/hrhreport2013/en/>
6. United Nations Development Program. The 2030 Agenda for Sustainable Development [Internet]. Geneva: United Nations Development Program; 2015 [cited 2016 Mar 14]. Available from: <http://www.who.int/mediacentre/events/meetings/2015/un-sustainable-development-summit/en/>
7. Evans DK, Goldstein M, Popova A. Health-care worker mortality and the legacy of the Ebola epidemic. Lancet Glob Heal [Internet]. 2015 Aug [cited 2016 Jan 30];3(8):e439–40. Available from: <http://www.sciencedirect.com/science/article/pii/S2214109X15000650>
8. Kasper J, Bajunirwe F. Brain drain in sub-Saharan Africa: contributing factors, potential remedies and the role of academic medical centres. Arch Dis Child [Internet]. 2012 Nov [cited 2013 Feb 26];97(11):973–9. Available from:

<http://www.ncbi.nlm.nih.gov/pubmed/22962319>

9. Crush J, Pendleton W. Brain Flight: The Exodus of Health Professionals from South Africa. *Int J Migr Heal Soc Care* [Internet]. Emerald Group Publishing Limited; 2010 Jul 2 [cited 2013 Mar 6];6(3):3–18. Available from:  
<http://www.emeraldinsight.com/journals.htm?issn=1747-9894&volume=6&issue=3&articleid=1929631&show=html>
10. WHO. The WHO Global Code of Practice on the International Recruitment of Health Personnel [Internet]. Geneva: World Health Organization; 2010 [cited 2016 Mar 14]. Available from: <http://www.who.int/hrh/migration/code/practice/en/>
11. Yami A, Hamza L, Hassen A, Jira C, Sudhakar M. Job satisfaction and its determinants among health workers in jimma university specialized hospital, southwest ethiopia. *Ethiop J Health Sci* [Internet]. 2011 Aug [cited 2016 Mar 14];21(Suppl 1):19–27. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3275875&tool=pmcentrez&rendertype=abstract>
12. UNAIDS. Epidemiological Fact Sheet on HIV and AIDS: South Africa [Internet]. 2013 [cited 2015 Aug 4]. Available from:  
<http://www.unaids.org/sites/default/files/epidocuments/ZAF.pdf>
13. World Health Organization. Tuberculosis country profiles: South Africa [Internet]. 2013 [cited 2015 Aug 3]. Available from:  
[https://extranet.who.int/sree/Reports?op=Replet&name=%2FWHO\\_HQ\\_Reports%2FG2%2FPROD%2FEXT%2FTBCountryProfile&ISO2=ZA&LAN=EN&outtype=html](https://extranet.who.int/sree/Reports?op=Replet&name=%2FWHO_HQ_Reports%2FG2%2FPROD%2FEXT%2FTBCountryProfile&ISO2=ZA&LAN=EN&outtype=html)
14. International Labour Office. Joint ILO/WHO guidelines on health services and HIV/AIDS. Geneva; 2005.
15. Shisana O. The impact of HIV/AIDS on the health sector: National survey of health personnel, ambulatory and hospitalised patients and health facilities, 2002 [Internet]. 2003 [cited 2016 Mar 19]. Available from:  
<https://books.google.ca/books?hl=en&lr=&id=JwwhHPGN8EAC&oi=fnd&pg=PA6&dq=The+Impact+of+HIV/AIDS+on+the+Health+Sector.+National+Survey+of+Health+Perso>

nnel,+Ambulatory+and+Hospitalised+Patients+and+Health+Facilities&ots=EssEd5h2XZ  
&sig=wmwOPMDJKckz25a-BrI5ss6GASM

16. Statistics South Africa. Mid-year population estimates, 2014 [Internet]. Pretoria,SA; 2014 [cited 2016 Mar 14]. Available from:  
[http://www.statssa.gov.za/?page\\_id=1854&PPN=P0302&SCH=6012](http://www.statssa.gov.za/?page_id=1854&PPN=P0302&SCH=6012)
17. Marchal B, Brouwere V De, Kegels G. HIV/AIDS and the health workforce crisis: what are the next steps? 2005 [cited 2016 Mar 19]; Available from:  
<http://193.190.239.98/handle/10390/1349>
18. Huddart J, Furth R, Lyons J. The Zambia HIV/AIDS Workforce Study: preparing for scale-up. 2004 [cited 2016 Mar 19]; Available from: <http://www.popline.org/node/238463>
19. Report on Challenges Facing the Kenyan Health Workforce in the Era of HIV/AIDS [Internet]. Republic of Kenya Ministry of Health. Nairobi; 2004 [cited 2016 Mar 19]. Available from:  
<http://www.equinetafrica.org/sites/default/files/uploads/documents/CRHhres.pdf>
20. National AIDS STD Control Programme. Preparedness for HIV/AIDS service delivery: the 2005 Kenya health workers survey [Internet]. Nairobi; 2006 [cited 2016 Mar 19]. Available from:  
<https://www.google.ca/search?q=Preparedness+for+HIV/AIDS+service+delivery:+the+2005+Kenya+health+workders+survey.&oq=Preparedness+for+HIV/AIDS+service+delivery:+the+2005+Kenya+health+workders+survey.&aqs=chrome..69i57&sourceid=chrome&ie=UTF-8#q=Pr>
21. WHO. Tuberculosis and HIV [Internet]. WHO. World Health Organization; 2014 [cited 2016 Mar 14]. Available from: [http://www.who.int/hiv/topics/tb/about\\_tb/en/](http://www.who.int/hiv/topics/tb/about_tb/en/)
22. Baussano I, Nunn P, Williams B, Pivetta E, Bugiani M, Scano F. Tuberculosis among health care workers. *Emerg Infect Dis* [Internet]. 2011 Mar [cited 2012 Dec 8];17(3):488–94. Available from:  
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3298382&tool=pmcentrez&rendertype=abstract>

23. Joshi R, Reingold AL, Menzies D, Pai M. Tuberculosis among health-care workers in low- and middle-income countries: a systematic review. Chowdhury M, editor. PLoS Med [Internet]. Public Library of Science; 2006 Dec [cited 2014 Jun 23];3(12):e494. Available from: <http://dx.plos.org/10.1371/journal.pmed.0030494>
24. Mathew A, David T, Thomas K, Kuruvilla PJ, Balaji V, Jesudason M V, et al. Risk factors for tuberculosis among health care workers in South India: a nested case-control study. J Clin Epidemiol [Internet]. 2013 Jan [cited 2016 Mar 15];66(1):67–74. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22521578>
25. Sydnor ERM, Perl TM. Hospital epidemiology and infection control in acute-care settings. Clin Microbiol Rev [Internet]. 2011 Jan [cited 2015 Nov 21];24(1):141–73. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3021207&tool=pmcentrez&rendertype=abstract>
26. World Health Organization. Fact sheet no. 103: Ebola virus disease [Internet]. World Health Organization. World Health Organization; 2014 [cited 2016 Mar 15]. Available from: <http://www.who.int/mediacentre/factsheets/fs103/en/>
27. Schepisi MS, Sotgiu G, Contini S, Puro V, Ippolito G, Girardi E. Tuberculosis transmission from healthcare workers to patients and co-workers: a systematic literature review and meta-analysis. PLoS One [Internet]. 2015 Jan [cited 2016 Mar 19];10(4):e0121639. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=4383623&tool=pmcentrez&rendertype=abstract>
28. Elliott AM, Hayes RJ, Halwiindi B, Luo N, Tembo G, Pobee JO, et al. The impact of HIV on infectiousness of pulmonary tuberculosis: a community study in Zambia. AIDS [Internet]. 1993 Jul [cited 2016 Mar 19];7(7):981–7. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/8357557>
29. Cruciani M, Malena M, Bosco O, Gatti G, Serpelloni G. The impact of human immunodeficiency virus type 1 on infectiousness of tuberculosis: a meta-analysis. Clin

- Infect Dis [Internet]. 2001 Dec 1 [cited 2016 Mar 19];33(11):1922–30. Available from: <http://cid.oxfordjournals.org/content/33/11/1922.full>
30. Middelkoop K, Mathema B, Myer L, Shashkina E, Whitelaw A, Kaplan G, et al. Transmission of tuberculosis in a South African community with a high prevalence of HIV infection. *J Infect Dis* [Internet]. 2015 Jan 1 [cited 2016 Mar 19];211(1):53–61. Available from: <http://jid.oxfordjournals.org/content/211/1/53.short>
  31. Escombe AR, Moore DAJ, Gilman RH, Pan W, Navincopa M, Ticona E, et al. The infectiousness of tuberculosis patients coinfecting with HIV. *PLoS Med* [Internet]. 2008 Sep 30 [cited 2016 Mar 19];5(9):e188. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2535657&tool=pmcentrez&rendertype=abstract>
  32. Jonsson J, Kan B, Berggren I, Bruchfeld J. Extensive nosocomial transmission of tuberculosis in a low-incidence country. *J Hosp Infect*. 2013;83(4).
  33. World Health Organization. WHO Policy on TB infection control in health-care facilities [Internet]. World Health Organization; 2009 [cited 2014 Jun 30]. Available from: <http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:No+Title#0>
  34. Centers for Disease Control and Prevention. Guideline for Hand Hygiene in Health-Care Settings: Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. *MMWR* [Internet]. 2002 [cited 2016 Mar 20];51(16). Available from: <http://www.cdc.gov/handhygiene/Guidelines.html>
  35. Siegel JD, Rhinehart E, Jackson M, Chiarello L, The Healthcare Infection Control Practices Advisory Committee. CDC - 2007 Isolation Precautions - HICPAC [Internet]. Atlanta; 2007 [cited 2016 Mar 20]. Available from: <http://www.cdc.gov/hicpac/2007IP/2007isolationPrecautions.html>
  36. World Health Organization. Infection prevention and control of epidemic- and pandemic-prone acute respiratory diseases in health care [Internet]. Geneva: World Health Organization; 2007 [cited 2014 Jun 30]. Available from:

[http://www.who.int/csr/resources/publications/WHO\\_CD\\_EPR\\_2007\\_6/en/](http://www.who.int/csr/resources/publications/WHO_CD_EPR_2007_6/en/)

37. Rutala WA, Weber DJ, HICPAC. Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008 [Internet]. Atlanta; 2008 [cited 2016 Mar 20]. Available from: [http://www.cdc.gov/hicpac/Disinfection\\_Sterilization/1\\_sumIntroMethTerms.html](http://www.cdc.gov/hicpac/Disinfection_Sterilization/1_sumIntroMethTerms.html)
38. Sehulster L, Chinn RYW. Guidelines for Environmental Infection Control in Health-Care Facilities: Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC) [Internet]. Guidelines for environmental infection control in health-care facilities. Recommendations from CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). Chicago; 2004 [cited 2016 Mar 20]. Available from: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5210a1.htm>
39. Mehtar S, Marais F, Aucamp M. From Policy to Practice-Education in Infection Prevention and Control. *Int J Infect Control* [Internet]. 2011 [cited 2013 Mar 26]; Available from: <http://sun025.sun.ac.za/portal/page/portal/UIPC/Downloads/IJIC - Education in IPC.pdf>
40. Yassi A, Lockhart K, Copes R, Kerr M, Corbiere M, Bryce E, et al. Determinants of healthcare workers' compliance with infection control procedures. *Healthc Q* [Internet]. 2007 Jan [cited 2016 Mar 19];10(1):44–52. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17326369>
41. Moore D, Gilbert M, Saunders S, Bryce E. Occupational Health and Infection Control Practices Related to Severe Acute Respiratory Syndrome: Health Care Worker Perceptions. *AAOHN J*. 2005;53(6).
42. Hulshof CT, Verbeek JH, van Dijk FJ, van der Weide WE, Braam IT. Evaluation research in occupational health services: general principles and a systematic review of empirical studies. *Occup Environ Med* [Internet]. 1999 Jun [cited 2016 Mar 20];56(6):361–77. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1757745&tool=pmcentrez&rendertype=abstract>
43. Olsen K. Occupational health and safety professionals strategies to improve working

- environment and their self-assessed impact. *Work* [Internet]. 2012 Jan [cited 2016 Mar 20];41 Suppl 1:2625–32. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22317117>
44. Lucchini RG, London L. Global occupational health: current challenges and the need for urgent action. *Ann Glob Heal* [Internet]. 2014 Jan [cited 2016 Mar 20];80(4):251–6. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25459325>
  45. Naidoo R, Ryan A. Specialist occupational medicine services in Sub-Saharan Africa. *African Newslet Occup Heal Saf* [Internet]. 2004 [cited 2016 Mar 20]; Available from: [http://www.ttl.fi/en/publications/electronic\\_journals/african\\_newsletter/african\\_archives/Documents/african\\_newsletter1-2004.pdf#page=4](http://www.ttl.fi/en/publications/electronic_journals/african_newsletter/african_archives/Documents/african_newsletter1-2004.pdf#page=4)
  46. Moyo D, Zungu M, Kgalamono S, Mwila CD. Review of Occupational Health and Safety Organization in Expanding Economies: The Case of Southern Africa. *Ann Glob Heal* [Internet]. 2015 Jan [cited 2016 Mar 11];81(4):495–502. Available from: <http://www.sciencedirect.com/science/article/pii/S221499961501214X>
  47. Mehtar S. Lowbury Lecture 2007: infection prevention and control strategies for tuberculosis in developing countries - lessons learnt from Africa. *J Hosp Infect* [Internet]. 2008 Aug [cited 2014 Jul 7];69(4):321–7. Available from: <http://www.sciencedirect.com/science/article/pii/S0195670108001631>
  48. Yassi A, Bryce EA, Breilh J, Lavoie M-C, Ndelu L, Lockhart K, et al. Collaboration between infection control and occupational health in three continents: a success story with international impact. *BMC Int Health Hum Rights* [Internet]. 2011 Jan [cited 2013 Mar 6];11 Suppl 2(Suppl 2):S8. Available from: <http://www.biomedcentral.com/1472-698X/11/S2/S8>
  49. Sissolak D, Marais F, Mehtar S. TB infection prevention and control experiences of South African nurses--a phenomenological study. *BMC Public Health* [Internet]. 2011 Jan [cited 2013 Mar 26];11:262. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3096589&tool=pmcentrez&rendertype=abstract>
  50. Manyele S V, Ngonyani HAM, Eliakimu E. The status of occupational safety among

- health service providers in hospitals in Tanzania. *Tanzan J Health Res* [Internet]. 2008 Jul [cited 2016 Mar 20];10(3):159–65. Available from:  
<http://www.ncbi.nlm.nih.gov/pubmed/19024341>
51. Yassi A, Moore D, Fitzgerald JM, Bigelow P, Hon C-Y, Bryce E. Research gaps in protecting healthcare workers from SARS and other respiratory pathogens: an interdisciplinary, multi-stakeholder, evidence-based approach. *J Occup Environ Med* [Internet]. 2005 Jan [cited 2016 Mar 19];47(1):41–50. Available from:  
<http://www.ncbi.nlm.nih.gov/pubmed/15643158>
  52. Gamage B, Moore D, Copes R, Yassi A, Bryce E. Protecting health care workers from SARS and other respiratory pathogens: a review of the infection control literature. *Am J Infect Control* [Internet]. 2005 Mar [cited 2016 Mar 19];33(2):114–21. Available from:  
<http://www.ncbi.nlm.nih.gov/pubmed/15761412>
  53. Bryce E, Copes R, Gamage B, Lockhart K, Yassi A. Staff perception and institutional reporting: two views of infection control compliance in British Columbia and Ontario three years after an outbreak of severe acute respiratory syndrome. *J Hosp Infect* [Internet]. 2008 Jun [cited 2016 Mar 20];69(2):169–76. Available from:  
<http://www.ncbi.nlm.nih.gov/pubmed/18485532>
  54. Labonte R. Health promotion and empowerment: reflections on professional practice. *Heal Educ Behav* [Internet]. 1994 [cited 2016 Mar 14]; Available from:  
<http://heb.sagepub.com/content/21/2/253.short>
  55. Lippin TM, Eckman A, Calkin KR, McQuiston TH. Empowerment-based health and safety training: evidence of workplace change from four industrial sectors. *Am J Ind Med* [Internet]. 2000 Dec [cited 2016 Mar 20];38(6):697–706. Available from:  
<http://www.ncbi.nlm.nih.gov/pubmed/11071691>
  56. Irvine D, Leatt P, Evans MG, Baker RG. Measurement of staff empowerment within health service organizations. *J Nurs Meas* [Internet]. 1999 Jan [cited 2016 Mar 20];7(1):79–96. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/10394776>
  57. Lavoie M-C, Yassi A, Bryce E, Fujii R, Logronio M, Tennessee M. International

- collaboration to protect health workers from infectious diseases in Ecuador. *Rev Panam Salud Pública* [Internet]. 2010 May [cited 2013 Jan 31];27(5):396–402. Available from: [http://www.scielosp.org/scielo.php?script=sci\\_arttext&pid=S1020-49892010000500010&lng=en&nrm=iso&tlng=en](http://www.scielosp.org/scielo.php?script=sci_arttext&pid=S1020-49892010000500010&lng=en&nrm=iso&tlng=en)
58. Janson J, Marais F, Mehtar S, Baltussen RMPM. Costs and process of in-patient tuberculosis management at a central academic hospital, Cape Town, South Africa. *Public Heal action* [Internet]. 2012 Sep 21 [cited 2016 Mar 15];2(3):61–5. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=4463050&tool=pmcentrez&rendertype=abstract>
  59. Greysen SR, Dovlo D, Olapade-Olaopa EO, Jacobs M, Sewankambo N, Mullan F. Medical education in sub-Saharan Africa: a literature review. *Med Educ* [Internet]. 2011 Oct [cited 2013 Mar 13];45(10):973–86. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21916938>
  60. Ward D. The role of education in the prevention and control of infection: a review of the literature. *Nurse Educ Today* [Internet]. 2011 [cited 2016 Mar 20]; Available from: <http://www.sciencedirect.com/science/article/pii/S0260691710000638>
  61. Robson LS, Stephenson CM, Schulte PA, Amick BC. A systematic review of the effectiveness of occupational health and safety training. *Scand J Work Environ Health*. 2012;38(3):193–208.
  62. Suchitra J, Devi N. Impact of education on knowledge, attitudes and practices among various categories of health care workers on nosocomial infections. *Indian J Med Microbiol* [Internet]. 2007 [cited 2016 Mar 20]; Available from: <http://www.ijmm.org/article.asp?issn=0255-0857;year=2007;volume=25;issue=3;spage=181;epage=187;aulast=Suchitra>
  63. Bank TW. Empowerment in practice : analysis and implementation. 2007 May 1 [cited 2016 Mar 19];1–72. Available from: <http://documents.worldbank.org/curated/en/2007/05/9113537/empowerment-practice-analysis-implementation>

64. Mortell M. Hand hygiene compliance: is there a theory-practice-ethics gap? *Br J Nurs* [Internet]. Jan [cited 2016 Mar 20];21(17):1011–4. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23123746>
65. van Rensburg D. Health And Healthcare In South Africa [Internet]. Pretoria,SA: VAN SCHAIK; 2004 [cited 2016 Mar 14]. Available from: <http://www.takealot.com/health-and-healthcare-in-south-africa/PLID35557641>
66. Coovadia H, Jewkes R, Barron P, Sanders D, McIntyre D. The health and health system of South Africa: historical roots of current public health challenges. *Lancet* [Internet]. 2009 [cited 2016 Mar 14];374(9692):817–384. Available from: <http://www.sciencedirect.com/science/article/pii/S014067360960951X>
67. Jansen JD, Herman C, Matenje T, Morake R, Pillay V, Sehoole C, et al. Tracing and explaining change in higher education: the South African case. In: *Review of Higher Education in South Africa* [Internet]. Pretoria,SA: Council on Higher Education; 2007 [cited 2016 Mar 14]. Available from: [http://www.che.ac.za/media\\_and\\_publications/research/review-higher-education-south-africa](http://www.che.ac.za/media_and_publications/research/review-higher-education-south-africa)
68. Bateman C. Paying the price for AIDS denialism. *S Afr Med J* [Internet]. 2007 Oct [cited 2016 Mar 15];97(10):912–4. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18000570>
69. Chopra M, Lawn JE, Sanders D, Barron P, Abdool Karim SS, Bradshaw D, et al. Achieving the health Millennium Development Goals for South Africa: challenges and priorities. *Lancet (London, England)* [Internet]. Elsevier; 2009 Sep 19 [cited 2016 Mar 15];374(9694):1023–31. Available from: <http://www.thelancet.com/article/S0140673609611223/fulltext>
70. Baker PA. From apartheid to neoliberalism: health equity in post-apartheid South Africa. *Int J Health Serv* [Internet]. 2010 Jan [cited 2016 Mar 15];40(1):79–95. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20198805>
71. Marais H. *South Africa Pushed to the Limit: The Political Economy of Change* [Internet].

- Zed Books; 2011 [cited 2016 Mar 15]. 544 p. Available from:  
<https://books.google.com/books?id=95g0bwAACAAJ&pgis=1>
72. UNAIDS. HIV and AIDS Estimated (2012) [Internet]. 2012 [cited 2013 Jan 9]. Available from: <http://www.unaids.org/en/regionscountries/countries/southafrica/>
  73. Karim SSA, Churchyard GJ, Karim QA, Lawn SD. HIV infection and tuberculosis in South Africa: an urgent need to escalate the public health response. *Lancet*. 2009 Sep;374(9693):921–33.
  74. World Health Organization. Global tuberculosis report 2014. 2014.
  75. Department of Health South Africa. National Strategic Plan on HIV, STIs and TB 2012-2016.
  76. World Health Organization. Global tuberculosis report 2013 [Internet]. World Health Organization; 2013 [cited 2014 Jun 23]. Available from: [http://www.who.int/tb/publications/global\\_report/en/](http://www.who.int/tb/publications/global_report/en/)
  77. Lehmann U. Strengthening human resources for primary health care [Internet]. Health Systems Trust; 2008 [cited 2015 Jul 31]. Available from: <http://repository.uwc.ac.za/xmlui/handle/10566/437>
  78. Health Systems Trust. District Health Barometer 2007/08 [Internet]. Durban, South Africa; 2009 [cited 2015 Aug 3]. Available from: <http://www.hst.org.za/publications/district-health-barometer-200708>
  79. van Rensburg HCJ. South Africa's protracted struggle for equal distribution and equitable access - still not there. *Hum Resour Health* [Internet]. 2014 Jan [cited 2015 Jul 31];12(1):26. Available from: <http://www.human-resources-health.com/content/12/1/26>
  80. OECD. Health care resources [Internet]. OECD Health Statistics. 2013 [cited 2016 Mar 14]. Available from: [http://www.oecd-ilibrary.org/social-issues-migration-health/data/oecd-health-statistics/oecd-health-data-health-care-resources\\_data-00541-en?isPartOf=/content/datacollection/health-data-en](http://www.oecd-ilibrary.org/social-issues-migration-health/data/oecd-health-statistics/oecd-health-data-health-care-resources_data-00541-en?isPartOf=/content/datacollection/health-data-en)
  81. Nair M, Webster P. Health professionals' migration in emerging market economies:

- patterns, causes and possible solutions. *J Public Health (Oxf)* [Internet]. 2013 Mar [cited 2014 Jun 2];35(1):157–63. Available from:  
<http://www.ncbi.nlm.nih.gov/pubmed/23097260>
82. Department of Labour. Regulation: OHS - Hazardous Biological Agents [Internet]. Pretoria,SA; 2001 [cited 2016 Apr 14]. Available from:  
<http://www.labour.gov.za/DOL/legislation/regulations/occupational-health-and-safety/regulation-ohs-hazardous-biological-agents>
  83. Zungu M. Medical Surveillance [Internet]. Department of Labour (Republic of South Africa); [cited 2016 Apr 14]. Available from:  
[http://www.labour.gov.za/DOL/downloads/documents/useful-documents/occupational-health-and-safety/NIOH\\_medical\\_surveillance\\_Zungu.pdf/view](http://www.labour.gov.za/DOL/downloads/documents/useful-documents/occupational-health-and-safety/NIOH_medical_surveillance_Zungu.pdf/view)
  84. Department of Health. The Draft National Infection Prevention and Control Policy for TB, MDRTB and XDRTB. Pretoria,SA;
  85. South African Department of Labour. Code of Good Practice on Key Aspects of HIV/AIDS and Employment [Internet]. Pretoria,SA; 2007 [cited 2016 Apr 14]. Available from: <http://www.labour.gov.za/DOL/legislation/codes-of-good-ractise/employment-equity/code-of-good-practice-on-key-aspects-of-hiv-aids-and-employment>
  86. Dudley L, Young T, Rohwer A. Fit for purpose? A review of a medical curriculum and its contribution to strengthening health systems in South Africa. *African J Heal ...* [Internet]. 2015 [cited 2016 Mar 15]; Available from:  
<http://www.ajol.info/index.php/ajhpe/article/view/124828>
  87. Yassi A, Nophale LE, Dybka L, Bryce E, Kruger W, Spiegel J. Building capacity to secure healthier and safer working conditions for healthcare workers: A South African-Canadian collaboration. *Int J Occup Environ Health*. 2009;15(4):360–9.
  88. Statistics South Africa. Mid-year population estimates 2013 [Internet]. Pretoria,SA; 2013. Available from: <http://www.statssa.gov.za/publications/P0302/P03022013.pdf>
  89. Department of Health (South Africa). 2012 National Antenatal Sentinel HIV & Herpes

- Simplex Type-2 Prevalence Survey [Internet]. Pretoria,SA; 2013 [cited 2016 Mar 14]. Available from: <http://www.hst.org.za/publications/2012-national-antenatal-sentinel-hiv-herpes-simplex-type-2-prevalence-survey>
90. Massyn N, Day C, Padarath A, Barron P, English R. District Health Barometer 2013/14. Durban, South Africa: Health Systems Trust; 2014 Oct.
  91. Massyn N, Day C, Dombo M, Barron P, English R, Padarath A. District Health Barometer 2012/13 [Internet]. Durban, South Africa; 2013 [cited 2016 Mar 14]. Available from: <http://www.hst.org.za/publications/district-health-barometer-201213>
  92. Crisp BR. Four approaches to capacity building in health: consequences for measurement and accountability. *Health Promot Int* [Internet]. 2000 Jun 1 [cited 2013 Feb 19];15(2):99–107. Available from: <http://heapro.oxfordjournals.org.ezproxy.library.ubc.ca/content/15/2/99.abstract?sid=a73b6806-7064-47fc-9593-8e91c37b2528>
  93. Yassi A, Zungu M, Kistnasamy B, Spiegel J, Lockhart K, Jones D, et al. Protecting health workers from infectious disease transmission: An exploration of a Canadian-South African partnership of partnerships. *Global Health*.
  94. Bullock A, Morris ZS, Atwell C. Collaboration between health services managers and researchers: making a difference? *J Health Serv Res Policy* [Internet]. England; 2012 Apr [cited 2013 Nov 8];17 Suppl 2:2–10. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22572710>
  95. Kirkpatrick DL. *Evaluating Training Programs: The Four Levels* [Internet]. Berrett-Koehler Publishers; 1998 [cited 2012 Nov 12]. 289 p. Available from: <http://www.amazon.com/Evaluating-Training-Programs-Four-Levels/dp/1576750426>
  96. OK TY; TS; RM; B. Capacity-building in family health: innovative in-service training program for teams in Latin America. *Can Fam Physician (CAN FAM PHYSICIAN)*. 2009;
  97. Omar M, Gerein N, Tarin E, Butcher C, Pearson S, Heidari G. Training evaluation: a case

- study of training Iranian health managers. *Hum Resour Health* [Internet]. England; 2009 Jan [cited 2013 Nov 8];7:20. Available from:  
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2654422&tool=pmcentrez&rendertype=abstract>
98. Wills J, Rudolph M. Health promotion capacity building in South Africa. *Glob Health Promot* [Internet]. 2010 Sep 27 [cited 2013 Jan 29];17(3):29–34. Available from:  
<http://ped.sagepub.com/cgi/doi/10.1177/1757975910375167>
  99. ALLIGER GM, JANAK EA. KIRKPATRICK'S LEVELS OF TRAINING CRITERIA: THIRTY YEARS LATER. *Pers Psychol* [Internet]. 1989 Jun [cited 2013 Nov 8];42(2):331–42. Available from: <http://doi.wiley.com/10.1111/j.1744-6570.1989.tb00661.x>
  100. Kember D. *Action Learning and Action Research: Improving the Quality of Teaching and Learning* [Internet]. Psychology Press; 2000 [cited 2016 Apr 14]. 245 p. Available from:  
[https://books.google.com/books?hl=en&lr=&id=4TH4\\_xSon9cC&pgis=1](https://books.google.com/books?hl=en&lr=&id=4TH4_xSon9cC&pgis=1)
  101. Cornwall A, Jewkes R. What is participatory research? *Soc Sci Med* [Internet]. 1995 Dec [cited 2013 Mar 6];41(12):1667–76. Available from: [http://dx.doi.org/10.1016/0277-9536\(95\)00127-S](http://dx.doi.org/10.1016/0277-9536(95)00127-S)
  102. Biggs S. *Resources-poor farmer participation in research : a synthesis of experiences from nine national agricultural research systems*. The Hague Netherlands: International Service for National Agricultural Research; 1989.
  103. Freire P. *Pedagogy of the Oppressed: 30th Anniversary Edition* [Internet]. Bloomsbury Publishing; 2014 [cited 2016 Mar 15]. 192 p. Available from:  
<https://books.google.com/books?id=v6IMBAAAQBAJ&pgis=1>
  104. Johnson RB, Onwuegbuzie AJ. Mixed Methods Research: A Research Paradigm Whose Time Has Come. *Educ Res* [Internet]. 2004 Oct 1 [cited 2014 Jul 9];33(7):14–26. Available from: <http://edr.sagepub.com/content/33/7/14.short?rss=1&ssource=mfr>
  105. Padgett D. *Qualitative and mixed methods in public health* [Internet]. Thousand Oaks,

- CA: SAGE Publications; 2012 [cited 2014 Sep 8]. Available from:  
[http://scholar.google.ca/scholar?cluster=5349596450390717300&hl=en&oi=scholar&sa=X&ei=2z4OVMLSI8W\\_igL37YGACg&ved=0CBwQgAMoATAA#0](http://scholar.google.ca/scholar?cluster=5349596450390717300&hl=en&oi=scholar&sa=X&ei=2z4OVMLSI8W_igL37YGACg&ved=0CBwQgAMoATAA#0)
106. Braun E, Woodley A, Richardson JTE, Leidner B. Self-rated competences questionnaires from a design perspective. *Educ Res Rev* [Internet]. ELSEVIER SCI LTD; 2012 Jan [cited 2013 Apr 23];7(1):1–18. Available from:  
[http://apps.webofknowledge.com/full\\_record.do?product=WOS&search\\_mode=Refine&qid=3&SID=2Ago88O9C4BLM8DDCgC&page=1&doc=2&cacheurlFromRightClick=no](http://apps.webofknowledge.com/full_record.do?product=WOS&search_mode=Refine&qid=3&SID=2Ago88O9C4BLM8DDCgC&page=1&doc=2&cacheurlFromRightClick=no)
  107. Göb R, McCollin C, Ramalhoto MF. Ordinal Methodology in the Analysis of Likert Scales. *Qual Quant* [Internet]. 2007 Mar 15 [cited 2014 Jan 31];41(5):601–26. Available from: <http://link.springer.com/10.1007/s11135-007-9089-z>
  108. Winter J de, Dodou D. Five-point Likert items: t test versus Mann-Whitney-Wilcoxon. *Pract assessment, Res ...* [Internet]. 2010 [cited 2014 Feb 10]; Available from:  
<http://www.pareonline.net/getvn.asp?v=15&n=11>
  109. IBM Corp. *IBM SPSS Statistics for Windows*. Armonk, NY: IBM Corp;
  110. Diccico-Bloom B, Crabtree BF. The qualitative research interview. *Med Educ* [Internet]. Blackwell Publishing Ltd; 2006 Apr 1 [cited 2014 Jul 12];40(4):314–21. Available from:  
<http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2929.2006.02418.x/full>
  111. Miles J, Gilbert P. *A Handbook of Research Methods for Clinical and Health Psychology* [Internet]. Oxford University Press; 2005 [cited 2016 Mar 25]. 315 p. Available from:  
<https://books.google.com/books?hl=en&lr=&id=kmZ3Yt5pY0YC&pgis=1>
  112. NVivo qualitative data analysis Software. QSR International Pty Ltd.; 2012.
  113. Kvale S. *InterViews: An Introduction to Qualitative Research Interviewing* [Internet]. SAGE Publications; 1996 [cited 2014 Mar 22]. 326 p. Available from:  
[http://books.google.ca/books/about/InterViews.html?id=IU\\_QRm-OEDIC&pgis=1](http://books.google.ca/books/about/InterViews.html?id=IU_QRm-OEDIC&pgis=1)
  114. Kawulich BB. Participant Observation as a Data Collection Method [Internet]. *Forum: Qualitative Social Research*. 2005 [cited 2016 Mar 12]. Available from:

<http://www.qualitative-research.net/index.php/fqs/article/view/466/998>

115. Merriam SB, Merriam SB. Qualitative research and case study applications in education [Internet]. 2nd ed. San Francisco: Jossey-Bass Publishers; 1998 [cited 2015 Mar 12]. Available from: [http://www.amazon.com/Qualitative-Research-Study-Applications-Education/dp/0787910090/ref=asap\\_bc?ie=UTF8](http://www.amazon.com/Qualitative-Research-Study-Applications-Education/dp/0787910090/ref=asap_bc?ie=UTF8)
116. Murphy DM, Hanchett M, Olmsted RN, Farber MR, Lee TB, Haas JP, et al. Competency in infection prevention: a conceptual approach to guide current and future practice. *Am J Infect Control* [Internet]. 2012 May [cited 2016 Mar 15];40(4):296–303. Available from: <http://www.sciencedirect.com/science/article/pii/S0196655312001654>
117. Uwakwe CBU. Systematized HIV/AIDS education for student nurses at the University of Ibadan, Nigeria: Impact on knowledge, attitudes and compliance with universal precautions. *J Adv Nurs*. 2000;32(2).
118. Diekema DJ, Schuldt SS, Albanese MA, Doebbeling BN. Universal precautions training of preclinical students: impact on knowledge, attitudes, and compliance. *Prev Med (Baltim)* [Internet]. 1995 Nov [cited 2016 Mar 16];24(6):580–5. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/8610081>
119. McCann T V, Sharkey RJ. Educational intervention with international nurses and changes in knowledge, attitudes and willingness to provide care to patients with HIV/AIDS. *J Adv Nurs* [Internet]. 1998 Feb [cited 2016 Mar 16];27(2):267–73. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/9515635>
120. Sitzmann T, Ely K, Brown K, Bauer K. Self-assessment of knowledge: a cognitive learning or affective measure? *Acad Manag ...* [Internet]. 2010 [cited 2016 Mar 24]; Available from: <http://amle.aom.org/content/9/2/169.short>
121. Laschinger H, Finegan J, Shamian J. Promoting nurses' health: Effect of empowerment on job strain and work satisfaction. *Nurs Econ* [Internet]. 2001 [cited 2016 Mar 16]; Available from: <http://search.proquest.com/openview/038da89a473585a6ef87a9b7232d833f/1?pq-origsite=gscholar>

122. Kuokkanen L. Nurse empowerment, job-related satisfaction, and organizational commitment. *J Nurs care* ... [Internet]. 2003 [cited 2016 Mar 16]; Available from: [http://journals.lww.com/jncqjournal/Abstract/2003/07000/Nurse\\_Empowerment,\\_Job\\_Related\\_Satisfaction,\\_and.4.aspx](http://journals.lww.com/jncqjournal/Abstract/2003/07000/Nurse_Empowerment,_Job_Related_Satisfaction,_and.4.aspx)
123. LASCHINGER HS. Workplace empowerment, incivility, and burnout: Impact on staff nurse recruitment and retention outcomes. *J Nurs* ... [Internet]. 2009 [cited 2016 Mar 16]; Available from: <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2834.2009.00999.x/full>
124. Elliott P. *Infection Control: A Psychosocial Approach to Changing Practice* [Internet]. Radcliffe Publishing; 2009 [cited 2016 Mar 25]. 264 p. Available from: <https://books.google.com/books?id=Up4KFUtKriwC&pgis=1>
125. Nkoko L, Spiegel J, Rau A, Parent S, Yassi A. Reducing the Risks to Health Care Workers From Blood and Body Fluid Exposure in a Small Rural Hospital in Thabomofutsanyana, South Africa. *Workplace Health Saf* [Internet]. 2014;62(9):382–8. Available from: <http://www.healio.com.ezproxy.library.ubc.ca/nursing/journals/aaohn/2014-9-62-9/{1ac2d5bf-0edf-4963-8ceb-caf463a43e16}/reducing-the-risks-to-health-care-workers-from-blood-and-body-fluid-exposure-in-a-small-rural-hospital-in-thabo-mofutsanyana-south-a>
126. Guerra CM, Ramos MP, Penna VZ, Goto JM, Santi LQ, de Andrade Stempliuk V, et al. How to educate health care professionals in developing countries? A Brazilian experience. *Am J Infect Control* [Internet]. 2010 Aug [cited 2016 Mar 15];38(6):491–3. Available from: <http://www.sciencedirect.com/science/article/pii/S0196655309009481>
127. HPCSA Iregister [Internet]. Health Professions Council of South Africa. [cited 2016 Mar 20]. Available from: <http://isystems.hpcsa.co.za/iregister/>
128. Canadian Medical Association. Occupational Medicine Profile [Internet]. 2015 [cited 2016 Mar 20]. Available from: <https://www.cma.ca/Assets/assets-library/document/en/advocacy/Occupational-Medicine-e.pdf>
129. Afri-Can Forum: A special synchronicity forum of CHVI-funded African and Canadian

- HIV prevention and vaccine research teams. *Proceedings. Open Med. Open Medicine*; 2013;7(3).
130. Denis J, Lomas J, Stipich N. Creating receptor capacity for research in the health system: the Executive Training for Research Application (EXTRA) program in Canada. *J Heal Serv Res* ... [Internet]. 2008 [cited 2016 Apr 15]; Available from: [http://hsr.sagepub.com/content/13/suppl\\_1/1.short](http://hsr.sagepub.com/content/13/suppl_1/1.short)
  131. Glew RH. Promoting collaborations between biomedical scholars in the U.S. and sub-Saharan Africa. *Exp Biol Med (Maywood)* [Internet]. SAGE Publications; 2008 Mar 1 [cited 2016 Mar 15];233(3):277–85. Available from: <http://ebm.sagepub.com.ezproxy.library.ubc.ca/content/233/3/277.full>
  132. Eby LT, Allen TD, Evans SC, Ng T, Dubois D. Does Mentoring Matter? A Multidisciplinary Meta-Analysis Comparing Mentored and Non-Mentored Individuals. *J Vocat Behav* [Internet]. 2008 Apr [cited 2016 Mar 16];72(2):254–67. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2352144&tool=pmcentrez&rendertype=abstract>
  133. Baugh S, Scandura T. The effect of multiple mentors on protégé attitudes toward the work setting. *J Soc Behav* ... [Internet]. 1999 [cited 2016 Mar 21]; Available from: <http://search.proquest.com/openview/2e10e4127c887613ea61489af58ee255/1?pq-origsite=gscholar&cbl=1819046>
  134. Health promotion [Internet]. World Health Organization. World Health Organization; 2016 [cited 2016 Mar 20]. Available from: [http://www.who.int/topics/health\\_promotion/en/](http://www.who.int/topics/health_promotion/en/)
  135. Tones K, Robinson YK, Tilford S. *Health Education: Effectiveness and efficiency* [Internet]. Springer; 2013 [cited 2016 Mar 21]. 286 p. Available from: <https://books.google.com/books?hl=en&lr=&id=NA7yBwAAQBAJ&pgis=1>
  136. Canadian Institute for Health Information. *Developing a Model for Measuring the Efficiency of the Health System in Canada* [Internet]. Ottawa; 2012 [cited 2016 Mar 20]. Available from: [https://secure.cihi.ca/free\\_products/HS\\_Efficiency\\_Tech\\_Report\\_EN-](https://secure.cihi.ca/free_products/HS_Efficiency_Tech_Report_EN-)

web.pdf

137. Kim KM, Choi JS. Self-perceived competency of infection control nurses based on Benner's framework: a nationwide survey in Korea. *Appl Nurs Res* [Internet]. 2015 May [cited 2016 Mar 15];28(2):175–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25315139>
138. Winchcombe J. Competency standards in the context of infection control. *Am J Infect Control* [Internet]. 2000 Jun [cited 2016 Mar 15];28(3):228–32. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/10840342>
139. Murphy CL, McLaws M. Credentialing, diversity, and professional recognition-foundations for an Australian infection control career path. *Am J Infect Control* [Internet]. 1999 Jun [cited 2016 Mar 15];27(3):240–6. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/10358226>
140. Paulhus D. Measurement and control of response bias. 1991 [cited 2016 Mar 13]; Available from: <http://doi.apa.org/psycinfo/1991-97206-001>

# Appendices

## Appendix A. Recruitment brochure

### Why this Certificate Programme?

International efforts are underway to improve working conditions for health workers, including improving access of healthcare workers to HIV and TB prevention and care. Building capacity to design, implement and evaluate workplace-based interventions, especially among African healthcare workplaces in view of the scourge of HIV and drug-resistant TB is warranted. This programme is offered to meet this challenge.

**What will be the format?**

There are four interlinked components:

- Two web-based modules to introduce the basics of occupational health and infection control, along with on-going virtual seminars and e-interaction before and after the modules, as well as monthly;
- Three 4-day face-to-face workshops;
- Problem-based learning; and
- Conducting actual participatory action research projects in workplaces.



### What is the Course Content?

**The courses will cover :**

- Power relations and politics involved in workplace health research;
- Legislative frameworks, policies and program in occupational health - including the rights and obligations of employers and worker rights;
- Importance of health and safety committees and the role of unions;
- Basic overview of occupational health hazards (including focusing on infection control issues, stress, burnout, and various control measures);
- Basics of HIV and tuberculosis transmission, as well as prevention, diagnosis, treatment, care and support;
- Relevant WHO and ILO guidelines including policy guidelines on improving access of workers to HIV and tuberculosis prevention, treatment, care and support;
- Basic research designs including qualitative and quantitative research methods;
- Basic research methods focused on intervention evaluation;
- Social-cultural, gender and ethical issues as well as rights-based issues that must be addressed in the research process; and
- Budgets and timelines construction using logic framework analysis.



### What will programme graduates be able to do?

- Design, implement and evaluate workplace health policies, programmes and other prevention and care initiatives. Particularly those aimed at HIV and TB prevention and control – such as, TB infection control, prevention of occupational and non-occupational HIV, policies and programmes to prevent stigma and discrimination, encouraging counselling and testing, offering post-exposure prophylaxis, and timely treatment, and encouraging adherence.
- Be able to work with all the workplace parties, including unions, employers, government, health practitioners, and health and safety committees .
- Conduct workplace assessments to identify hazards in the workplace, assess risks, recommend appropriate control measures and formulate action plans.
- Advise and demonstrate appropriate use of personal protective equipment; and especially
- Demonstrate sensitivity to social, cultural, gender and ethical issues, as well as worker rights and human rights issues in conducting workplace-based intervention projects.



### Who are the ideal Students?

- active members (or prospective member) of a health and safety committee
- occupational health practitioners (physician or nurse) interested in acquiring greater skills in implementing and evaluating workplace HIV and TB programmes
- HIV, TB, infection control or other health practitioners interested in addressing the challenges of HIV and TB in the context of workplace
- union stewards with responsibility for HIV, TB and/or occupational health
- teachers or ethicists interested in these areas
- health science or social science researchers interested in conducting workplace-based research
- government decision-makers, human resource managers, or front-line supervisors
- enthusiastic people who want to make a difference!



### What are the Admission Criteria?

A university degree is NOT required. Applicants should be able to demonstrate that they have attributes consistent with those listed above, AND that they have their employer's or institution's support, if applicable. This is an interdisciplinary programme that should meet the needs of a variety of participants.

NOTE: Graduates of this programme will make strong health and safety representatives and occupational health or infection control practitioners. However, completing this course alone will NOT allow you to become accredited as an occupational health physician or occupational health nurse. (Please see the Diploma programmes for Occupational Physicians and Occupational Health Nurses, also offered at UFS).

### To Apply Send Application to:

**Michelle Engelbrecht**  
CHSR&D  
University of the Free State  
P.O. Box 339, L.B. 39  
Bloemfontein 9301

Deadline for applications is  
**January 15<sup>th</sup>, 2011.**

The programme will begin  
**March 2011.**

### Application Information

**Who is administering the programme?**

This is a joint offering by the Centre for Health Systems Research and Development (CHSR&D) and the Department of Community Health's Occupational Health Unit at UFS, working in collaboration with the Department of Computer Science at UFS, and the University of British Columbia in Canada. The three 4-day modules will be held at CHSR&D.

**Who will teach?**

Every module will be co-led by international interdisciplinary experts from Canada along with local experts from South Africa.

**How much will this cost?**

In the 2011 admission cycle, FULL SCHOLARSHIPS will be provided for 30 applicants who meet the criteria and are endorsed by their employer to attend the programme (if applicable).

**Will I be able to obtain Continuing Professional Development Points?**

Yes. Health professionals registered for CPD are supposed to accumulate 30 points per 12-month period of which at least 5 are for ethics, human rights and medical law. We are applying for this Certificate Programme to be awarded a full 30 points, of which 5 will indeed meet the ethics/human rights and medical law requirements, such that participation in this programme will meet the full annual CPD requirement.

**To Apply Send:**

- A letter indicating your interest in this programme, and, if possible, what workplace project you might want to conduct.
- A CV – indicating previous education and work experience.
- Up to three letters of support, including a letter from your supervisor at work, if applicable.
- Demonstration of institutional support is essential.

**Michelle Engelbrecht**  
CHSR&D  
University of the Free State  
P.O. Box 339, L.B. 39  
Bloemfontein 9301

Email: engelme@ufs.ac.za

**By when must I apply? And when will the course begin?**

Deadline for applications is  
**January 15<sup>th</sup>, 2011.**

The programme will begin  
**March 2011.**

**Implementation and Evaluation of Workplace-based Programmes for HIV & Tuberculosis Prevention & Care**

CERTIFICATE PROGRAM



**Centre for Health Systems Research & Development**



An international collaboration between the University of British Columbia, Canada and the University of the Free State, South Africa




IDRC \* CRD Funded by International Development Research Centre, Canada

**Appendix B. Certificate program photo**

Photo 1. Program participants at the graduation ceremony



## Appendix C. Questionnaires 1 - 5

### Baseline questionnaire for course evaluation (Q1)

As part of the Certificate Programme we would like to ask you to fill out this questionnaire to help us in the evaluation. You will also be asked to fill out other questionnaires during the course of the programme, all of which are important parts of its monitoring and evaluation.

This questionnaire is divided into four sections: 1) background information, 2) your own rating of your knowledge on topics that will be discussed in the course, 3) your assessment of your own comfort with various practices, and 4) your expectations of the course.

Your answers will remain confidential and will only be used to evaluate the programme.

**Participant PIN:** \_\_\_\_\_

#### Section 1

#### Background information

*Please circle the most correct response.*

1. Age group:  
a. Below 20      b. 20-29      c. 30-39      d. 40-49      e. 50-59      f. 60 or more
2. Have you ever participated in the design, implementation, or evaluation of a **programme at your workplace**?  
a. Yes      b. No
3. Have you received any **occupational health training**?  
a. Yes      b. No
4. Have you received any **infection prevention and control training**?

- a. Yes                      b. No
5. Have you received any **training specific to HIV**?
- a. Yes                      b. No
6. Have you received any **training specific to Tuberculosis**?
- a. Yes                      b. No

## Section 2 - Self-rated Knowledge

*Please circle the number that most reflects your assessment of your own knowledge:*

	1 Very Little	2 Little	3 OK	4 Good	5 Very Good
<b>a) <u>Occupational Health and Infection Control</u></b>					
1. Occupational health and safety hazards for health workers	1	2	3	4	5
2. How stress influences worker health	1	2	3	4	5
3. The procedures for reporting incidents at work (e.g. falls, needle stick injuries etc.)	1	2	3	4	5
4. How and when to use personal protective equipment	1	2	3	4	5
5. How and when to isolate a patient suspected of having an infectious disease such as tuberculosis (TB)	1	2	3	4	5
6. How to clean up blood or body fluid spills effectively and safely	1	2	3	4	5
7. How and when to clean your hands properly	1	2	3	4	5
<b>b) <u>HIV/AIDS</u></b>					
8. How HIV transmission can be prevented	1	2	3	4	5
9. How HIV is diagnosed	1	2	3	4	5
10. The role of anti-retroviral therapy (ART) for HIV	1	2	3	4	5

Please circle the number that most reflects your assessment of your own knowledge:

	1 Very Little	2 Little	3 OK	4 Good	5 Very Good
<b><i>c) Tuberculosis (TB)</i></b>					
11. How tuberculosis transmission can be prevented	1	2	3	4	5
12. How <b>active</b> tuberculosis is diagnosed	1	2	3	4	5
13. How <b>latent</b> tuberculosis is diagnosed	1	2	3	4	5
14. How tuberculosis is treated (including issues of drug resistance)	1	2	3	4	5
15. The impact of HIV/AIDS and tuberculosis on each other	1	2	3	4	5
<b><i>d) International guidelines related to HIV and TB in the healthcare workplace</i></b>					
16. World Health Organization guidelines on TB infection control	1	2	3	4	5
17. International Labour Office guidelines on HIV in the workplace	1	2	3	4	5
<b><i>e) Workplace health research in a health care setting.</i></b>					
18. Cultural and gender issues that may need to be addressed when conducting research	1	2	3	4	5
19. Ethical issues that need to be addressed when conducting research (including human rights and worker rights)	1	2	3	4	5
<b><i>e) Policy and Legislation</i></b>					
20. Legislative frameworks and policies in occupational health in South Africa	1	2	3	4	5
21. The rights and obligations of employers	1	2	3	4	5
22. The rights of workers regarding their health and safety	1	2	3	4	5
23. The role of health and safety committees	1	2	3	4	5

Please circle the number that most reflects your assessment of your own knowledge:

	1 Very Little	2 Little	3 OK	4 Good	5 Very Good
24. The union role with respect to worker health and safety	1	2	3	4	5

### Section 3: Self-rated Comfort with Practice

Please circle the number corresponding to your level of comfort in performing the following activities

	1 Very Low	2 Low	3 OK	4 High	5 Very high
<b>a) <u>Occupational Health and Infection Control</u></b>					
1. Conduct workplace assessments to identify hazards in the workplace	1	2	3	4	5
2. Recommend appropriate control measures	1	2	3	4	5
3. Advise and demonstrate appropriate use of personal protective equipment	1	2	3	4	5
4. Formulate an action plan to address unsafe practises	1	2	3	4	5
<b>b) <u>Research</u></b>					
5. To evaluate an intervention	1	2	3	4	5
6. To conduct focus groups	1	2	3	4	5
7. To conduct key informant interviews	1	2	3	4	5
8. To collect data through questionnaires	1	2	3	4	5
9. To analyze the results of focus groups and interviews	1	2	3	4	5
10. To perform any statistical analysis of quantitative data	1	2	3	4	5
11. To interact with various workplace parties (senior management, front-line workers, and their unions) in the context of workplace health research	1	2	3	4	5

*Please circle the number corresponding to your level of comfort in performing the following activities*

	1 Very Low	2 Low	3 OK	4 High	5 Very high
12. To construct a budget	1	2	3	4	5
13. To construct a timeline	1	2	3	4	5
14. To use logical framework analysis to structure a project	1	2	3	4	5

## Section 4

### Expectations of the course

1. What are your expectations from the course?

---

---

---

---

2. Please name 3 things that you think are most important to address in this course:

a) 

---

---

b) 

---

---

c) 

---

---

### Comments

If you have any comments or suggestions about the evaluation, or about the Programme, please use the space provided below.

---

---

---

---

Thank you for your time and your answers.

## **Pre-module questionnaire for course evaluation (Q2)**

This short questionnaire is part of the evaluation of the first module of the course. It is divided into four sections: 1) knowledge, 2) attitudes and, 3) reactions to pre-course material 4) additional questions.

Please answer as accurately as possible to ensure a just evaluation.

Your answers will remain confidential and will only be used to evaluate the programme.

**Participant PIN:** \_\_\_\_\_

### Section 1 - Knowledge

*True or False: Please circle the correct answer.*

1. It is the responsibility of the employer to decide if a health and safety committee is needed in the workplace.  
a. True                      b. False
2. If you see a used needle lying around, you should re-cap it and dispose of it promptly.  
a. True                      b. False
3. HIV and AIDS are the same thing.  
a. True                      b. False
4. If you have TB you are more likely to get HIV.  
a. True                      b. False
5. You should use a medical mask to protect yourself from TB unless the person you are caring for has multiple drug resistant TB, in which case you need to use an N95 respirator.  
a. True                      b. False
6. If you have HIV you should be treated for latent tuberculosis even if you do not have active TB.

a. True                      b. False

7. You can only get TB if you have HIV or have poor nutrition.

a. True                      b. False

8. Privacy and confidentiality are different.

a. True                      b. False

## Section 2 - Attitudes

*Please rate how much you agree or disagree with the following statement:*

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree
1. It is important to implement HIV/AIDS voluntary counselling and testing (VCT) as part of routine occupational health and safety activities	1	2	3	4	5
2. Health workers with HIV/AIDS should have equal opportunity to be promoted to higher positions	1	2	3	4	5
3. I am equally comfortable working with a colleague that is HIV positive as with any other colleague	1	2	3	4	5
4. Health workers with HIV/AIDS should receive priority access to treatment and care services	1	2	3	4	5
5. Health workers with tuberculosis should receive priority access to treatment and care services	1	2	3	4	5
6. I believe HIV/AIDS stigma is the most significant barrier for health workers' access to testing, treatment or care	1	2	3	4	5

Please rate how much you agree or disagree with the following statement:

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree
7. If, as a health professional, I learn that a worker's health may be putting patients at risk, I would tell his supervisor if the worker refuses to do so	1	2	3	4	5
8. Asking healthcare workers to complete questionnaires during their breaks is better than interfering with their work	1	2	3	4	5

### Section 3 - Reactions to pre-course material

For each of the following components of the module, please rate your reactions.

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree
<b>a. <u>Pre-course documentation</u></b>					
1. I was provided with enough information to answer the questions I have about the course.	1	2	3	4	5
2. The learning goals of this course are clear	1	2	3	4	5
<b>b. <u>Readings</u></b>					
3. The readings were easy to understand	1	2	3	4	5
4. I will be able to use the content of these readings	1	2	3	4	5
5. I would recommend these readings to a colleague	1	2	3	4	5

## Section 4 - Supplemental questions

Please rate your comfort:

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor	4. Agree	5. Strongly Agree
1. On the use of excel	1	2	3	4	5
2. On the use of <i>Occupational Health and Safety Information Systems (OHASIS)</i>	1	2	3	4	5

### Comments

If you have any comments or suggestions about the evaluation, or about the Programme, please use the space provided below.

---



---



---



---



---



---

Thank you for your time and your answers.

## ■ Post-module questionnaire for course evaluation (Q3)

This questionnaire is part of the evaluation of the first module of the course. It is divided into 6 sections. The first section assesses your reaction to the module, the second and third sections assess your knowledge and attitudes respectively, the fourth section contains additional questions and, the fourth and fifth sections assess your self-rated knowledge and self-rated comfort with practice. **You will find that Sections 2-6 are repeats from the questions we asked you previously – so that we can see how the course influenced your responses.**

Your answers will remain confidential and will only be used to evaluate the programme.

**Participant PIN:** \_\_\_\_\_

### Section 1 - Reactions

Reactions are divided into 3 sections: a) presentations, b) problem exercises, c) reflections and discussion, and d) overall module.

*For each of the following components of the module, please rate your reactions:*

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree
<b>a) <u>Presentations</u></b>					
6. The presentations were clear (understandable)	1	2	3	4	5
7. I will be able to use the information provided in the future	1	2	3	4	5

For each of the following components of the module, please rate your reactions:

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree
<b><i>b) Problem exercises</i></b>					
8. The exercises were at the appropriate level for me	1	2	3	4	5
9. I learned skills that I will be able to use	1	2	3	4	5
<b><i>c) Reflections and discussion (at the beginning and end of every day)</i></b>					
10. Reflection and discussion time was useful	1	2	3	4	5
11. There was enough time allocated for reflection and discussion	1	2	3	4	5
<b><i>d) Module overall</i></b>					
12. I liked the format of the module (i.e. presentations, problem exercises, reflection and discussion)	1	2	3	4	5
13. I will be able to use the information I learned	1	2	3	4	5

Has the course addressed your expectations?

Yes    No

If you answered “No,” what should have been done to have addressed your expectations?

---



---



---

If you could change the course, what would you have done differently?

---



---



---

What content should future courses include that was not covered in the present course?

---

---

---

## Section 2 - Knowledge

*True or False: Please circle the correct answer.*

8. It is the responsibility of the employer to decide if a health and safety committee is needed in the workplace.
- a. True                      b. False
9. If you see a used needle lying around, you should re-cap it and dispose of it promptly.
- a. True                      b. False
10. HIV and AIDS are the same thing.
- a. True                      b. False
11. If you have TB you are more likely to get HIV.
- a. True                      b. False
12. You should use a medical mask to protect yourself from TB unless the person you are caring for has multiple drug resistant TB, in which case you need to use an N95 respirator.
- a. True                      b. False
13. If you have HIV you should be treated for latent tuberculosis even if you do not have active TB.
- a. True                      b. False
14. You can only get TB if you have HIV or have poor nutrition.
- a. True                      b. False
8. Privacy and confidentiality are different.
- a. True                      b. False

### Section 3 - Attitudes

Please rate how much you agree or disagree with the following statement:

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree
9. It is important to implement HIV/AIDS voluntary counselling and testing (VCT) as part of routine occupational health and safety activities	1	2	3	4	5
10. Health workers with HIV/AIDS should have equal opportunity to be promoted to higher positions	1	2	3	4	5
11. I am equally comfortable working with a colleague that is HIV positive as with any other colleague	1	2	3	4	5
12. Health workers with HIV/AIDS should receive priority access to treatment and care services	1	2	3	4	5
13. Health workers with tuberculosis should receive priority access to treatment and care services	1	2	3	4	5
14. I believe HIV/AIDS stigma is the most significant barrier for health workers' access to testing, treatment or care	1	2	3	4	5

Please rate how much you agree or disagree with the following statement:

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree
15. If, as a health professional, I learn that a worker's health may be putting patients at risk, I would tell his supervisor if the worker refuses to do so	1	2	3	4	5
16. Asking healthcare workers to complete questionnaires during their breaks is better than interfering with their work	1	2	3	4	5

## Section 4 - Additional questions

Please rate your comfort:

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree
3. On the use of excel	1	2	3	4	5
4. On the use of <i>Occupational Health and Safety Information Systems (OHASIS)</i>	1	2	3	4	5

## Section 5 - Self-rated Knowledge

Please circle the number that most reflects your assessment of your own knowledge:

	1. Very Little	2. Little	3. OK	4. Good	5. Very Good
<b>f) <u>Occupational Health and Infection Control</u></b>					
25. Occupational health and safety hazards for health workers	1	2	3	4	5
26. How stress influences worker health	1	2	3	4	5
27. The procedures for reporting incidents at work (e.g. falls, needle stick injuries etc.)	1	2	3	4	5
28. How and when to use personal protective equipment	1	2	3	4	5
29. How and when to isolate a patient suspected of having an infectious disease such as tuberculosis (TB)	1	2	3	4	5
30. How to clean up blood or body fluid spills effectively and safely	1	2	3	4	5
31. How and when to clean your hands properly	1	2	3	4	5
<b>g) <u>HIV/AIDS</u></b>					
32. How HIV transmission can be prevented	1	2	3	4	5
33. How HIV is diagnosed	1	2	3	4	5
34. The role of anti-retroviral therapy (ART) for HIV	1	2	3	4	5
<b>h) <u>Tuberculosis (TB)</u></b>					

Please circle the number that most reflects your assessment of your own knowledge:

	1. Very Little	2. Little	3. OK	4. Good	5. Very Good
35. How tuberculosis transmission can be prevented	1	2	3	4	5
36. How <b>active</b> tuberculosis is diagnosed	1	2	3	4	5
37. How <b>latent</b> tuberculosis is diagnosed	1	2	3	4	5
38. How tuberculosis is treated (including issues of drug resistance)	1	2	3	4	5
39. The impact of HIV/AIDS and tuberculosis on each other	1	2	3	4	5
<b><i>i) <u>International guidelines related to HIV and TB in the healthcare workplace</u></i></b>					
40. World Health Organization guidelines on TB infection control	1	2	3	4	5
41. International Labour Office guidelines on HIV in the workplace	1	2	3	4	5
<b><i>e) <u>Workplace health research in a health care setting.</u></i></b>					
42. Cultural and gender issues that may need to be addressed when conducting research	1	2	3	4	5
43. Ethical issues that need to be addressed when conducting research (including human rights and worker rights)	1	2	3	4	5
<b><i>j) <u>Policy and Legislation</u></i></b>					
44. Legislative frameworks and policies in occupational health in South Africa	1	2	3	4	5
45. The rights and obligations of employers	1	2	3	4	5
46. The rights of workers regarding their health and safety	1	2	3	4	5
47. The role of health and safety committees	1	2	3	4	5

Please circle the number that most reflects your assessment of your own knowledge:

	1. Very Little	2. Little	3. OK	4. Good	5. Very Good
48. The union role with respect to worker health and safety	1	2	3	4	5

## Section 6: Self-rated Comfort with Practice

Please circle the number corresponding to your level of comfort in performing the following activities

	1. Very Low	2. Low	3. OK	4. High	5. Very high
<b>c) <u>Occupational Health and Infection Control</u></b>					
15. Conduct workplace assessments to identify hazards in the workplace	1	2	3	4	5
16. Recommend appropriate control measures	1	2	3	4	5
17. Advise and demonstrate appropriate use of personal protective equipment	1	2	3	4	5
18. Formulate an action plan to address unsafe practises	1	2	3	4	5
<b>d) <u>Research</u></b>					
19. To evaluate an intervention	1	2	3	4	5
20. To conduct focus groups	1	2	3	4	5
21. To conduct key informant interviews	1	2	3	4	5
22. To collect data through questionnaires	1	2	3	4	5

Please circle the number corresponding to your level of comfort in performing the following activities

	1. Very Low	2. Low	3. OK	4. High	5. Very high
23. To analyze the results of focus groups and interviews	1	2	3	4	5
24. To perform any statistical analysis of quantitative data (e.g. calculating odds ratios)	1	2	3	4	5
25. To interact with various workplace parties (senior management, front-line workers, and their unions) in the context of workplace health research	1	2	3	4	5
26. To construct a budget	1	2	3	4	5
27. To construct a timeline	1	2	3	4	5
28. To use logical framework analysis to structure a project	1	2	3	4	5

## Comments

If you have any comments or suggestions about the evaluation, or about the Programme, please use the space provided below.

---



---



---



---

Thank you for your time and your answers.

## ■ Post-module questionnaire for course evaluation

**(Q4)**

Module 2 : Sept 6th to 9th 2011

The following questionnaire is part of the ongoing monitoring and evaluation of the certificate program. It is divided into two sections, the first assesses your reactions using a rating scale out of 5. The second asks for more details about your experience in the Certificate Programme to date and seeks to find the successes and potential improvements for the course.

**Participant PIN:** \_\_\_\_\_

### Section 1 - Reactions (rating)

Reactions are divided into two sections: I) Midterm period and II) Module 2.  
The midterm period refers to the time between Module 1 and Module 2.  
Module 2 refers to the current contact session.

*For each of the following components, please rate your reactions:*

1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree	Not Applicable
----------------------	-------------	-------------------------------	----------	-------------------	----------------

#### **Midterm Period (working with your group and mentors BEFORE the module)**

**a) Work with your group (if applicable)**

*Please leave blank if you are working by yourself*

1. It is helpful to be doing this project with other group members.	1	2	3	4	5	na
2. It would be easier to be doing this project without having to meet with others in the group.	1	2	3	4	5	na
3. The work was divided fairly between the group members.	1	2	3	4	5	na
4. Everybody contributed to the project the best they could.	1	2	3	4	5	na
5. I contributed to the project as best I could.	1	2	3	4	5	na

Reactions are divided into two sections: I) Midterm period and II) Module 2. The midterm period refers to the time between Module 1 and Module 2. Module 2 refers to the current contact session.

For each of the following components, please rate your reactions:

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree	Not Applicable
<b><i>b) Support from employer and others</i></b>						
6. I have support from my employer to conduct this project.	1	2	3	4	5	na
7. I am able to make the time to conduct this project.	1	2	3	4	5	na
8. Most people in my workplace support this project.	1	2	3	4	5	na
9. I have support from my union to conduct this project.	1	2	3	4	5	na
<b><i>Work with your mentors and the UBC grad students</i></b>						
10. I asked help from the mentors when needed.	1	2	3	4	5	na
11. Working with the mentors has been useful to me.	1	2	3	4	5	na
12. The mentors provided me with as much help as I needed.	1	2	3	4	5	na
13. I had trouble contacting mentors because I have no internet access	1	2	3	4	5	na
14. It was useful to have had the visits from the UBC grad students	1	2	3	4	5	na
<b><i>Module 2 (contact session)</i></b>						
<b><i>Presentations by MENTORS</i></b>						
15. The presentations were clear (understandable).	1	2	3	4	5	na
16. I will be able to use the information provided for my project.	1	2	3	4	5	na
<b><i>Presentations by PARTICIPANTS</i></b>						
17. Presenting our project to the mentors and other participants was useful to me.	1	2	3	4	5	na

Reactions are divided into two sections: I) Midterm period and II) Module 2.  
 The midterm period refers to the time between Module 1 and Module 2.  
 Module 2 refers to the current contact session.

*For each of the following components, please rate your reactions:*

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree	Not Applicable
18. Seeing the other groups present was useful to me.	1	2	3	4	5	na
19. All group members should present, not just one person	1	2	3	4	5	na
<b><u>Working with the MENTORS</u></b>						
20. Working with the mentors has been useful to me.	1	2	3	4	5	na
21. The mentors provided me with as much help as I needed.	1	2	3	4	5	na
22. I am satisfied by the changes in my project suggested by my mentors.	1	2	3	4	5	na
23. I would like mentors to let me work on my own more (e.g. letting you do your own powerpoint presentations)	1	2	3	4	5	na
<b><u>Module overall</u></b>						
24. I gained additional knowledge during this module	1	2	3	4	5	na
25. I acquired additional skills during this module	1	2	3	4	5	na
26. Overall, the module has been useful to me.	1	2	3	4	5	na
27. I would recommend the same format (Module 2) be used for a future Certificate Programme (i.e. presentations by groups, presentations by mentors, work with mentors, presentations by groups again).	1	2	3	4	5	na
28. I am ready to start implementing my project.	1	2	3	4	5	na

## Section 2 - Reactions (details)

1. Have all the members in your group contributed equally to project?  
Please provide detail.

---

---

---

---

---

2. Please explain how you think the mentors could have been more helpful during **midterm period** (between Module 1 and Module 2) (we know nobody is perfect!!).

*For example, providing you with more literature or more tools, meeting with you more often, giving you more direction.*

---

---

---

---

3. Please explain how you think the mentors could have been more helpful **during this module**.

---

---

---

---

---

4. Are you ready to start implementing your projects? Please explain why or why not.

---

---

---

---

5. Were you able to express your ideas for the project with your group and were you ideas considered fairly by your group? Please provide details.

---

---

---

---

6. Has the work you were expected to do until now been clear to you?  
What could we have done to make it clearer?

---

---

---

7. Are there topics that should have been covered more thoroughly or other skills that you would like to have developed? (e.g. learning to use powerpoint, other skills?)

---

---

---

8. If there were another Certificate programme, how can we improve the approach?

---

---

---

## **Comments**

Please include any further comments you may have (if any).

---

---

---

**Thank you, Re a leboha, Dankie!**

## ■ Certificate Programme

### ■ Post-programme evaluation (Q5)

May 16th, 2012

This questionnaire is part of the evaluation of the 3<sup>rd</sup> module of the course and the overall programme. After each section, there is space to write comments, please use this space for any thoughts you may have concerning the programme.

The rest of the questionnaire assesses your knowledge, attitudes and self-reported comfort with practice. These will be the same questions that were asked in the first module of the course.

Your answers will remain confidential and will only be used to evaluate the programme.

**Participant PIN:** \_\_\_\_\_

### Section 1 - Reactions

Reactions are divided into 3 sections: a) *Module 3*, b) *Mentors*, and c) *Group project and Certificate Programme*.

*For each of the following components, please rate your reactions:*

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree
<b>e) <u>Module 3</u></b>					
14. The module was well organized (given the time constraints).	1	2	3	4	5
15. I would recommend using the “Stigma tool kit” exercise again.	1	2	3	4	5

For each of the following components, please rate your reactions:

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree
16. I would recommend using the “TB screening, diagnosis and treatment protocols for health workers: challenges and tools” exercise again.	1	2	3	4	5
17. Please provide comments for questions from 1 – 3:					
<b>f) <u>Mentors (please consider the period between modules as well as during the modules)</u></b>					
18. The mentors made themselves available enough to work with my group.	1	2	3	4	5
19. I would like to work with the same team of mentors again.	1	2	3	4	5
20. Having the perspective of different mentors was useful.	1	2	3	4	5
21. I found it beneficial to have guest speakers/mentors from the <u>national level</u> .	1	2	3	4	5
22. The mentors took <u>too</u> active a role instead of letting the groups manage for themselves.	1	2	3	4	5
23. I would have acquired more skills if I were “driving” the powerpoint, instead of the mentors or someone else from the group doing this.	1	2	3	4	5
24. The input of the mentors was the right balance between “being directive” and “providing useful suggestions.”	1	2	3	4	5

For each of the following components, please rate your reactions:

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree
25. Please provide comments for questions from 5 – 11 :					
<b>g) <u>Group project and Certificate Programme</u></b>					
26. My project was beneficial to my own learning.	1	2	3	4	5
27. My project was beneficial to my workplace.	1	2	3	4	5
28. I would recommend this programme to my colleagues.	1	2	3	4	5
29. I would like to continue working on my project now that the certificate programme is done.	1	2	3	4	5
30. The Certificate Programme was too difficult for me.	1	2	3	4	5
31. The Certificate Programme required too much work.	1	2	3	4	5
32. I had enough tools/resources to conduct my project.	1	2	3	4	5
33. We should have had specific pass/fail criteria for all participants (specific expectations that if are not fulfilled may lead to not receiving the certificate for the course).	1	2	3	4	5
34. The Certificate Programme had too many participants.	1	2	3	4	5
35. If the programme is offered again, I would recommend that the groups not be larger than 4 people.	1	2	3	4	5

For each of the following components, please rate your reactions:

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree
36. If the programme is offered again, we should have regular meetings scheduled between the groups and the mentors during the programme that are compulsory to attend.	1	2	3	4	5
37. If you agree that regular meetings should take place, how often should these take place? (circle one) a) Every week                      c) Every 3 weeks b) Every 2 weeks                  d) Every month                  e) Other:					
38. Please provide comments for questions from 13 – 24:					

### Additional questions

Please provide as much detail as you can. If you cannot think of anything right away, please take time to think about it.

39. What is the most important thing that you have learned in this programme (please be as precise as you can)?

---



---



---



---

40. Will you use most of the knowledge and skills that you have learned?

Circle: **YES**    **NO**

- a. If **YES**, which skills will you use and how will you make use of these (please be precise as you can)?

---

---

---

---

---

41. Do you think your project was successful?

Circle: **YES**    **NO**

- a. Please explain why

---

---

---

42. If you could change the course, what would you have done differently?

---

---

---

---

- a. What would you add?

---

---

---

---

- b. What would you remove?

---

---

---

---

**43. Comments**

*Please provide any comments you may have about your reactions to the programme.*

---

---

---

---

## Section 2 - Knowledge

*True or False: Please circle the correct answer.*

44. It is the responsibility of the employer to decide if a health and safety committee is needed in the workplace.

a. True            b. False

45. If you see a used needle lying around, you should re-cap it and dispose of it promptly.

a. True            b. False

46. HIV and AIDS are the same thing.

a. True            b. False

47. If you have TB you are more likely to get HIV.

a. True            b. False

48. You should use a medical mask to protect yourself from TB unless the person you are caring for has multiple drug resistant TB, in which case you need to use an N95 respirator.

a. True            b. False

49. If you have HIV you should be treated for latent tuberculosis even if you do not have active TB.

a. True            b. False

50. You can only get TB if you have HIV or have poor nutrition.

a. True            b. False

51. Privacy and confidentiality are different.

a. True            b. False

### Section 3 - Attitudes

Please rate how much you agree or disagree with the following statement:

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree
52. It is important to implement HIV/AIDS voluntary counselling and testing (VCT) as part of routine occupational health and safety activities	1	2	3	4	5
53. Health workers with HIV/AIDS should have equal opportunity to be promoted to higher positions	1	2	3	4	5
54. I am equally comfortable working with a colleague that is HIV positive as with any other colleague	1	2	3	4	5
55. Health workers with HIV/AIDS should receive priority access to treatment and care services	1	2	3	4	5
56. Health workers with tuberculosis should receive priority access to treatment and care services	1	2	3	4	5
57. I believe HIV/AIDS stigma is the most significant barrier for health workers' access to testing, treatment or care	1	2	3	4	5
58. If, as a health professional, I learn that a worker's health may be putting patients at risk, I would tell his supervisor if the worker refuses to do so	1	2	3	4	5
59. Asking healthcare workers to complete questionnaires during their breaks is better than interfering with their work	1	2	3	4	5

**60. Comments**

*Please provide any comments you may have concerning the “Attitudes” section.*

---



---



---

**Section 4 - Additional questions**

*Please rate your comfort:*

	1. Strongly Disagree	2. Disagree	3. Neither Agree nor Disagree	4. Agree	5. Strongly Agree
61. On the use of excel	1	2	3	4	5
62. On the use of <i>Occupational Health and Safety Information Systems (OHASIS)</i>	1	2	3	4	5

**Section 5 - Self-rated Knowledge**

*Please circle the number that most reflects your assessment of your own knowledge:*

	1. Very Little	2. Little	3. OK	4. Good	5. Very Good
<b>k) <u>Occupational Health and Infection Control</u></b>					

Please circle the number that most reflects your assessment of your own knowledge:

	1. Very Little	2. Little	3. OK	4. Good	5. Very Good
63. Occupational health and safety hazards for health workers	1	2	3	4	5
64. How stress influences worker health	1	2	3	4	5
65. The procedures for reporting incidents at work (e.g. falls, needle stick injuries etc.)	1	2	3	4	5
66. How and when to use personal protective equipment	1	2	3	4	5
67. How and when to isolate a patient suspected of having an infectious disease such as tuberculosis (TB)	1	2	3	4	5
68. How to clean up blood or body fluid spills effectively and safely	1	2	3	4	5
69. How and when to clean your hands properly	1	2	3	4	5
<b><i>l) HIV/AIDS</i></b>					
70. How HIV transmission can be prevented	1	2	3	4	5
71. How HIV is diagnosed	1	2	3	4	5
72. The role of anti-retroviral therapy (ART) for HIV	1	2	3	4	5
<b><i>m) Tuberculosis (TB)</i></b>					
73. How tuberculosis transmission can be prevented	1	2	3	4	5
74. How <b>active</b> tuberculosis is diagnosed	1	2	3	4	5
75. How <b>latent</b> tuberculosis is diagnosed	1	2	3	4	5
76. How tuberculosis is treated (including issues of drug resistance)	1	2	3	4	5
77. The impact of HIV/AIDS and tuberculosis on each other	1	2	3	4	5

Please circle the number that most reflects your assessment of your own knowledge:

	1. Very Little	2. Little	3. OK	4. Good	5. Very Good
<b><i>n) <u>International guidelines related to HIV and TB in the healthcare workplace</u></i></b>					
78. World Health Organization guidelines on TB infection control	1	2	3	4	5
79. International Labour Office guidelines on HIV in the workplace	1	2	3	4	5
<b><i>e) <u>Workplace health research in a health care setting</u></i></b>					
80. Cultural and gender issues that may need to be addressed when conducting research	1	2	3	4	5
81. Ethical issues that need to be addressed when conducting research (including human rights and worker rights)	1	2	3	4	5
<b><i>o) <u>Policy and Legislation</u></i></b>					
82. Legislative frameworks and policies in occupational health in South Africa	1	2	3	4	5
83. The rights and obligations of employers	1	2	3	4	5
84. The rights of workers regarding their health and safety	1	2	3	4	5
85. The role of health and safety committees	1	2	3	4	5
86. The union role with respect to worker health and safety	1	2	3	4	5

### 87. Comments

Please provide any comments you may have concerning the "Knowledge" section.

---



---



---

## Section 6: Self-rated Comfort with Practice

Please circle the number corresponding to your level of comfort in performing the following activities

	1. Very Low	2. Low	3. OK	4. High	5. Very high
<b>e) <u>Occupational Health and Infection Control</u></b>					
88. Conduct workplace assessments to identify hazards in the workplace	1	2	3	4	5
89. Recommend appropriate control measures	1	2	3	4	5
90. Advise and demonstrate appropriate use of personal protective equipment	1	2	3	4	5
91. Formulate an action plan to address unsafe practises	1	2	3	4	5
<b>f) <u>Research</u></b>					
92. Evaluate an intervention	1	2	3	4	5
93. Conduct focus groups	1	2	3	4	5
94. Conduct key informant interviews	1	2	3	4	5
95. Collect data through questionnaires	1	2	3	4	5
96. Analyze the findings of focus groups and interviews	1	2	3	4	5
97. Perform any statistical analysis of quantitative data (e.g. calculating odds ratios)	1	2	3	4	5

Please circle the number corresponding to your level of comfort in performing the following activities

	1. Very Low	2. Low	3. OK	4. High	5. Very high
98. Interact with various workplace parties (senior management, front-line workers, and their unions) in the context of workplace health research	1	2	3	4	5
99. Construct a budget	1	2	3	4	5
100. Construct a timeline	1	2	3	4	5
101. Use logical framework analysis to structure a project	1	2	3	4	5

## Comments

102. If you have any other comments or suggestions about the “Practice” section, the evaluation, or about the Programme, please use the space provided below.

---



---



---



---



---



---

Thank you for your time and your answers.

Re a leboha, Dankie!

## **Appendix D. Interview Guides (mid-program, post-program, mentors)**

Mid-term progress interviews

M&E – Certificate Programme

PIN: \_\_\_\_\_

Date: \_\_\_\_\_

1. What were your expectations and objectives when you decided to join this programme?
  
2. Is this programme meeting these expectations/learning objectives? Why or why not?
  
3. What did you find the most useful? (e.g. what is the one thing that you think will impact your practice most). And why? What did you find least useful? And why?
  
4. Do you feel you are benefiting adequately from this training programme? Why or why not?
  
5. Have you had enough time to manage working on your projects and attending the contact sessions? If not, please explain or offer suggestions as to what could be, or have been, done differently.
  
6. Is your participation in this programme helping or hindering your relationships in the workplace, either with management or colleagues? Explain

7. What have been the major barriers to successfully planning and starting your project?  
How can these barriers be prevented in the future?

8. Do you want us to add another face-to-face session between now and the end of the programme? If so, what would you want it to focus on? When would be a good time to have it?

9. What can be done to improve the certificate programme? With respect to mentor involvement, face-to-face sessions, project planning, management involvement, Canadian involvement, CHSR&D involvement?

10. What other comments would you like to add?

PIN: \_\_\_\_\_

Date: \_\_\_\_\_

1. Can you tell me about the impact the programme has had on your:

- 1.1. practice

---

---

- 1.2. attitudes

---

---

2. Can you comment on the strengths of the programme:

---

---

- 2.1. modules

---

---

- 2.2. project

---

---

3. Can you comment on the weaknesses of the programme:

---

---

- 3.1. modules

---

---

- 3.2. project

---

---

4. How comfortable would you be if asked to design, implement and evaluated an intervention in the workplace?

---

---

---

5. How comfortable would you be conduct research in a workplace?

---

---

---

6. If the Certificate Programme repeated, what would you recommend be changed, added or removed?

---

---

---

Date: \_\_\_\_\_

1. Can you comment on the strengths and weaknesses of participants?

- 1.1. Strengths:

---

---

- 1.2. Weaknesses:

---

---

2. Can you comment on the general strengths of the programme?

---

---

- 2.1. Modules

---

---

- 2.2. Projects

---

---

3. Can you comment on the general weaknesses of the programme?

---

---

- 3.1. Modules

---

---

- 3.2. Projects

---

---

4. What are your thoughts on the impact of the programme, if any:

---

---

- 4.1. For participants

---

---

- 4.2. For the workplaces:

---

---

5. If we have another certificate programme, what changes would recommend?

---

---

---

6. Can you comment on working with the South African – Canadian collaboration?

---

---

- 6.1. Advantages

---

---

- 6.2. Disadvantages

---

---

## Appendix E. Group abstracts

### (Group 1) Improving utilisation of workplace HIV and AIDS programme for healthcare workers at Pelonomi Hospital

N Brandsel, M Ntlola, N Myeko, F Tlhapuletsa

#### Background

From January to May 2011, of the 1900 healthcare workers (HCWs) that use the free occupational health service (OHS) at Pelonomi hospital, only 121 accessed the service for HIV counselling and testing (HCT). In contrast, 568 accessed it for Hepatitis B immunisation. Since November 2011, OHS offers a comprehensive HIV and AIDS program where HCT, routine monitoring of CD4 counts, drug readiness and initiation of treatment is offered. Thus, in keeping with the joint WHO- ILO- UNAIDS guidelines on *Improving Health Workers Access to HIV and TB prevention, treatment, care and support services*, the aim of this study was to improve the utilisation of the workplace HIV and AIDS programme at the OHS.

#### Objectives

This study aimed to understand why the OHS is under-utilised for the HIV and AIDS program in order to determine what can be done to improve the service.

#### Methods

This ethically approved study used self-completed questionnaires consisting of both closed and open-ended questions. The questionnaire was piloted, translated and back translated before distribution to a stratified sample of HCWs representing all categories of occupation, sex, race and age. A total of 18.1% of Pelonomi's HCWs completed the survey.

#### Results

Asked if a boss found out the status of a HCW, 37% felt their boss would be supportive, encourage them to get treatment (28.9%) and follow all procedures to protect themselves (18%). The majority (82.2%) knew where the OHS unit is located and 69.6% knew its operating times. More than half (57.6%) knew that HIV treatment is available at the OHS unit. Most (71.3%) agreed that occupational health (OH) practitioners are well trained to offer HCT, while 70.4% agreed that OH practitioners encourage people to use the OHS unit for HIV and AIDS services. The majority (71.2%) believed that confidentiality is maintained at the OHS unit most or all of the time. When asked what factors explain why HCWs do not access HIV services at OHS unit, most stated that they feared that confidentiality will not be maintained (37.3%), while 28.6% said the reasons listed were not applicable. Other reasons included not being given enough time during the work day (20.6%), concern that the service is not free (7%), and a misperception that anti-retroviral treatment is not provided (6%). Nearly two-thirds (62.9%) do not believe that there is stigma in the workplace often or at all. When asked what could be done to reduce stigma, more training through workshops by OHS staff for health workers, and support through support groups were the most common answers.

#### Conclusions and Recommendations

HCWs may be under-utilising OH services due to fear of being stigmatised, fear of breach of confidentiality, lack of knowledge of the HIV and AIDS programme, misconceptions and attitudes towards the OHS service and HIV and AIDS programme, and a misperception between policies and their implementation. Thus, more education, training and development of HCWs and OHS staff, awareness about the unit, a greater emphasis on ethical principles such as confidentiality and better links between OHS and employee assistance programme services may improve utilisation of the OHS.

## **(Groups 2 & 3) Reducing the risk of DOTS supporters acquiring TB during home visits in Bloemfontein and Welkom**

N Nyembe, N Jacobs and D Mofokeng

### **Background and Objectives**

Healthcare workers have an increased risk of acquiring TB disease compared to the general population and the risk is even higher for those that are co-infected with HIV. Heavy exposure to TB disease also increases the likelihood of TB infection. Infection prevention and control measures greatly reduce the risk of TB transmission and the implementation of effective strategies can improve TB awareness. The introduction of the primary health care re-engineering programme emphasises the increasing role of community health workers in healthcare provision and the necessity of TB infection control (IC) measures in the household and community setting. The objectives of this study were to:

- Identify possible risk factors for TB among DOTS supporters
- Identify and assess strategies used by DOTS supporters to reduce TB transmissions
- Assess the impact of the training intervention on TB prevention and control strategies adopted by DOTS supporters

### **Methods**

This study adopted a pre and post intervention research design. The DOTS supporters were purposively sampled from local non-governmental organisations (NGOs) in Bloemfontein and Welkom. In total, 23 respondents, ten and 13 respondents respectively from Motheo and Lejweleputswa participated in the study. Face to face interviews were conducted with DOTS supporters using a structured questionnaire. A personal protective equipment tool was completed during visits with TB patients. The intervention was a two-day training session, designed using pre-test questionnaire results and existing materials. Data were captured and analysed using SPSS.

### **Results and Discussion**

All respondents were female and older than 30 years. Although levels of knowledge, attitudes and beliefs regarding TB IC were higher in Motheo than Lejweleputswa, there was an overall improvement in levels of knowledge, attitudes beliefs regarding TB IC after the intervention. Administrative controls and use of personal protective equipment was lacking. Personal risk reduction measures such as vaccinations and IPT were not being accessed or deemed necessary. Although DOTS supporters had access to HIV and AIDS testing and treatment services, they could not relocate jobs when assisting active TB patients. When assisting MDR and XDR TB patients, N95 respirators were not available for protection. Health and safety problems were being reported to coordinators but no follow-up was provided on these. Observations made during the audit included washing of hands whilst wearing gloves and not knowing the sequence of removing personal protective equipment.

### **Conclusion and Recommendations**

TB infection control guidelines for households and community settings as well as training for the NGO sector is needed, especially for those organisations that are responsible for DOT supporters in the community. DOT supporters need to be provided with protective and good quality personal protective equipment. They need to understand the importance of vaccinations and IPT and use these protective measures. Facility-based refresher and in-service TB IC training need to be introduced and monitored.

## **(Group 4) Creating a safe environment for patients and staff in the Bronchoscopy theatre at Universitas Academic Hospital.**

HM Madiehe, ML Magerman, MJ Morweng, ME Motlohelo, A Smuts, TC Walaza, EA Wiese  
Universitas Academic Hospital, Bloemfontein, Free State, South Africa

### **Background and Objectives**

Health care workers (HCW) are in direct contact with TB infected patients in Bronchoscopy theatre where invasive procedures are done putting them at high risk of acquiring TB. The aim of the study was to improve the TB prevention and control knowledge and practice of HCWs in the Bronchoscopy theatre. It was further aimed to screen coughing patients on admission and provide them with surgical masks and pamphlets on cough etiquette. Additionally, it was aimed to perform a risk assessment and provide related recommendations.

### **Methods**

Knowledge and practice questionnaires were issued to all 14 HCWs who work in the Bronchoscopy theatre to evaluate knowledge and practice of TB transmission and infection control. Training was developed and performed based on the results, along with a post survey. Pre and post physical observations were conducted to evaluate infection control practices in the Bronchoscopy theatre and waiting room. An environmental risk assessment was done of the theatre using a checklist. Theatre staffs were trained based on the findings of the knowledge questionnaire and observations. Pamphlets were developed and distributed to patients in waiting areas.

### **Results and Discussion**

A major improvement from 46% to 83% compliance rate with adherence to correct principles of infection control was observed. By analysing the knowledge questionnaire it was found that although 79% knew that they should wear N95 respirators in the theatre, observations indicated that only 22% wore it. Only 14% knew that clean hands are the most important method to reduce the spread of infection. The results of the practice questionnaires corresponded with the post-observation survey. Environmental risks identified were overcrowding, poor ventilation, no negative pressure, lack of hand-washing facilities and cluttering of surfaces.

### **Conclusion and Recommendations**

These findings suggest that training is important to improve infection prevention and control practices and ensure a safe environment. Several recommendations have been made, including that the Bronchoscopy theatre should be moved to the operating rooms, that a DVD should be developed on the procedure for medical and nursing students to prevent overcrowding in the theatre and advice management on formulation of policy on our findings. Although staff knowledge is adequate, continuous training and assessment of environmental risks is necessary.

## **(Group 5) Investigating TB infection control knowledge, practices and environment in the medical outpatient department at Pelonomi Hospital**

SE Mmutle, MR Morake, ME Moea, NF Jacobs  
Pelonomi Regional Hospital, Bloemfontein, South Africa

### **Background and Objectives**

Healthcare workers (HCW) are at greater risk of exposure to Tuberculosis (TB) than the general population. Pelonomi is a large regional hospital in Free State province where 60 new TB patients are registered in the medical outpatient department (OPD) each month. This study aims to make recommendations to management regarding TB infection control practices based on knowledge and practice questionnaires and observations.

### **Methods**

Anonymous, self-administered questionnaires assessing knowledge and self-reported practice regarding TB infection control were distributed to all staff in OPD (n=21). A workplace assessment/observation checklist to assess managerial, administrative, environmental and personal protective equipment hazards and best practices was also conducted. These tools were used to identify gaps in infection control practices, document areas for improvement and implement change management processes. Questionnaire analysis was done using SPSS.

### **Results and Discussion**

The response rate was high (91%). Most questionnaire respondents were female (71%), many were nurses (33%) and a large proportion had worked in the facility for several years (median =18 years, range=2-42 years). Only 24% reported that they were screened annually for TB. Approximately half of the respondents (47%) answered questions related to personal protective equipment (PPE) correctly. Impressively, 78% stated that they knew when and how to control hazards at the source, however, only 33% answered questions related to hand hygiene correctly. Nineteen percent of respondents knew when and how to use other PPE such as eye protection. Questions assessing infection control practice demonstrated inadequate and inappropriate use of N95 respirators when caring for patients with TB. However, 84% of respondents reported that they asked coughing patients to practice respiratory etiquette. Most observations were positive (e.g. signage for cough etiquette was displayed, coughing patients were separated and "fast tracked", etc). Hazards identified included: the sputum collection area was inaccessible and full of debris, a lack of non-latex gloves and the use of spirometry room as an office as well.

### **Conclusions and Recommendations**

Training is necessary for OPD staff on personal protective equipment and hand hygiene to improve low knowledge scores. Model infection control practices observed in OPD should be applauded and replicated in other areas. Environmental control measures should be implemented to improve sputum collection area and the spirometry room. More research is necessary to determine why yearly screening for TB is so low.

## (Group 6) Blood and body fluid exposure in the workplace

LNkoko

### **Background and Objectives**

Blood and body fluids (BBF) are the most common route by which blood-borne viruses and other infections such as HIV and Hepatitis are transmitted to healthcare workers (HCWs). Such infections pose high risks to HCWs, especially where basic rules of occupational health and safety (OHS) are not applied. This study was conducted to determine knowledge, attitudes and practices of HCWs regarding exposure to blood and body fluids at Thebe District Hospital in Thabo Mofutsanyana in the Eastern Free State.

### **Methods**

A questionnaire investigating BBF exposures, reporting of exposures, and HCWs' knowledge of infection control and occupational health resources was distributed to all HCWs in 11 high-risk departments in the hospital; 74 (88%) of 101 questionnaires were returned. Data were captured into SPSS and descriptive statistics were generated.

### **Results and Discussion**

Awareness of OHS contact points can be improved. The majority (82.4%) of respondents knew how to contact occupational health services; 74% knew how to contact the Infection Control Service; but only 62% knew how to contact Health and Safety representatives. Most (84.9%) indicated that they had no needle stick or BBF exposure in the past 6 months; 9 out of 11 respondents who experienced exposure reported these exposures. Exposures were significantly greater for HCWs with less than 6 years of work experience in their departments. Risks were greater in casualty, maternity and male wards. The majority (83.3%) of respondents reported being vaccinated for Hepatitis B; but only 59.5% completed all doses. Nearly one third (29.7%) either did not complete or could not remember. Reasons for not being vaccinated or not completing all doses included forgetting and not knowing about immunisation services. There were shortcomings in knowledge concerning BBF. Only 54.3% of respondents knew needles should never be recapped; 44.9% knew gloves should be used all the time; and 63.4% knew cleaners should use latex gloves when cleaning. Incorrect knowledge was associated with needle pricks and BBF exposure, with all (4) incorrectly informed enrolled nursing assistants experiencing being exposed, while none of those (9) correctly informed being exposed.

### **Conclusions and Recommendations**

Too many respondents did not know enough about dealing with BBF exposures. Despite this, HCWs take immunisation for Hepatitis B seriously, most take precautions to avoid BBF exposures, and most report exposures. Awareness of OHS at Thebe District Hospital needs improvement. *Immediate* induction for new employees would help improve awareness of OH services. OHS representatives need to be more proactive within their units. More training is needed on sharps disposal and the importance of using personal protective equipment.

## **(Group 7) STRENGTHENING THE OCCUPATIONAL HEALTH CLINIC FOR THE MANAGEMENT OF TB IN THE HEALTH CARE WORKPLACE AT UNIVERSITAS HOSPITAL**

L Benson, DA Kololo, NJ Sidiyio, MW Moliko, J Nkhatho, NW Phandle, H Langfoot  
Group 7, Universitas Hospital, Free State Province South Africa a

### **Introduction and Objectives**

TB is a major public health problem with a global incidence of 128/100 000,341/100000 in Sub-Saharan Africa and 971/100 000 in South Africa. Within the healthcare system, occupationally acquired TB is one of the leading occupational diseases in HealthCare Workers (HCWs), and is fuelled by the HIV epidemic in South Africa. Health care work increases the risk of TB by 5.8% (range 0-11%). Currently there is limited or no data for Free State Province (FS) and Universitas Hospital (UH) on the burden of TB in HCWs. The main objective of this project was to strengthen the TB workplace programme in the Occupational Health Clinic (OHC) at UH.

### **Methods**

We conducted a feasibility study for the development of a cough registry at UH in the FS, South Africa. The following activities were conducted: 1) consultation with stakeholders (unions, employer, workers, practitioners), 2) information sessions and distribution of information, education and communication (IEC) materials, 3) development of a cough registry tool and permission slip, 4) training of operational managers on the use of cough registry, 5) development of a plan for diagnosis and treatment of TB in HCWs (adapting national guidelines), and 6) monitoring the use of the cough registry within the OHC for TB services.

### **Results**

The feasibility study was conducted from April 2011 - April 2012. The stakeholder consultation revealed a positive reaction to the proposal. The information sessions had a high attendance, with positive responses from participants, but on follow-up information sessions concerns were raised about confidentiality and it was recommended that self-referral be promoted as well as universal TB testing should be offered. IEC materials were distributed (e.g. posters) and OHC started receiving calls from staff enquiring about the OHC TB services. A number of tools were developed; including the cough registry, permission slips, a plan for diagnosis and treatment of HCWs with TB was modified and adapted from existing national guidelines. The operational managers were trained on the use of the cough registry, and all these activities led to a subsequent increase in the utilisation of the OHC, from only one sputum sent April 2010 to April 2011 to 22 sputa taken from April 2011 to April 2012, of which 2 were AFB positive, resulting in the HCW being treated.

### **Conclusion and Recommendations**

Confidentiality is a major impediment in the implementation of a cough register; HCWs in the hospital do not trust their operational managers to maintain confidentiality regarding their medical conditions. Also the information sessions revealed that there was uncertainty about confidentiality in the OHC. Changes are needed at the OHC to improve privacy and confidentiality. Implementing a cough registry with self referral is desirable as well as the OHC offering universal TB screening. And finally there is a need for more data to be gathered with regard to TB and HIV services.

## **(Group 8) Infection control and workplace safety: Knowledge and practices in the Bloemfontein Central Laundry**

MM Litsoane, KD Moeketsi

### **Background and Objectives:**

Laundry workers (LWs) are at risk for occupational hazards, including infectious diseases, chemical exposures, and musculo-skeletal problems. The Occupational Health and Safety Act (1993) requires that employers provide vaccination against hepatitis B, suitable personal protective equipment, and ensure safety for workers using machinery. Observation revealed concerns that laundry workers were not adhering to infection control and safety practices (ICSP). This study was done to assess the knowledge and ICSP of LWs.

### **Methods:**

The literature and relevant guidelines and regulations were reviewed to determine best ICSP for LWs. A questionnaire was developed, piloted and adapted. The questions collected information on demographics, knowledge and reporting practices on work place hazards, and knowledge about ICSP. Participation was voluntary. The questionnaire was self-administered or by interview. Data was analysed using univariate analysis. Authorisation was obtained from Head, Laundry Services, laundry management, and information sessions were held for all including employees and unions.

### **Results and Discussion:**

Questionnaires were completed by 68/128 (53%) of the LWs, but not all respondents completed all questions. Production workers represented the largest participant group (71 %). The median age group was 30-39 years old, and 56% had less than 5 years experience. The male: female ratio was 60:40 and 78% were black. Vaccination against hepatitis B was reported by 85%. Injuries at work were due to needle-sticks (12%) and other (21%). The majority (82%) knew how to contact the Health and Safety (H&S) representative, but only 56% report regularly doing so. A high percentage of respondents reported that no training was received on needle-stick injury prevention (90%), machine hazards (69%), use of protective equipment (57%), safe lifting of linen bags (46%), HIV/AIDS prevention (37%), and hand hygiene (30%). Reported failure to follow safe practices included: never using eye protection (72%), not using guards on machinery (47%), not changing procedures with infected linens (37%) and not getting supervision on safe working practices (31%). Study limitations include bias due to self-reporting, volunteer participation, unequal risk across all sections of the laundry, and insufficient responses to allow bivariate analysis.

### **Conclusion and Recommendations:**

ICSP important to protect LWs were determined. Discrepancies between reported knowledge and practices were identified. A review of training programs for LWs on ICSP is needed and additional training is required. Policy and guidelines for ICSP for LWs should be developed.

## Appendix F. Group 7 final Certificate Program presentation

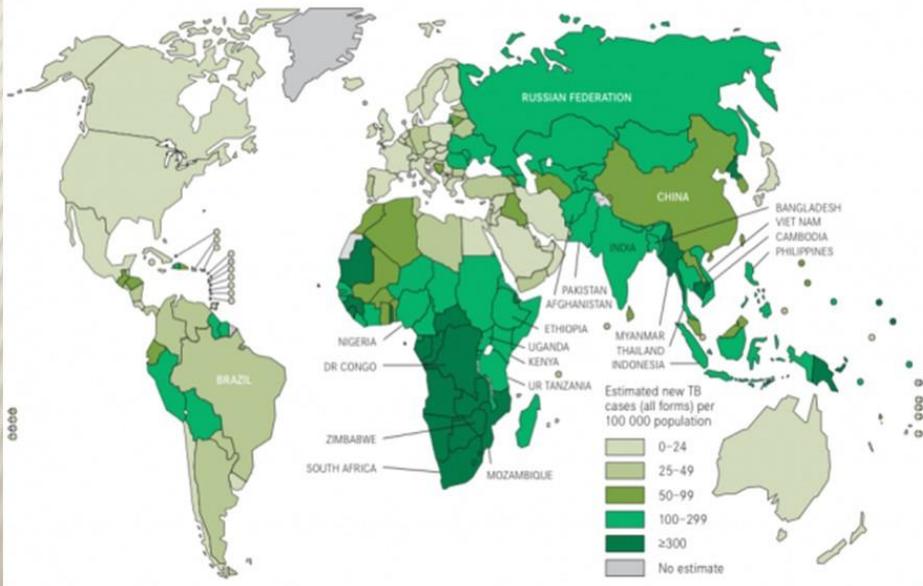
# STRENGTHENING THE OCCUPATIONAL HEALTH CLINIC FOR THE MANAGEMENT OF TB AND HIV IN THE HEALTH CARE WORK PLACE AT UNIVERSITAS HOSPITAL

## Group 7

L Benson  
D A Kololo  
N J Sidiyo  
M W Moliko  
J Nkhatho  
N W Phandle  
H Langfoot

## BACKGROUND

Estimated TB incidence rates, 2010



## CONT...

- ✘ TB incidence
  - + Global 128/100000
  - + Sub Saharan Africa 341/100 000
  - + South Africa 971/100 000 population South Africa
- ✘ Incidence of TB infection attributable to health care work 5.8% (range 0-11%) in HCW's
- ✘ No data for Free State Province and Universitas Hospital on burden of TB in HCW's

3

## CONT...

- ✘ Delay in diagnosing TB patients increases risk of HCW's contracting TB
- ✘ Lack of provincial guidelines on TB management amongst HCW's.

4

## AIM

---

Strengthening of TB and HIV workplace programme at Universitas hospital

## OBJECTIVES

---

1. To encourage staff to utilize the OHC for TB and HIV services from April 2011 to May 2012
2. To improve TB services that are rendered at OHC, in keeping with international guidelines
3. To evaluate the use of the cough register in the control of TB in HCW's.

## METHODS AND OBSERVATIONS

- ✘ Feasibility study for developing cough registry at Universitas hospital
- ✘ Activities:
  1. **Consult stakeholders** (unions, employer, workers..)
  2. **Conduct information sessions** and distributed information and education communication (**IEC**)
  3. Develop a **cough registry tool and permission slip**
  4. **Train operational managers** on cough registry
  5. Develop a **plan for diagnosis and treatment**
  6. **Monitor use of the OHC for TB services**

## RESULTS

- ✘ The feasibility study conducted April 2011 - April 2012:
  1. **Stakeholders consulted:** reaction was positive
  2. **Information Sessions:** attendance was high, with positive responses from participants, but on follow-up information sessions concerns raised about confidentiality and **IEC materials distributed** (e.g. posters) and OHC received calls
  3. Tools for the cough registry developed

**ESTABLISHING AN EFFECTIVE SYSTEM TO PREVENT, IDENTIFY AND TREAT TB IN EMPLOYEES AT UNIVERSITAS HOSPITAL**

All health care workers have the right to prevention, diagnosis, treatment, care and support services for HIV and TB.

If you have a cough for more than two weeks, please contact Occupational Health Clinic for free (OHC), confidential diagnosis and treatment. Workplace acquired TB could be compensated.

Your manager will be pleased to provide you with a permission slip so that you can attend the Occupational Health Clinic during working hours.

If you encounter any problem after hours or at nearby clinics, you are more than welcome to visit OHC so as to assist you further. No information about your testing will be shared with your manager or anyone else.

Your Health and Safety representatives will also encourage you to seek diagnosis and treatment if you are coughing.

**For more information contact:**

Ms Sidiyo: 0514053727      Mr Nkhathe: 0514053408  
 Ms Moliko: 0514053014      Ms Langfoot: 0514053262  
 Ms Kololo: 0833043450      Ms Benson: 0514053793  
 Mr Phandle: 0514079201

**Hoos vir twee weke of meer?  
Kry Help.**

**O hohlola beke tse pedi kapa ho feta?  
Batla thuso.**



## COUGH REGISTER



**health**  
 Department of  
 Health  
 FREE STATE PROVINCE

<u>Date</u>	<u>Name</u>	<u>Duration of cough</u>	<u>Referral to OHC/OTH ER</u>	<u>Attended OHC</u>	<u>Signature of Unit Manager</u>

## Permission slips developed



**health**  
Department of  
Health  
FREE STATE PROVINCE

**"ESTABLISHING AN EFFECTIVE SYSTEM TO PREVENT, IDENTIFY AND TREAT TB IN EMPLOYEES AT UNIVERSITAS HOSPITAL: PHASE 1 OF A COMPREHENSIVE PROGRAMME TO MANAGE TB AND HIV IN THE HEALTH CARE WORKPLACE"-by Group 7 of certificate programme.**

**PERMISION SLIP:**

I (Manager)..... send  
(Employee)..... to the clinic

Left the ward at..... Signed by (Manager/Supervisor):.....

Time out from clinic:..... Signed by (OH Practitioner):.....

### 4. Operational managers trained

## CONT...

5. Plan for diagnosis and treatment of TB modified & adopted from existing national guide

I.

Health Worker Cough > 2 Weeks



II.

Health Worker obtains permission slip to go to OH clinic on work hours

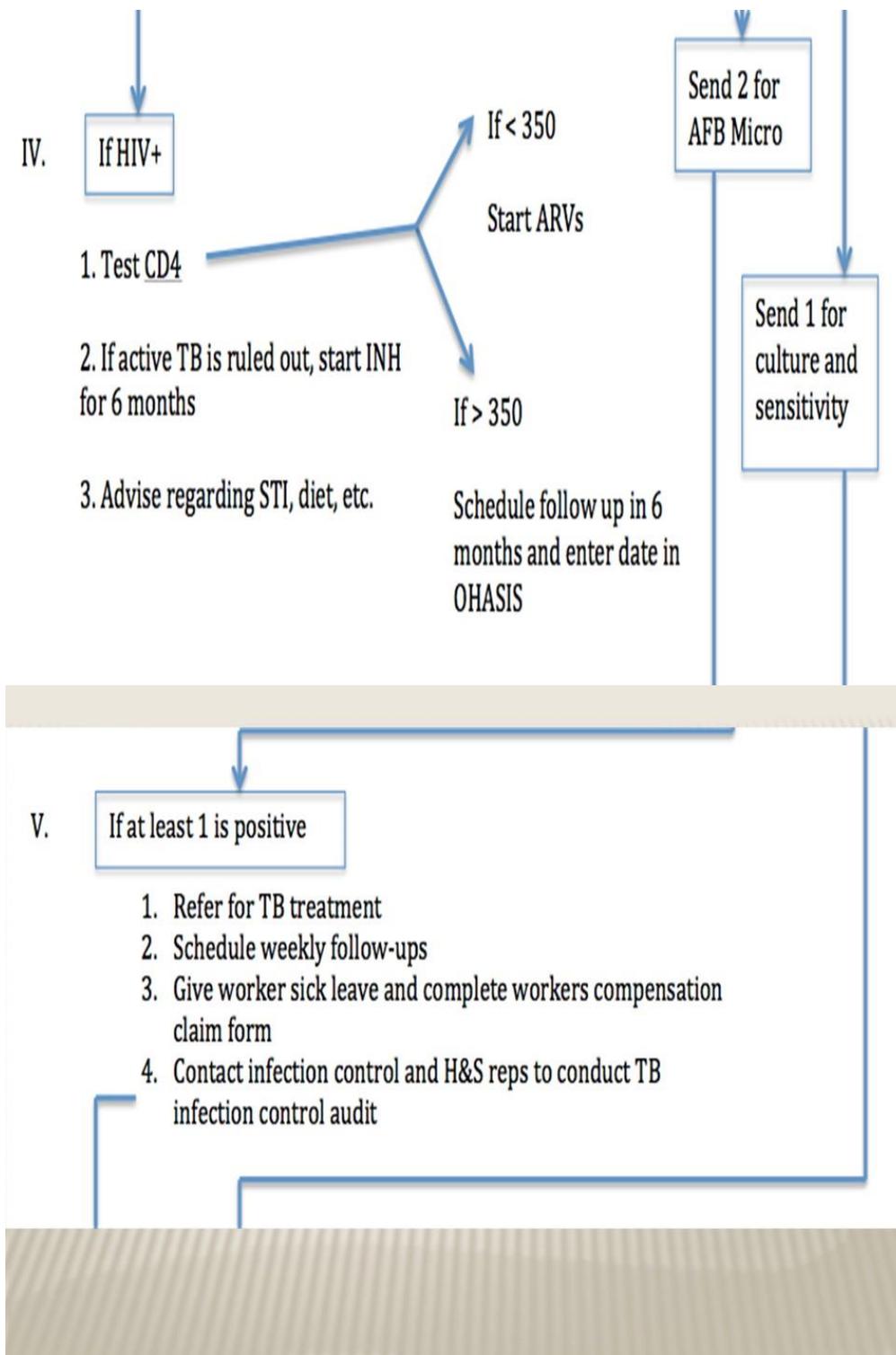
Manager records name and referral date in registry and gives worker info package.

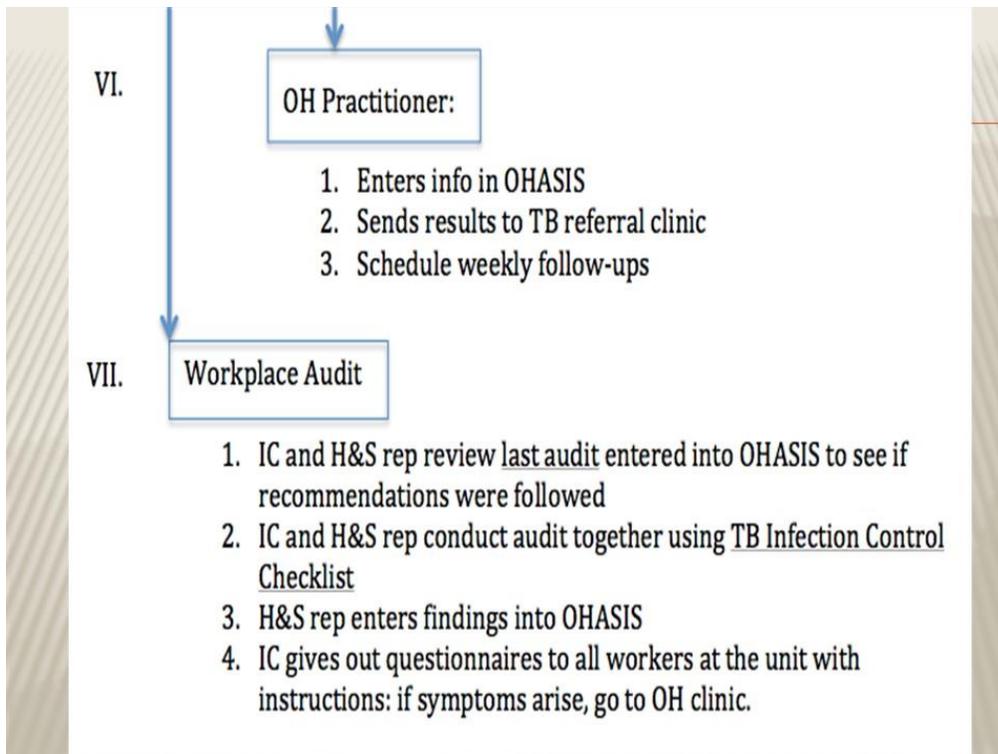


III.

OH professional collects info:

1. Symptoms
2. Contact History
3. 3 Sputum Samples
4. Offers HCT
5. Enters info from previous steps into OHASIS
6. Follow-up appointment 2 business days later  
(collect mobile phone number)





## 5. DATA FOR APRIL 2010- MAY 2012

	April 2010- April 2011	April 2011- May 2012
Total OHC visits	4005	4569
HCWs for Sputum Collection	1	22

2 cases of active TB in HCW identified and treated due to cough registry!!

## DISCUSSIONS AND CONCLUSIONS

---

### × Concerns about Confidentiality:

- + Lack of Use of Cough Register: lack of confidence in operational managers
- + Information sessions revealed uncertainty about confidentiality in OHC

### × Benefits of the cough register

### × Data Capturing: more data should be gathered with regard to TB and HIV

## RECOMMENDATIONS

---

- × Cough registry – create a self-referral system
- × Data Management: improve monitoring and evaluation (OHASIS) to see if there is an increase in use of OH services
- × Provide feedback to the managers, health and safety committees
- × Universal TB screening
- × Restructuring of OH – to allow for greater privacy and confidentiality

THANK YOU, RE YA LEBOHA, BAIE DANKIE  
THE MASTER GROUP 😊

