Factors contributing to low Tuberculosis case finding in Zimbabwe: New challenges demand innovative approaches

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DECLARATION

I, MKHOKHELI NGWENYA, do hereby declare that this thesis is of my own effort, where other people's work has been used (either from a printed source, internet or any other source) this has been carefully acknowledged and referenced in accordance with departmental requirements in the preparation of this thesis.

The thesis "FACTORS CONTRIBUTING TO LOW TUBERCULOSIS CASE FINDING IN ZIMBABWE: New challenges demand innovative approaches" is my own work.

Signature: 

Date: 19th August, 2015.

TABLE OF CONTENTS

DECLARATION ii
TABLE OF CONTENTS i
TABLE OF FIGURES AND TABLES v
DEDICATION vii
ACKNOWLEDGEMENTS viii
LIST OF ACRONYMS AND ABBREVIATIONS ix
GLOSSARY xi
SELF-INTRODUCTION xii
ABSTRACT xiii
1 CHAPTER 1: Background 1
1.1 Chapter Introduction 1
1.2 Tuberculosis epidemiology 1
1.2.1 Global and regional perspective 1
1.2.2 TB Epidemiology in Zimbabwe 1
1.3 Geography 5
1.4 Population and Demographic Characteristics 6
1.5 Socio-economic situation 6
1.6 Health Systems Environment 7
1.6.1 Health Governance and Leadership 7
1.6.2 Service Delivery 7
1.6.3 Health Information 8
1.6.4 Health Financing 8
1.6.5 Human Resources for Health 8
1.6.6 Medicines, Supplies, equipment and infrastructure 9
1.7 Organization of the National TB Control Programme 9

1.7.1 Private sector 9

1.7.2 Laboratory Services 9

1.7.3 TB Medicines and Supplies 10

1.8 Zimbabwe TB Prevalence Survey 10

2 CHAPTER 2: Problem Statement, analysis of the problem, justification, objectives, methodology and analytical framework. 11

2.1 Chapter Introduction 11

2.2 Problem Statement 11

2.3 Justification 13

2.4 Research objectives 13

2.5 Methodology 14

2.6 Analytic framework 16

3 Chapter 3: Findings: Literature Review 18

3.1 Chapter Introduction 18

3.2 Patient-initiated pathway 18

3.2.1 Disease natural history delays 18

3.2.2 Patient delays 19

3.2.3 Access delays 21

3.2.4 Suspect identification delays 22

3.2.5 Diagnostic delays 22

3.2.6 Notification and treatment delays 23

3.3 Screening pathway 23

3.3.1 Contacts 23

3.3.2 Clinical risk groups 24

3.3.3 Risk populations 24

4 Chapter 4: Findings from the First National TB Prevalence Survey in Zimbabwe 26

4.1 Chapter introduction 26

4.2 Results introduction 26

4.3 Characteristics of patients identified during the survey 31

4.4 Risk analysis for the diagnosis of bacteriologically confirmed TB cases 37

4.5 Absence of symptoms suggestive of TB among prevalent cases...... 38

4.6 Non-Tuberculosis Mycobacterium (NTMs) and diagnosis of TB 40

4.7 Health Seeking Behaviour... 41

4.7.1 Where people sought care 41

4.7.2 Management of presumptive TB cases at formal health institutions 41

4.7.3 Reasons for not seeking care... 42

4.7.4 Where do TB patients prefer to visit?... 42

5 Chapter 5: Good practices... 47

5.1 Chapter Introduction... 47

5.2 Improving Knowledge and awareness 47

5.3 Minimising barriers to health care access... 48

5.4 Strengthening identification of patients with suspected of TB 49

5.5 Ensuring quality assured diagnosis 50

5.6 Improve referral and notification practices... 52

6 Chapter 6: Discussion... 53

6.1 Main Discussion 53

6.2 Limitations of the study 56

7 Chapter 7: Conclusion and Recommendations 57

7.1 Conclusion 57

7.2 Recommendations 57

7.2.1 World Health Organisation 57

7.2.2 NTP 58

References 60

Annexures 70

Annex 1: Main roles and responsibilities MOHCC Survey Focal Point 70

Annex 2: TB Screening form 71

Annex 3: Map of Zimbabwe with populations per province 72

Annex 4: Participation rate per cluster and number of Bac+ cases detected 73

Annex 5: Notification Rates of new SS+ cases: 2012 74

Annex 6: Characteristics of participants 75

Annex 7: Association of TB symptoms of any duration with diagnosis of Bac+ TB 77

Annex 8: Part of survey questions for all presumptive PTB cases 80

Annex 9: Part of survey symptom screening form. 81

TABLE OF FIGURES AND TABLES

Figure 1: Trends in TB Mortality in Zimbabwe 2

Figure 2: Trends in TB Prevalence in Zimbabwe*: 1990 - 2013* 2

Figure 3 Trends in adult (15-49 years) HIV prevalence in Zimbabwe, 1970 – 2015..3

Figure 4 Trends in incidence and notifications of TB in Zimbabwe 1990-2013 3

Figure 5: Trends for estimated TB case detection rate with 95% CI error bars 1995 - 2013...4

Figure 6 HIV prevalence by Province in Zimbabwe in 2012........................5

Figure 7 Location of Zimbabwe...5

Figure 8 Population Pyramid Zimbabwe 2012 6

Figure 9 The "onion" model...16

Figure 10 Pathways to TB case detection 17

Figure 11 Population pyramids comparing survey population to the national population 26

Figure 12 Map of Zimbabwe with cluster distributions selected based on application of PPS. 27

Figure 13 Participants age-sex distribution...28

Figure 14 Crude prevalence (SS+ and Bac+) and age 29

Figure 15 Summary Zimbabwe NTPS - 2014 30

Figure 16: Distribution of Bac+ cases from NTPS 31

Figure 17 Relationship between provincial crude prevalence from survey and case notification rates for 2013 37

Figure 18 Where people sought care 41
Figure 19 Reasons for not seeking care 42
Figure 20 Where people found to have TB prefer to seek care 43
Figure 21 SS+/Bac+ TB patients treated before and after TB Reach project in Sidama, Ethiopia 49
Figure 22 Number of SS+/BC+ patients treated before and after the TB Reach project in Tajikistan 50
Figure 23 Number of patients treated before and after TB Reach Project in Nepal 51

Table 1: Summary search table 14
Table 2 Percentage of symptom free TB cases smear positive and bacteriologically confirmed from African TB Prevalence Surveys conducted 2010 – 2014 19
Table 3 Characteristics of bacteriologically confirmed cases 32
Table 4 Risk analysis for the diagnosis of bacteriologically confirmed TB cases 35
Table 5: Factors associated with reporting symptoms among Bac + cases . 39
Table 6 Management of cases at public health facilities 42
Table 7 Analysis of factors associated with NTM.......................................44

DEDICATION

I dedicate this thesis to my parents; my late father Leonard “Ndoga” Makholwa Zwabambwe Ngwenya (*makalale ngokuthula*) and my loving mother Othilia “Ntingana” Dube. I owe it all to them. I appreciate their sacrifices to get me quality education despite their background.

I also dedicate it to my grandparents; My late grandfather Makholwa Zwabambwe Ngwenya (*makalale ngokuthula*), my grandmother Diana Moyo, my grandfather Amos Dube, my grandmother Ncengani Dube as well as all my ancestors on whom I stand on their shoulders.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACSM	Advocacy, communication and social mobilisation
Bac+	Bacteriologically Confirmed Tuberculosis
BRTI	Biomedical Research and Training Institute
CHP	Community Health Promoter
CI	Confidence Interval
CXR	Chest Radiography
DHIS2	District Health Information System Version 2
DNA	Deoxyribonucleic acid
EHT	Environmental Health Technician
EQA	External Quality Assurance
FP	Focal Point
HAART	Highly Active Antiretroviral Therapy
HBC	High Burden TB Country
HCW	Health Care Worker
HIV	Human Immunodeficiency Virus
HSEP	Health Service Extension Programme
IQR	Interquartile Range
MDG	Millennium Development Goal
MDR-TB	Multi-Drug Resistant Tuberculosis
MOHCC	Ministry of Health and Child Care
MOTT	Mycobacterium Other Than Tuberculosis
MTB	Mycobacterium Tuberculosis
NAAT	Nucleic Acid Amplification Technique
NGO	Non-Governmental Organization
NMRL	National Microbiology Reference Laboratory
NTM	Non-Tuberculous Mycobacteria
NTP	National TB Programme
NTPS	National TB Prevalence Survey
PHC	Primary Health Care
PHCC	Primary Health Care Centre
PI	Principal Investigator
PPM	Public Private Mix
PPP	Public Private Partnerships
PTB	Pulmonary Tuberculosis
Rif	Rifampicin
SADC	Southern African Development Community
SC	Survey Coordinator
SMC	Survey Management Committee
SS+	Sputum Smear Positive
TAG	Technical Advisory Group
TB	Tuberculosis
TBSCT	TB Screaming Tool

UPS	Uninterrupted Power Supply Backup
WHO	World Health Organization
ZIMSTAT	Zimbabwe National Statistics Agency

GLOSSARY

Xpert MTB/Rif	A cartridge-based, automated rapid diagnostic test that can identify *Mycobacterium tuberculosis* (MTB) DNA and resistance to rifampicin (RIF) by nucleic acid amplification technique.(NAAT)
TB CARE	United States Agency for International Development Project to fight Tuberculosis
Non-tuberculous mycobacterium	is also known as environmental mycobacteria, atypical mycobacteria and mycobacteria other than tuberculosis (MOTT), are mycobacteria which do not cause tuberculosis or leprosy

SELF-INTRODUCTION

I work at the Ministry of Health and Child Care (MOHCC) as one of the technical officers for the National Tuberculosis Control Programme (NTP) at central level. Over the past four years I have been responsible for Public Private Mix (PPM), Programmatic Management of Drug Resistant Tuberculosis and the National TB prevalence Survey (NTPS). The NTPS was conducted as a public-private partnership (PPP) of the MOHCC and a private institute, Biomedical Research and Training Institute (BRTI). I was the MOHCC Focal Point (MOHCC NTPS FP) for the survey under the guidance of the Deputy Director AIDS & TB [Principal Investigator (PI)]. My roles in the survey were ensuring co-ordination between BTRTI, Zimbabwe National Statistics Agency (ZIMSTAT), National Microbiology Reference Laboratory (NMRL), Radiologist, all survey stakeholders and MOHCC to ensure smooth running of the survey. The specific details of the roles and responsibilities are as outlined in Annex 0 of this paper.

ABSTRACT

Tuberculosis (TB) remains a major public health problem in Zimbabwe and the country is not on track to meet the Millennium Development Goals (MDGs) targets. In 2013, the estimated incidence, prevalence and mortality in Zimbabwe was estimated at 552(95%CI 474-643), 409(95%CI 235-630) and 193(95%CI 146-241)/100,000 population, respectively. Persistently low estimated case detection rates and sustained decline of notifications over the past few years is of concern. While this decline may be due to a real decline in incidence, there have been concerns over poor case detection. Exploration of factors contributing to low case detection was done through literature review and analysis of data from National TB Prevalence Survey (NTPS) conducted in 2014. Findings indicate that as much as 43% of bacteriologically positive (Bac+) cases [22% for sputum smear positive (SS+)] in the community are symptom free and there is a large gap between SS+ and Bac+ TB. Non-tuberculous mycobacteria (NTMs) were also shown to complicate diagnosis and management of TB cases. Significant challenges exist in ensuring early diagnosis of TB in the country. Provinces and districts with low case notification rates may be missing a number of cases in the community. A review of current case finding strategies, tools and algorithms is recommended in order to improve case detection. Capacity strengthening targeted at provinces and districts which traditionally report fewer cases may have increased yield of Bac+. NTM burden and effects on TB diagnosis and management needs to be explored further.

Word Count: Excluding Tables = **13,131**

Key words: Tuberculosis, Zimbabwe, Symptoms, Prevalence, Survey

1 CHAPTER 1: Background

1.1 Chapter Introduction

This Chapter provides an introduction to this thesis; it explains the background and focus of this thesis, why this study is important and it also outlines the study objectives.

1.2 Tuberculosis epidemiology

1.2.1 Global and regional perspective

Tuberculosis (TB) is a communicable disease which remains one of the world's leading cause of death though its prevalence is slowly declining. In 2013, about 9 million people developed TB globally and 1.5 million succumbed to the disease. Globally there is a gap between notified cases and incident cases of around 3.3 million cases with approximately 64% (CI 61-66%) case notification rate. The African region contributes about a quarter of the TB burden and the highest number of deaths per population.(1) Recent National TB prevalence Surveys(NTPSs) in 3 African countries (Malawi, Tanzania, Nigeria) demonstrate significant under diagnosis ranging from 200-500%.(2–4)

Globally, 13% of TB patients were infected with Human Immuno-Deficiency Virus (HIV) with 78% of these from the African region mainly from Southern and East Africa.(5) The impact of HIV in this region was obvious in the 1980s since there was an upsurge of mortality especially among the most economically productive age groups due to HIV and TB.(6)

The emerging Multi-Drug Resistant Tuberculosis (MDR-TB) burden is a threat to tuberculosis control efforts. Globally, an estimated 3.5% (95% CI: 2.2–4.7%) of new cases and 20.5% (95%CI: 13.6–27.5%) of previously treated cases have MDR-TB.(1)

1.2.2 TB Epidemiology in Zimbabwe

TB is a significant public health problem in Zimbabwe with high morbidity and mortality rates. It remains fuelled by the dual TB-HIV epidemic. The World Health Organisation (WHO) estimates Zimbabwe TB prevalence at 409(95%CI 235-630) /100,000 population, still making it to be counted among the top 22 high burdened countries (HBCs) in the world, which together contributed to 81% of the world's TB burden in 2013(1). The country is one of the 11 HBCs that are not on track to reach one or more of the Millennium Development Goals (MDGs) targets for TB. It is not on track for prevalence and mortality reduction which is to reduce by 2015, TB prevalence and death rates by 50% relative to 1990 (1,7).

The country set targets for these two indicators for 2014 were TB prevalence of 200 per 100 000 population and mortality of 100 per 100 000 population(8) and yet mortality of all TB patients remains high at 193(95%CI 146-241)/ per 100 000 population and prevalence as stated above.(1)

Figure 1 and Figure 2 below show the trends in TB mortality and prevalence in Zimbabwe from 1990 – 2013.

Figure 1: Trends in TB Mortality in Zimbabwe *(excludes HIV +ve TB): 1990 - 2013 (Rate per 100 000 population per year)*(1)

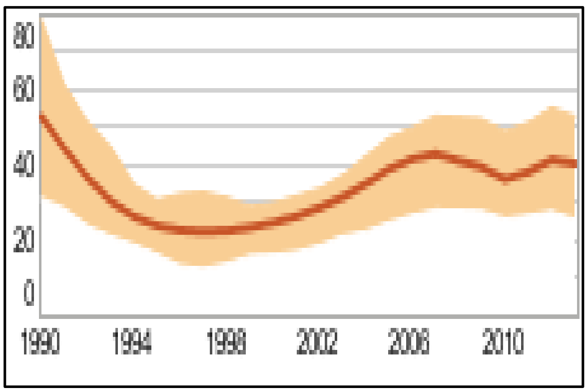
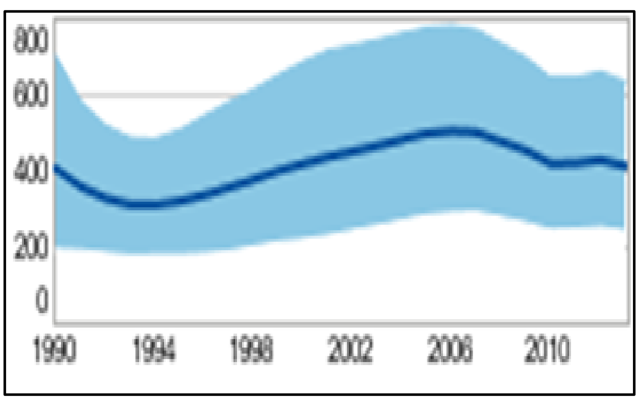


Figure 2: Trends in TB Prevalence in Zimbabwe*: 1990 - 2013*(1)



The incidence of HIV peaked around 1990 and prevalence in 1997 was around 29.3%(9). This has declined to around 15% in 2010 as shown in Figure 3.(10) Prevalence of TB followed the trend for HIV as shown in Figure 3. In 2013, TB incidence was estimated to be at 552(95%CI 474-643)/100,000 representing a doubling of 1990 estimates, having reached a peak of

799/100,000 population in 2005. In 2013, 69% of notified TB patients were co-infected with HIV.(1)

Figure 3 Trends in adult (15-49 years) HIV prevalence in Zimbabwe, 1970 –2015(10)

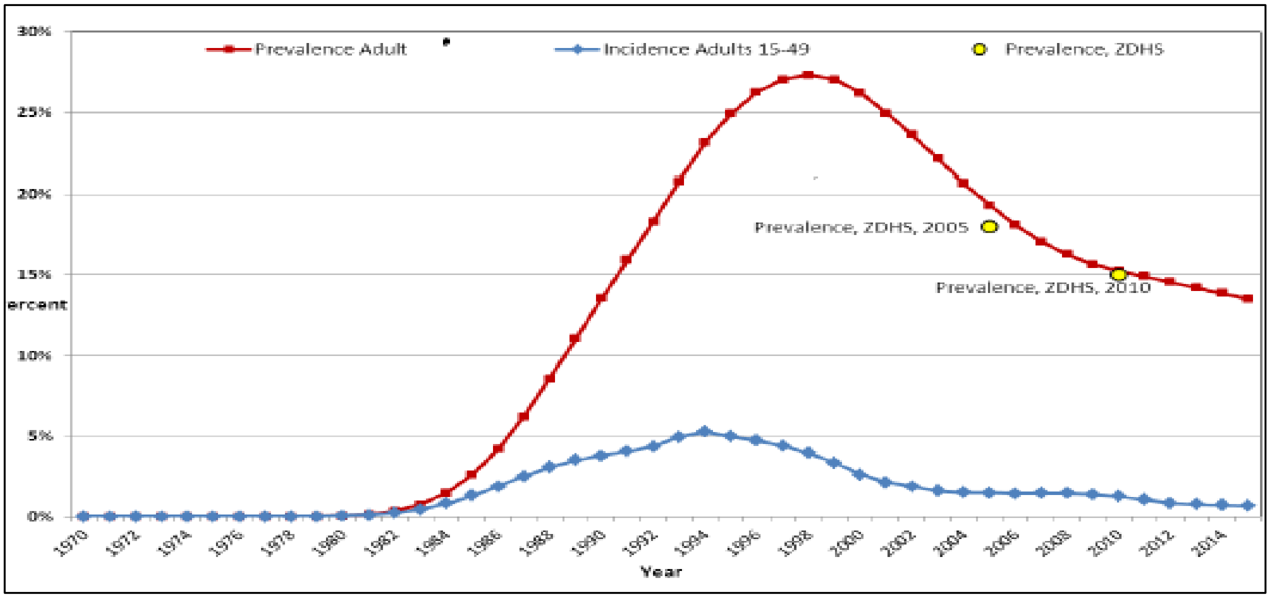
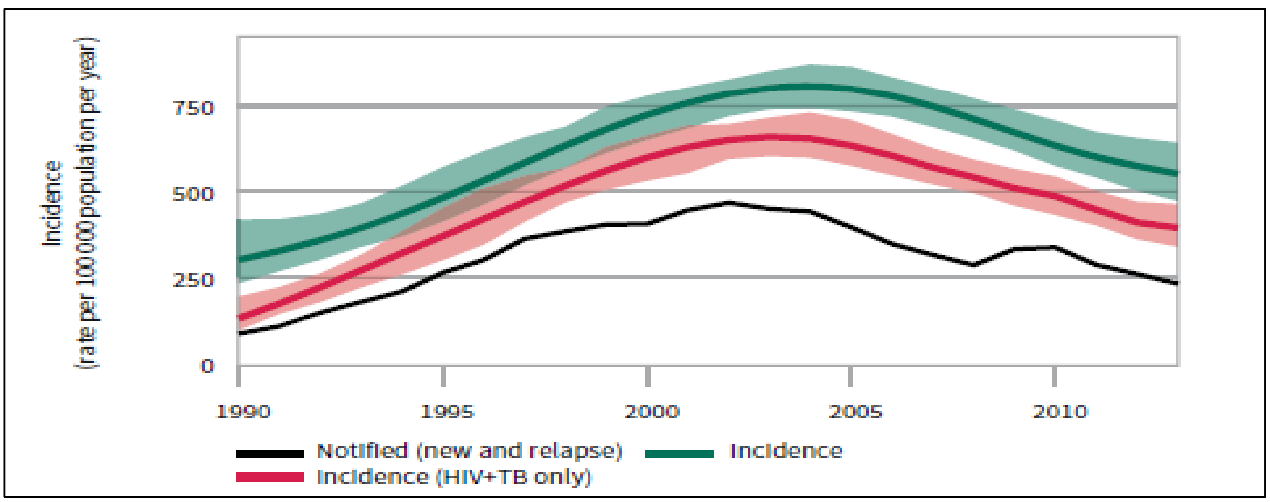


Figure 4 Trends in incidence and notifications of TB in Zimbabwe 1990-2013(1)

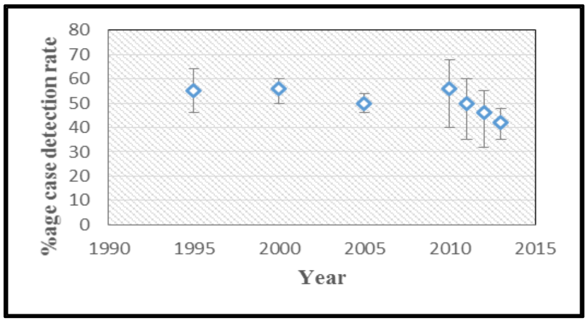


The country has witnessed a decline in TB case notification rates over the last 5 years. In 2013, 35 278 new and relapse TB cases were notified, translating to a notification rate of around 270 per 100,000 population and a case detection rate of 42 % (95%CI 36-49). This represents a 34% decline from

407/100,000 in 2000. Figure 4 above shows trends in incidence and notification rates from 1990 – 2013.(1,10)

Trends in notification rates over the last decade seem to suggest a huge gap in TB case detection. Increased access to antiretroviral treatment may be responsible for a reduced TB incidence, however limited case finding cannot be ruled out.(10) Figure 5 shows trends in TB case detection rate from 1995 – 2013.

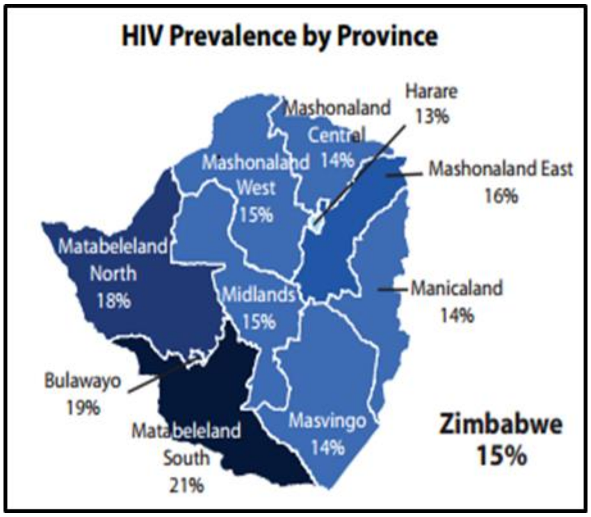
Figure 5: Trends for estimated TB case detection rate with 95% CI error bars 1995 - 2013 (1,11,12)



TB notification rates vary significantly at sub-national level, with the southern part of the country reporting high figures. Beitbridge district, in the south, has one of the highest notification rates at 872 per 100 000 population in 2013, while Mudzi, in the north have notification rates as low as 80 per 100 000 population. Of note that some provinces such as Matebeleland North have experienced a more pronounced decline over the last 3 years, while Masvingo has remained stagnant.(10) HIV prevalence also varies at sub-national level as shown in

Figure 6, and TB notifications follow this trend. Matabeleland South and Bulawayo have the highest HIV prevalence, 21.2% and 19.1% respectively(13) and have consistently reported high TB notification rates which were 521 and 427 per 100 000 population respectively in 2012.(10)

Figure 6 HIV prevalence by Province in Zimbabwe in 2012(13)



The country is also not spared from the emerging threat from MDR-TB, with annual estimates of around 1000 MDR-TB cases and yet only 433 MDR-TB cases were confirmed in 2013 and 351 started on treatment(1).

1.3 Geography

Zimbabwe is a landlocked country situated in Southern Africa. It shares borders with Zambia to the north, South Africa to the south, Botswana to the west and Mozambique to the east. It also shares a tiny frontier with Namibia on the west. It has a surface area of about 391,000 square kilometres. Administratively, it is divided into 10 provinces and 65 districts.(14)

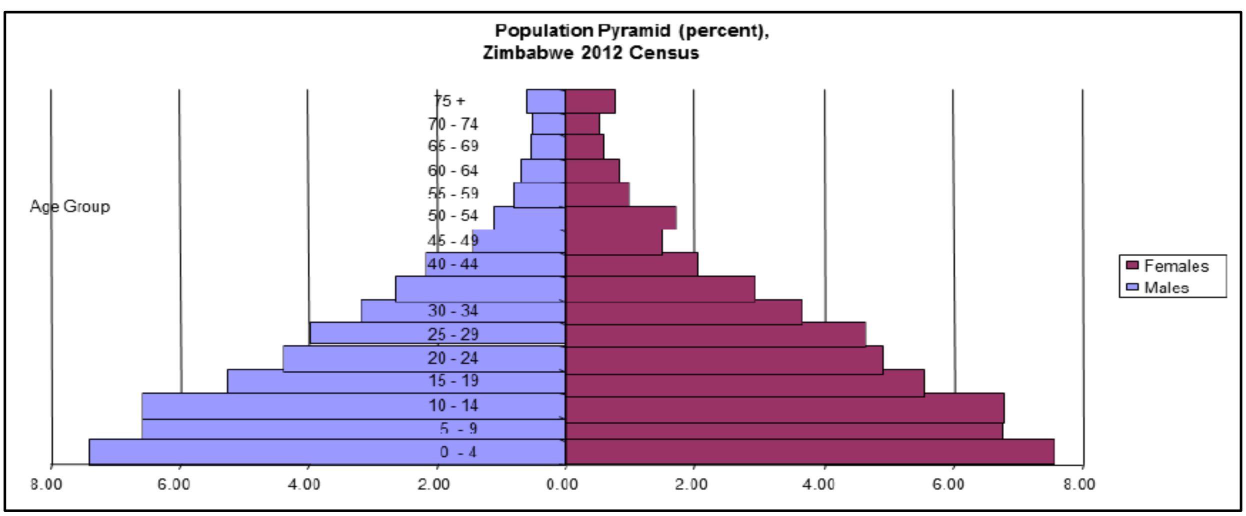
Figure 7 Location of Zimbabwe(14)

1.4 Population and Demographic Characteristics

In 2012, the population was estimated at around 13 million with a 2.2% crude rate of natural increase. Females constitute 52% of the population. The majority of Zimbabweans reside in rural areas which accommodate 67% of the population. The average household size is 4.2. The country has a young population with 41% of the population under 15 years. The literacy rate for the population in Zimbabwe is about 96%.(14) .

Figure 8 shows the population pyramid of Zimbabwe according to 2012 national census.

Figure 8 Population Pyramid Zimbabwe 2012(14)



1.5 Socio-economic situation

Zimbabwe has been faced with 2 decades of political and economic crises that led to a 96% decline in Gross Domestic Product as the country experienced record hyperinflation and a collapse in industries leading to a decline of formal employment. Critical services including health care were severely affected. The Human Development Index fell to 173 out of 187 countries in 2011 with poverty headcount confirming 72.3% of the population in poverty with 22.5% in extreme poverty.(15)

1.6 Health Systems Environment

1.6.1 Health Governance and Leadership

1.6.1.1 Policy and Regulation

The health system in Zimbabwe is guided by the extended and updated National Health Strategy 2009 – 2015 "Equity and Quality in Health: A People's Right". The strategy is informed by the Government Medium Term Plan (2010-2015), the Zimbabwe United Nations Development Assistance Framework, Zimbabwe Agenda for Sustainable Socio-Economic Transformation (2013-2018) and the MDG targets.(16)

The management of the health care delivery system in Zimbabwe is decentralized and consist of four levels; namely national, provincial, district and primary health care centres (PHCCs).(17,18)

1.6.1.2 Legislature

The Public Health Act empowers the MOHCC to protect the public health of the population through regulating and controlling important activities/procedures of public health importance.(19)

Zimbabwe has a patient chatter that provides for certain rights, such as information about patient care, confidentiality, and the right to compensation in the event of malpractice.(19)

1.6.2 Service Delivery

Zimbabwe has a well-developed health service delivery system with four established levels: primary, secondary, tertiary and quaternary. The Primary Care level is the most peripheral and first point of contact of health services with the community. It consists of village health workers, community volunteers, and PHCCs.(19) The PHCCs are usually manned by a nurse, supported by an Environmental Health Technician (EHT).(20) Secondary care consists of facilities that receive patients via referrals from the primary care facilities. Tertiary care is provided at the seven provincial hospitals that receive referral patients from district and mission hospitals and may have certain specialists to deal with more difficult health issues. Quaternary care is offered in six central hospitals in Bulawayo, Harare, and Chitungwiza that have the most advanced equipment, staff, and pharmaceuticals for dealing with the most complicated cases.(19)

The majority of health services in Zimbabwe are provided by the public sector (MOHCC and Local Government, and to a lesser extent through Ministries of Education, Defence, Home Affairs and Prison services). Public sector health services are complemented by the private sector, which includes both private for profit (e.g. industrial clinics, private hospitals, maternity homes and general practitioners) and not-for-profit private sector (e.g. mission clinics and hospitals and Non-Governmental Organizations (NGOs).(18) The country is making efforts to increase collaboration and health service provision through numerous public private partnership (PPPs) initiatives(16).

1.6.3 Health Information

Health information is guided by the National Health Information Strategy that provides the overall framework for data management. MOHCC is currently implementing electronic health information systems like the District Health Information System version 2 (DHIS 2*).* With cell-phone-based reporting, completeness and timeliness has increased to above 90% from participating facilities for most of 2012 and 2013. TB information has been integrated into DHIS2. Efforts to establish a National TB register is underway. However, most of TB recording and reporting is still paper based and some programmes still maintain vertical reporting and overburdening health care workers at service delivery level, however integration is currently on going.(18,19,21)

1.6.4 Health Financing

In Zimbabwe the government is the major source of funding for health with taxation being the major source of revenue. However, following the political instability, targeted sanctions and the hyperinflationary period which led to the collapse of the microeconomic environment led to a near collapse of the basic social services in 2008. Since then, the country has needed multi-donor support to resuscitate health services. Health insurance coverage in Zimbabwe is very low. More than 91% of the population is not covered. Those who are covered have private schemes, employer schemes or other mechanisms. Out of pocket expenditure is very high and leads to serious health inequities.(14)

1.6.5 Human Resources for Health

The Public sector Human Resources for Health has suffered major internal and external attrition despite having initially successfully producing a high quality workforce. This attrition is largely due to the poor macro-economic environment that led to poor working environment. As of May 2013, overall vacancy levels were 19% with high vacancy rates for specialist doctors (73%), for EHTs (44%) radiographers (50%) and medical laboratory scientists (46%) among others. The overall density of Health Care Workers (HCWs) in Zimbabwe is 12.3 health staff per 10,000 population against the International Labour Organisation estimate of 41.1 per 10,000 population necessary to provide at least basic health services to all in need.(22) The workload has been increasing over the years against an establishment that was given thirty years ago. The government has tried to address attrition by mobilizing resources from a pool of development partners who support health workers by paying top up allowances as part of a comprehensive Human Resources Retention Scheme.(16)

1.6.6 Medicines, Supplies, equipment and infrastructure

The availability of essential medicines and supplies has been greatly reduced. The overall availability of vital medicines from the National Pharmaceutical Company of Zimbabwe as at June 2013 was 43%. However the Primary Health Package supported by donors since 2009, has ensured a higher availability at primary levels.(19)

Most of the medical equipment is old and obsolete and in most cases non-functional in a number of institutions. Around 60% of district hospitals do not have functional X-ray machines whilst for central hospitals less than 30% of the X-ray machines are functional. Physical infrastructure in most facilities is also in a state of serious disrepair. There is also a shortage of transport to run programmes and emergency services.(16)

1.7 Organization of the National TB Control Programme

The National TB Policy provides for offering TB diagnosis through sputum smear microscopy and TB treatment free of charge. The services are available at all levels and integrated into the health care delivery system and are decentralized to the most peripheral public health entity. Each level has well defined roles and responsibilities in line with the MOHCC roles and responsibilities at each level of care.(20)

1.7.1 Private sector

Since services in the private sector are available at a cost, the private health sector has been supporting the NTP mainly in the diagnosis of TB and referral of diagnosed cases to government or designated health facilities for notification and treatment. However, the NTP is at advanced stages of implementing PPM strategies.(18)

1.7.2 Laboratory Services

Laboratory services are managed under the Directorate of Laboratory Services in collaboration with the NTP. The country has two culture laboratories in the two largest cities that are linked to a Supra-national reference laboratory in Antwerp-Belgium for alignment with global best practices, 10 intermediate (Provincial/cities) and 220 peripheral laboratories. In addition, there are more than 30 private laboratories that perform smear microscopy in the private sector. A well-established external quality assurance (EQA) system that ensures that laboratories at a higher level have regular support visits to lower levels is in place. As of April 2014, the country introduced rapid molecular technology (Xpert^{R} MTB/RIF). A total of 58 machines have been installed across the country.(18)

1.7.3 TB Medicines and Supplies

Anti-TB medicines are distributed through the Zimbabwe Informed Push System, introduced in response to economic and health system challenges in 2007 and 2008. This system was introduced to ensure timely delivery of commodities, as well as collection of essential logistics data. Drug management is the responsibility of the Department of Pharmaceutical Services via National Pharmaceutical Company with the active participation of the NTP Manager.(18)

1.8 Zimbabwe TB Prevalence Survey

Zimbabwe conducted its first NTPS in 2014 in order *'to estimate the prevalence of pulmonary TB among population (aged 15 years or older) within Zimbabwe in 2014'*(23).

This survey was a nationally representative, cluster-sampled, stratified, cross-sectional survey. The survey was conducted on a population aged 15 years and above. A multistage cluster sampling approach was used to select clusters using probability proportional to size. A total of 75 clusters (22 urban and 53 rural) with and average adult population 15 years and above of 600, were sampled. Wards were the primary sampling unit and 75 randomly sampled enumeration areas were selected. More neighbouring EAs were added if the adult population was not up to 600 with 10% allowance less or more.(23)

The sample size was 44 951. All people in the cluster were listed and those eligible by residence status and age were invited to a survey site were screening using a questionnaire and digital chest radiography. Spot and early morning sputum specimens were collected from presumptive TB cases for TB microscopy and culture. Bacteriological positive (Bac+) specimens were run on Xpert[R] MTB-Rif. HIV results of confirmed TB cases was requested from treating centres.(23)

The survey data collection was conducted from January to December 2014 following a pilot survey in December 2013.

2 CHAPTER 2: Problem Statement, analysis of the problem, justification, objectives, methodology and analytical framework.

2.1 Chapter Introduction

In this chapter the problem statement will be presented and the problem analysis and justification of the study presented including the objectives and methodology of the study. The analytical framework that will be used to present findings will be introduced in this chapter.

> *"The term "case detection", as used here, means that TB is diagnosed in a patient and is reported within the national surveillance system, and then to WHO. The case detection rate is calculated as the number of cases notified divided by the number of cases estimated for that year, expressed as a percentage."* (24)

2.2 Problem Statement

The stagnation of case notification rates in Zimbabwe is an issue of concern for the NTP as highlighted in the TB National Strategic Plan 2015-2017 and the Global Fund Concept Note in 2014.(10,18) Incidence may be indeed decreasing due to decrease in HIV prevalence since some studies have confirmed a strong association between TB incidence rates and adult HIV prevalence.(25–27) HIV prevalence in Zimbabwe peaked in 1997 at 29.3% (9)and has now declined to about 15% by 2010(13). Increase in Highly Active Antiretroviral Therapy (HAART) coverage may also be an important determinant since studies have demonstrated how it is strongly associated with decreasing TB incidence.(28–30) In Zimbabwe HAART coverage has increased to 77% in 2013, for eligible adults as per WHO 2013 guidelines.(31)

Despite these possibilities, it is evident that the Zimbabwe health system is currently not able to detect and notify all cases. This has been demonstrated in countries of similar settings like Malawi, Nigeria and Tanzania.(2–4,10,18) Undetected cases continue to spread the deadly TB bacilli thereby increasing incidence of TB. Early diagnosis and initiation of effective TB treatment is an important control measure for TB.(32) In the event that low case detection rate is due to cases properly registered in the system then this may lead to poor case management and increased case mortality.

Some people with TB do not have TB symptoms since TB is of insidious onset. This phenomenon has been confirmed in some studies. In Zimbabwe it was noted that most people found with smear or culture positive TB, in an active case finding study among factory workers, were HIV negative and asymptomatic while in South Africa one study noted that asymptomatic TB among HIV positive individuals was responsible for low case detection.(33) A systematic review also found similar results.(34,35) In Switzerland, it was found that at least 22% of migrants found to have smear positive TB, by active case finding, were asymptomatic.(36,37)

Some people with TB in the community are not aware of their TB symptoms. Cultural perceptions about TB symptoms may contribute to whether people become aware of symptoms or think it is normal. A study in Ethiopia found that belief that TB is caused by evil spirits was associated with people not seeing the need to seek health care once they had TB symptoms.(38)(39)

Some people with TB who are aware of symptoms may not seek treatment. This may be due to fear of stigma and discrimination, poor education, poor health knowledge or feelings of powerlessness when confronting the health system. Poor health knowledge, stigma and discrimination may be associated with poor advocacy, communication and social mobilisation (ACSM) activities. In a study in Zimbabwe it was found that some people avoided seeking care out of fear of being diagnosed with HIV related TB.(39) Unresponsiveness of the health care system may be responsible for people having feelings of powerlessness when confronting the system. In Ghana it was noted that the poor were hopeless when approaching the health system where nurses were '*rude and shouting*'. This meant reduced use of services.(40)

Poor geographical access where people have to walk long distances to reach health care services as well as lack of transport results in inconveniences in seeking care.(40)

Services may also be unacceptable to the community either due to unresponsiveness of the system or cultural beliefs.(40) In certain communities gender issues play a role as women are not allowed to seek care or to travel on their own. Sometimes in societies women are overloaded with gender roles and may find it difficult to find time to visit health facilities as was the case in Nepal.(41)

Some people aware of symptoms visit informal health care sector. This may be due to the fact that informal sector is easily accessible, culturally acceptable and cheaper than the formal sector.(40)

Another reason for low TB case detection is the fact that not all cases detected are recorded and reported. A study by Murimwa et al in 2011, found that more than 40% of TB patients diagnosed and started treatment were not entered in district TB registers in Manicaland Province.(42)

Inadequate knowledge still exists in terms of understanding all factors that affect case detection. Moreover, these factors may be context specific.

2.3 Justification

Understanding factors contributing to low case detection is in line with MDGs. Since Zimbabwe is a TB HBC, there is need to accelerate efforts to increase case detection so that infectious TB cases are identified in the community in order for effective treatment to be initiated. The first NTPS presents an opportunity to have an in-depth understanding some of the issues at population level.

2.4 Research objectives

Overall objective: To identify factors contributing to low case detection, in order to develop and recommend to the NTP, feasible TB case finding interventions and strategies to increase TB case detection rates in Zimbabwe.

Specific objectives:

1. To describe delays in TB diagnosis in Zimbabwe
2. To analyse NTPS data to identify possible factors contributing to delays in TB diagnosis
3. To describe good practices for increasing TB case detection
4. To develop and recommend to the NTP, feasible TB case finding interventions and strategies to increase TB case detection in Zimbabwe

2.5 Methodology

The following table summarises the methodology of the search strategy.

Table 1: Summary search table

	Objective 1: To describe good practices for increasing TB case detection	**Objective 2: To analyse NTPS data to identify possible factors contributing to delays in TB diagnosis**	**Objective 3: To describe good practices for increasing TB case detection**
Google Scholar[R] **Pubmed[R]** **Picarta[R]**	Search terms in various combinations: “Zimbabwe”, “High Burden TB Countries” or “HBCs” “Tuberculosis” or “TB” “Symptoms”, “Asymptomatic” or “symptom free”, “Factors”, “Low Tuberculosis Case Detection” or “Low Tuberculosis Case notification”, “Health Seeking Behavior” or “Health Seeking Behavior/behaviour”, “Private health care providers”, “Tuberculosis Diagnosis”, “Barriers” or “obstacles”, “Recording and Reporting”, “monitoring and evaluation” “Stigma" "Discrimination”, “Access”, “Contact Tracing”, “Informal Providers”, cultural perceptions”. “Patient delays”, “Health system delays”	"Non-tuberculous mycobacterium" or NTM, "Mycobacterium Other than Tuberculosis" or "MOTT"	Search terms in various combinations: “Tuberculosis”, or “TB” “Health Seeking Behavior” or “Health Seeking Behavior/behaviour”, “Public Private Mix”, “Private health care providers”, “Access”, “Contact Tracing”, “Public Private Mix”, “Private health care providers”, “Tuberculosis ACSM or Advocacy, communication and Social mobilisation" , “Tuberculosis IEC or Information, Education and Communication", "Increasing tuberculosis case detection", ''Case studies''
Ministry of Health and	Searched links to AIDS & TB Unit guidelines, reports and strategic documents		

Child Care of Zimbabwe	Requested programme guidelines, strategic documents from NTP manager		
WHO	Searched website for Global Tuberculosis reports "2009-2014"		
	Contacted WHO Tuberculosis Monitoring and Evaluation Expert on Symptom free tuberculosis and was given papers with this phenomenon	Contacted WHO Tuberculosis Monitoring and Evaluation Expert on Symptom free tuberculosis, NTM and update on TB Prevalence surveys, and relevant papers and survey reports were availed.	
Stop TB partnership website			"Increasing case detection" and "case studies"

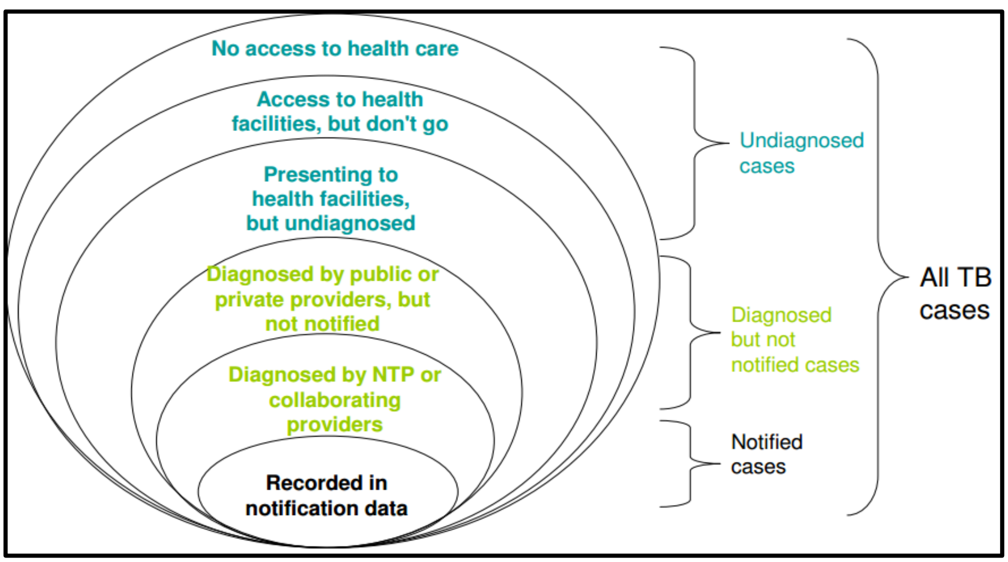
All literature found was initially screened using tittle to search for relevance to the topic, if the tittle was relevant then abstract screening was done. Relevant articles were then read in full text and checked for quality and relevancy to the objectives.

Sub-analysis was used on the recently completed Zimbabwe NTPS. The dataset consisted of 299 variables 85,636, some (101) of which were derived or secondary variables. Stata^{R} version 13.0 was used to analyse data. Characteristics of participants, Bac+ cases and NTMs was extracted and presented in tables and figures. Information on health seeking behaviour was analysed among Bac+ cases. Univariate and multivariate logistic regression analysis was done to calculate odds ratios.

2.6 Analytic framework

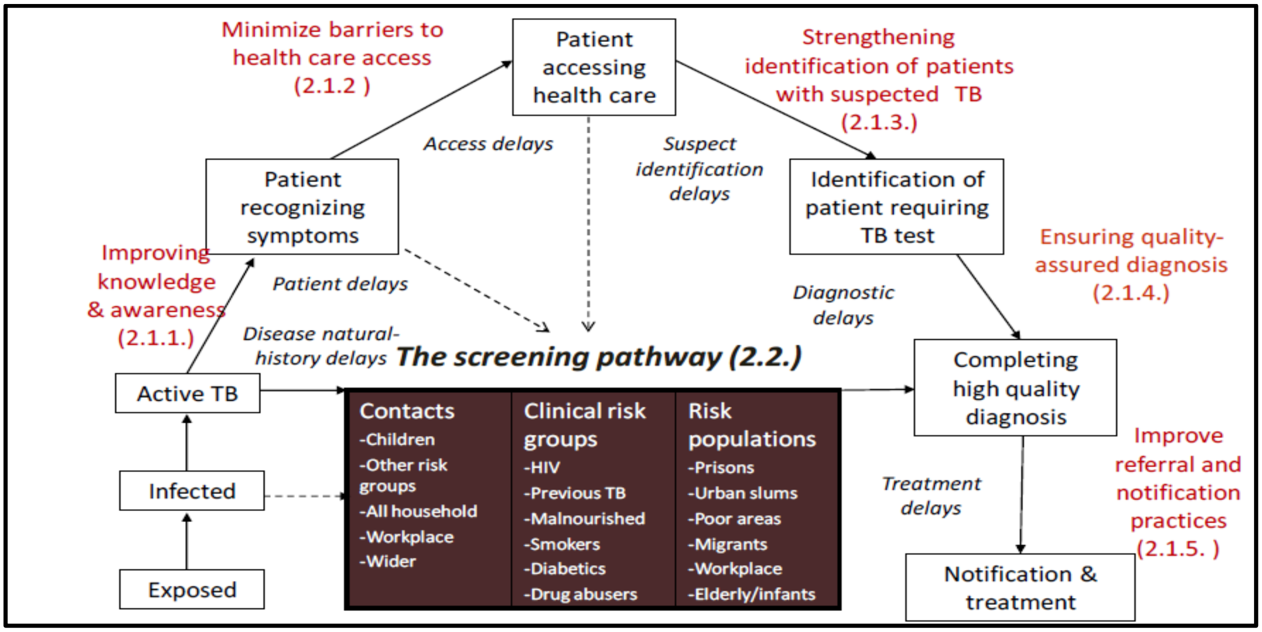
Two models were identified from literature that could help analyse information according to my problem tree and analysis. The "onion" model (Figure 9 below) is important when quantifying cases lost at each level. However, this study tries to identify factors affecting low TB case detection and goes beyond quantifying cases lost.

Figure 9 The "onion" model(43)



A framework for analysis and action to improve early case detection (WHO and Stop TB partnership) was found to be relevant for my problem analysis and objectives. The framework was also found to be action oriented which is important to identify areas that needs attention and draw practical recommendations. Figure 10 presents this framework.

Figure 10 Pathways to TB case detection(44)



3 Chapter 3: Findings: Literature Review

3.1 Chapter Introduction

It is important to note that delayed diagnosis of TB causes spread of infection in the community, increases patient costs, and leads to increased risk of mortality.(45) In this chapter findings from literature are presented according to the headings of the selected framework.

3.2 Patient-initiated pathway

> *'This pathway includes the following steps, each of which represents a potential barrier to early case detection: (i) recognizing symptoms by the sick individual or caretaker; (ii) accessing an appropriate health-care provider; (iii) identifying patients with suspected TB by health-care workers; (iv) successfully applying all required steps in an appropriate diagnostic algorithm, using quality-assured diagnostic tools; (v) referring to the appropriate place of treatment and/or notification'.*(44)

Delays in each step are explored below.

3.2.1 Disease natural history delays

TB is a disease of insidious onset. Sometimes patients do not have symptoms or have mild symptoms even though they have active TB. This means that someone can have very long periods of infectiousness and therefore spread TB in the community before s/he is diagnosed.

A population based study in a high prevalence HIV setting confirmed isolation of MTB in people who were asymptomatic or who did not recognise symptoms. HIV was suggested to be a modifier of TB progression and presentation leading to atypical and asymptomatic disease.(33) A systematic review confirmed similar findings and there was additional yield of cases when intensified TB screening was done among HIV positive patients regardless of symptoms.(35) However, studies done in Zimbabwe and South Africa noted that HIV-associated TB may be of shorter duration to progress and therefore more likely to be detected than TB in the HIV negative individuals.(26,34)

In Switzerland, active screening of immigrants coming from countries outside the European Community, USA, Canada, Australia and New Zealand was done using tuberculin skin test and chest X-ray (CXR) and it was shown that as much as 49.3% of adults found to be having tuberculosis were symptom free. Among those Bac+, it was higher for those confirmed by culture than for those confirmed by smear only.(36)

NTPSs in Ethiopia, Nigeria and Tanzania also found similar findings as shown in Table 2 below;

Table 2 Percentage of symptom free TB cases smear positive and bacteriologically confirmed from African TB Prevalence Surveys conducted 2010 – 2014(3,4,46)

COUNTRY	YEAR SURVEY CONDUCTED	% SYMPTOM FREE AMONG SS+)	% SYMPTOM FREE AMONG BC+)
ETHIOPIA	2010	43%	48%
NIGERIA	2012	25%	36%
TANZANIA	2012		27% in HIV- , 30% in HIV+
ZIMBABWE	2014	22%	43%

Onazaki et al reviewed Asian TB Prevalence surveys conducted between 1990-2012, and noted that the proportion of bacteriologically positive cases that did not report symptoms was high, ranging from 40% in Pakistan to 79% in Myanmar. They also noted that in three repeat surveys, this proportion was incremental.(47)

Notably, countries in the Northern hemisphere and some parts of Asia implemented periodic active case finding, mainly with CXR during the period when TB prevalence was higher and under efforts to reduce it. This activity was discouraged when it was no longer cost effective due to low yield of cases when prevalence became very low. A systematic review then, found that studies conducted showed that passive case finding was then missing only a few cases. In 1974 WHO strongly supported passive case finding and discouraged mass radiography.(48)

In 2013, WHO defined systematic screening for active TB as *'the systematic identification of people with suspected active TB, in a predetermined target group, using tests, examinations or other procedures that can be applied rapidly'*. It goes on to recommend that '*Indiscriminate mass screening should be avoided. The prioritization of risk groups for screening should be based on assessments made for each risk group of the potential benefits and harms, the feasibility of the initiative, the acceptability of the approach, the number needed to screen, and the cost effectiveness of screening*.'(49)

3.2.2 Patient delays

Most studies defined '*patient delay'* as the time between onset of symptoms and the time of first consultation. Some studies associated patient delay to lack of TB knowledge and low education status(50–53) among other factors. However, a study done in Zimbabwe did not find education as an association. TB knowledge was associated with '*patient delay'* though not statistically significant. Perhaps this was because of generally high level of knowledge and higher proportion of people attaining secondary education.(54)

Wandwalo, et al in Tanzania noted that age > than 45 years was associated with patient delay(50) while Rajeswari et al in India noted that age < 45 years was associated with patient delay.(45) In Nepal age was not found to be significant.(41)

A study in Zambia found that female gender was associated with patient delay but this could have been confounded by low education in females.(52) In Nepal women, had a longer patient delay even though they knew that services are offered free of charge at a government establishment unlike their male counterparts. Long distance to these facilities could be an issue for the women and it was noted that women had a lot of household chores and caring for children that led them to fail to have time to visit distant government medical facilities. It also seemed that women visited traditional healers more and seemed to believe more on their charms more than men who usually sought other interventions faster even though they visited a traditional healer.(41)

However, in South India which has a similar sociocultural context with Nepal it was found that men delayed seeking care.(45) This finding was similar to a finding in the Peruvian Amazon.(53) In Zimbabwe one study also had similar findings.(54) These findings may mean that the masculinity nature of males makes them first try to be strong and only visit the health facilities when they consider the symptoms severe. In Zimbabwe masculinity is very important culturally and a man has to be strong and provide for the family and must not be seen to be weak such as failing to work and seeking care for a '*minor cough*.' In other studies in Zambia and Ethiopia, gender was not found to be significant.(38,50)

A systematic review showed that in most studies on 'patient delay' patients had consistently visited traditional healers.(51) In one study in Tanzania this showed that as much as more than a third of patients first visited a traditional healer.(50) '*Patient delay'* in this study was as much as 266 days for these patients. This shows that apart from the medical explanation of symptoms people have other beliefs on the causes as was also noted in another study in Ethiopia(38). A qualitative study done in South Africa found such beliefs as TB being caused by witchcraft, breaking traditional rules and that TB was sexually transmitted. These beliefs were strongly associated with visiting traditional healers since people believed that these are the only ones who can deal with such issues. Stigma and discrimination is also closely linked to these beliefs and can affect people making decisions to visit health facilities.(38,55)

In Zimbabwe, it was found that the association between TB and HIV led to a lot of stigma since people thought a diagnosis of TB means HIV infection which is termed '*TB-2*'.(39)

3.2.3 Access delays

> *'There is a multiplicity of providers, a multiplicity of reasons for choosing them and a number of key problems when they have been accessed. The burden of care seeking is on the patient, to select the correct provider; this is influenced by perceptions of illness, the availability and cost of accessing providers and the treatment they receive when they get there*.'(56)

Access to services can be affected by many factors. A study done in Zimbabwe which focused on '*total delay'* and defined it as the sum total of '*patient delay'* and '*health systems delay'*. In this study patient delay was defined as the time taken between onset of symptoms and first contact with a nurse or doctor in a formal public health facility (excluding private practitioners). In this study the median '*patient delay'* was 28 days (IQR 21-63)(54) which was similar to another study done in Tanzania. Total delay was almost all ascribed to '*patient delay'*. Factors associated with '*patient delays'* included rural residency and staying far from health centres. The association with rural residence may have a significance in terms of how services are accessed in the rural areas. However, the study did not explore these further. In the Tanzanian study longer distance from health facility was also associated with patient delay. These findings relate to geographic access.

In Zimbabwe TB diagnosis and treatment is free in public health institutions, however the transport costs, time and effort as well as opportunity costs can present as a barrier to access. This access issue is called financial access. Several studies have found money to be an issue in accessing care. In Zimbabwe delaying seeking care was seen as a means of deferring costs while hoping symptoms will subside. Taking self-medication symbolised this deferment of costs.(39) In Ethiopia patients cited lack of transport money.(38) In Nigeria and Malawi patients who delayed said they had no money.(56,57) Rajeswari et al found that low income was associated with delayed health seeking.(45)

Acceptability and perceptions about quality of services offered can also be an access barrier. In Zimbabwe negative perceptions about the health care system, fear of impolite treatment which was often based on past experience was found to be an issue.(39). Okeibunor et al found that attitude of health workers was a barrier to accessing care.(57) In Malawi, health worker attitudes, perceived quality of care, shortage of drugs and personnel affected the decision for patients to seek care.(56)

3.2.4 Suspect identification delays

Suspect identification delay can be defined as the time between the first consultation from a formal health care delivery point, and the patient being identified as a presumptive TB case. According to the study by Takarinda et al, it seems the NTP is efficient in this area since health systems delay (of which suspect identification delay is a part) was very minimal compared to other studies of similar settings. The median total health systems delay was 2 days (IQR 1-5) which includes the time from first consultation to TB treatment.(54)

In Zimbabwe, all people visiting a health care facility are supposed to be screened using a simple TB Screening tool Annex 2 and all presumptive TB clients must have a thorough general medical examination and an examination of the respiratory system, and should have their sputum examined. Known HIV patients are screened for TB in each and every visit.(20)

A study done in Zimbabwe and several studies in resource limited settings like Zimbabwe have demonstrated that visiting private practitioners is associated with delay in identification of presumptive TB clients. This is worse if the practitioners are the informal ones such as traditional healers or faith healers. These practitioners are normally easily accessible in the community and may be more responsive than the formal sector. Patients' choices on whom to seek care depends on the quality of services offered and the location of care provision.(41,45,50,52)

3.2.5 Diagnostic delays

Diagnostic delay can be defined as the time taken from the HCW suspecting TB until a diagnosis of TB is confirmed. This time depends on the diagnostic algorithms as well as the availability and quality of available diagnostic tests. Takarinda et al found that those who had an Xpert^{R} MTB/Rif test had less odds of diagnostic delays. In this study, all patients who had an Xpert^{R} MTB/Rif test were HIV positive. Male gender was also associated with diagnostic delay.(54)

Smear microscopy is recommended for all clients identified to be suspects in Zimbabwe. Xpert^{R} MTB/Rif is available in some diagnostic facilities and prioritises HIV positive clients, presumptive drug-resistant TB (DRTB) clients and presumptive TB in children. Smear negative clients and presumptive drug resistant clients. Patients who are sputum smear negative and fail to respond to antibiotics are considered for CXR, culture and/or Xpert^{R} MTB/Rif.(20,58)

For CXR the patients have to travel to a centre with CXR while for culture and Xpert^{R} MTB/Rif, sputa are collected and transported to centres with the Xpert machines or culture laboratories. Some innovative strategies to improve sputum transportation have been implemented in some districts through support from The Union-Zimbabwe. This involves regular courier visiting peripheral centres to collect specimens and deliver results. An integrated specimen transport system is also being implemented and is integrating specimen transportation with other programmes like early infant diagnosis for HIV. TB diagnosis is offered free of charge in public health facilities.(19,22)

Patients who had more than 4 visits were also likely to have diagnostic delay especially if they were seen at different facilities or by different health workers in the same facility.(54) Wandwalo et al, noted that diagnostic delay was less if the patient was diagnosed in the place where they first sought care compared to those who had to go elsewhere for diagnosis after initially visiting a centre.(50)

Being HIV positive, having a negative sputum result, having extra pulmonary TB, having generally poor health, coexistence of chronic cough and other lung conditions are also associated with diagnostic delays.(59) Waiting for results and delayed CXR was also found to be associated with diagnostic delays.(60) In Chad it was found that low socio-economic status was associated with diagnostic delay. This was due to the fact that the patients incur costs to go through the diagnostic process before they access free TB treatment.(61).

3.2.6 Notification and treatment delays

The study by Murimwa et al confirmed that Zimbabwe might be having challenges regarding notification. In their study they noted that 40% of people on treatment were not recorded in the District Tuberculosis register.(42) A study in South Africa had revealed similar findings where they noted that up to 26% of TB cases diagnosed did not start treatment and were not registered.(62) In their editorial Harries et al noted that a series of studies had reported a phenomenon known as 'initial defaulters'.(63) This is the case where a patient submits sputum that is found to be sputum positive but is not issued results and does not start treatment.

3.3 Screening pathway

Screening pathway are mainly in the control of the HCWs.

3.3.1 Contacts

Identifying contacts of index cases is a useful strategy in systematic screening for tuberculosis. Contacts can be household members (particularly children under 5 years) workmates, schoolmates or people from a wider social network. The more remote from the index case the more difficult to identify these contacts.(49)

In one study older contact age, cohabitation, positive sputum test and duration of the index patient symptoms were identified as independent risk factors for a positive screening among contacts.(64) In Zimbabwe contact screening is one of the case finding strategies prioritising infectious cases. It is recommended that all diagnosed TB cases give a list of their close contacts. EHTs have to follow up these contacts and use a screening questionnaire to identify TB suspects. These suspects then have to submit specimens for smear microscopy.(20) Challenges include lack of transport, poor communication and shortage of EHTs.(18)

3.3.2 Clinical risk groups

Clinical risk groups are groups of people with an identified medical condition that is associated with an increased risk of developing TB. Examples of such risk groups include HIV, silicosis, previous TB, diabetes, undernutrition, chronic obstructive lung disease, alcohol dependency, smoking and other conditions.(49)

Diabetics have been shown to be 2-3 times more likely to develop TB than non-diabetics. In some countries such as India, 20% of sputum positive TB cases are diabetic.(65)

HIV has been shown to alter the presentation of TB and the disease has been shown to present an acute illness in HIV infected patients. A similar picture was observed for silicosis and other conditions that lower the immune status of an individual.(26) In Zimbabwe intensified TB case finding was introduced in HIV clinics with even lowered threshold for suspicion of TB to any cough rather than cough for at least two weeks as in HIV negative individuals.(20) The country's strategic plan has also identified diabetes as targets for intensified case finding.(18)

3.3.3 Risk populations

Risk populations are divided into institutional, occupational, residential, demographic and socioeconomic risk groups. Examples of institutionalized risk groups include prisons, homeless shelters and mental institutions, where TB transmission may be high and other TB risk factors may be prevalent. Examples of occupational risk groups include health-care workers, mining industries and crowded health places. Cost of screening these can be shared with employers. Studies have confirmed high rates of infection among student nurses showing the nursing profession as a high risk population.(66,67)

Examples of residential risk groups include people living in high-density residential areas including slums, refugee camps, or any other identified high TB prevalence setting. Corbett et al found a significant number of undetected TB in a high-density residential area in Zimbabwe.(68) Examples of demographic and socioeconomic risk groups includes immigrants from a high TB prevalence setting, the elderly, and people in low socioeconomic groups.(49)

The Southern African Development Community (SADC) Heads of States have signed the *"SADC Declaration of TB in the Mining sector"*, as a means of sharing regional commitment to curb the spread of TB among mine workers. Zimbabwe is both a member and a signatory of this declaration. The rates of TB in the mines in the SADC region are higher than in the general population with rates as high as four times the national rates in some member states. The United States Agency for International Development, under TB CARE-II is supporting TB in mines interventions in the SADC region following the declaration.(69,70)

4 Chapter 4: Findings from the First National TB Prevalence Survey in Zimbabwe

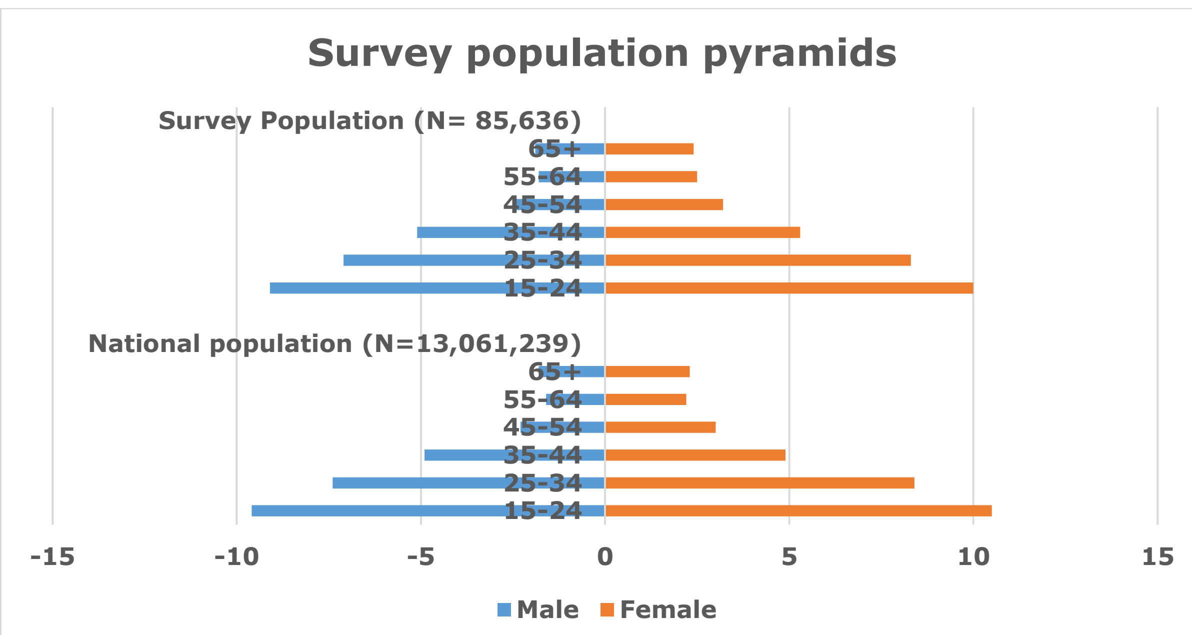
4.1 Chapter introduction

This chapter outlines the summary findings of the Zimbabwe NTPS. Information that was considered important for the objectives of this paper was included in the main document and annexes.

4.2 Results introduction

The survey was conducted on a sample of the Zimbabwe national population. The population pyramids comparing the survey population and the national population are shown in Figure 11 below. The survey population consisted of 85,636 enumerated individuals. The age-sex distributions for the survey population and the national population are similar.

Figure 11 Population pyramids comparing survey population to the national population(14)



Of the 46,860 eligible individuals, 43,486 were invited to participate in the survey and 33,736 individuals participated. The participation rate for those invited to participate was 77.6% and this was below the anticipated participation rate of 85% used in the assumptions for sample size calculation for the survey.(23) Location of clusters on the Zimbabwe map are shown on Figure 12 and follow population trends since probability proportional to size was used for sampling. The southern region of the country is more sparsely populated compared to the northern part. Annex 3 shows the populations in the 10 provinces. Participation rates per cluster and Bac+ cases are shown in Annex 4. Case notification rates per district are shown in Annex 5 for comparison on relative burden and case detection performance. The participation populations are as shown on Figure 13 below. Females participated better than males with a male to female ratio of 73 males for every 100 females, compared to 87 in the general population for those aged 15 years and older.

Figure 12 Map of Zimbabwe with cluster distributions selected based on application of PPS.(71)

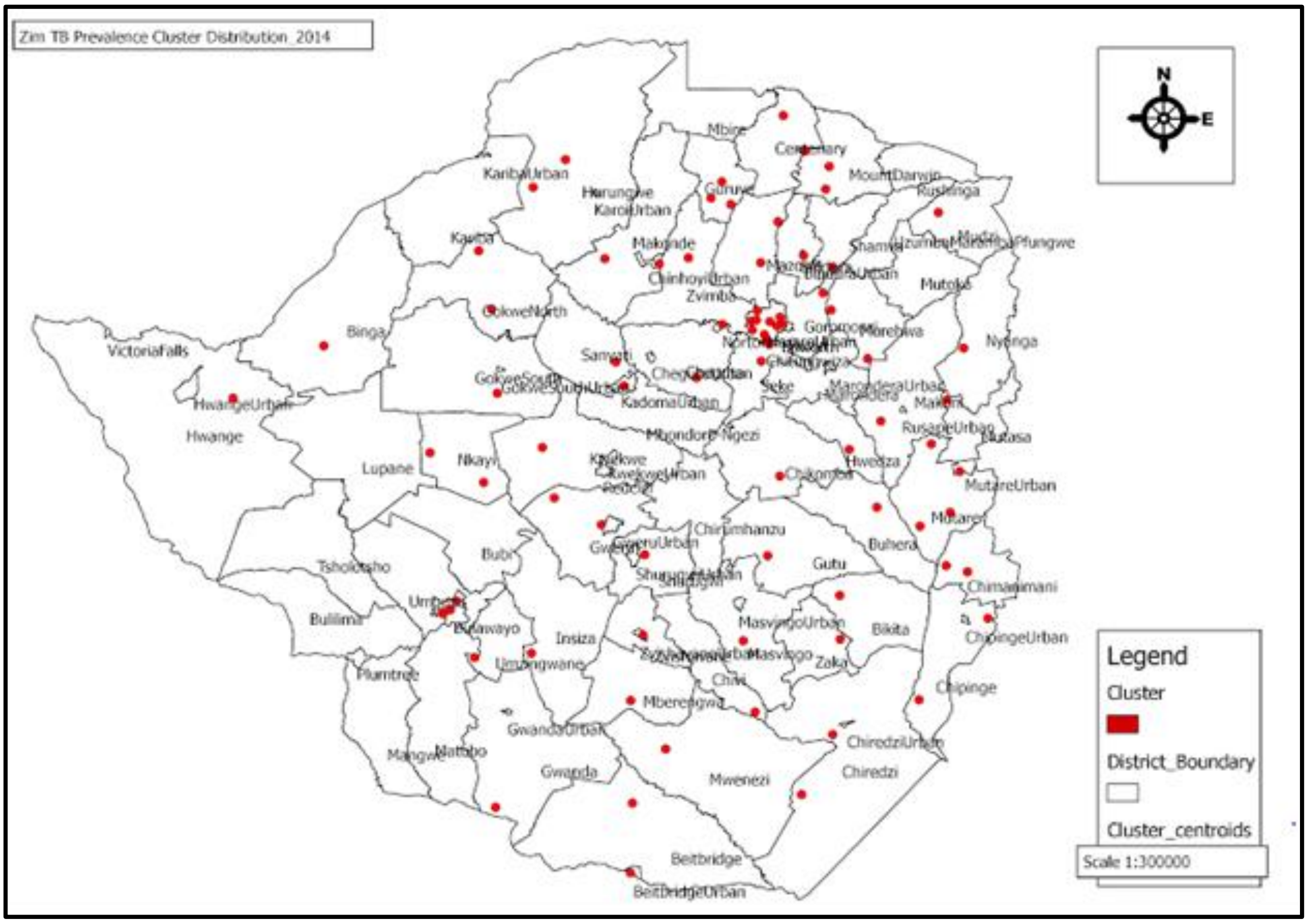
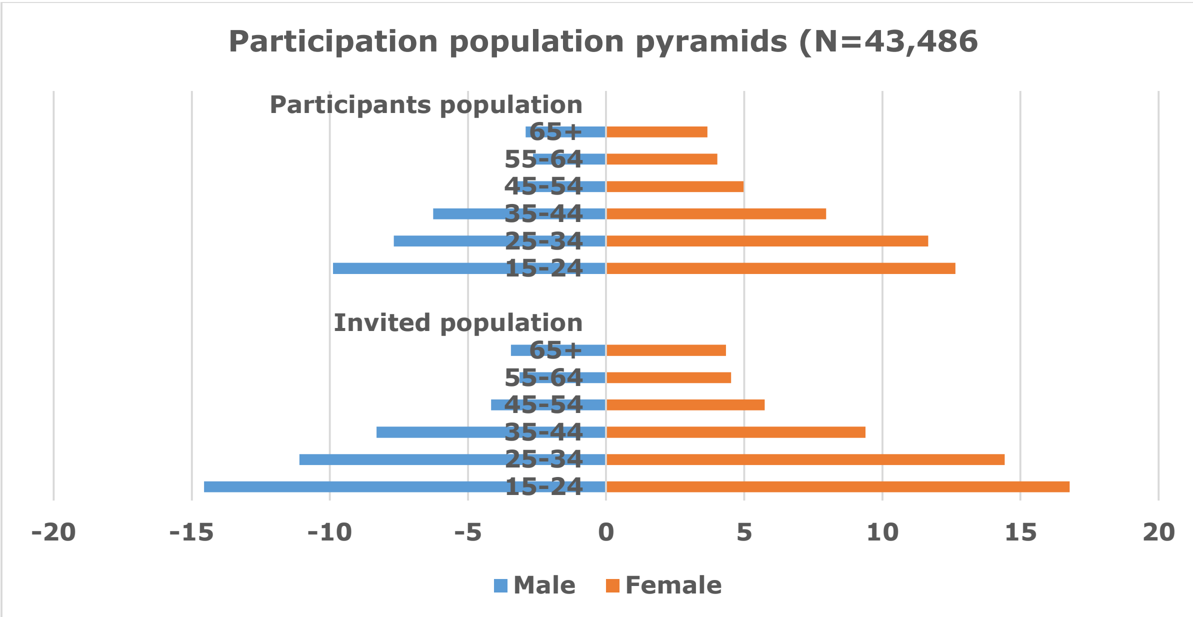


Figure 13 Participants age-sex distribution



Participation was lower for those neighbourhoods with relatively higher income especially the urban areas. The rural population contributed 73% of survey participants, as shown in Annex 6, despite the fact that they contribute 67%(14) of the population. Participation in rural areas was affected by poor weather conditions especially during the rainy survey when flooded rivers prevented people from being mobile.

There were 23 SS+ TB and a total of 107 Bac+ cases identified in the survey. The estimation of the national prevalence of smear positive and bacteriologically positive cases is beyond the scope of this paper. However, based on the number of participants and confirmed cases, the crude prevalence of SS+ and Bac+ cases is 68 (95%CI 45-103) and 317 (95%CI 262-383) per 100 000, for the population aged 15 years and above, respectively. This indicates that Zimbabwe still has a high burden of TB though it is lower than current estimates, and there is a wide gap at population level between SS+ TB and Bac+ cases. This shows that smear microscopy could only successively detect about 21% of bacteriologically positive cases at population level. This gap is wide in all age groups as shown in Figure 14 but highest in older people.

Figure 14 Crude prevalence (SS+ and Bac+) and age

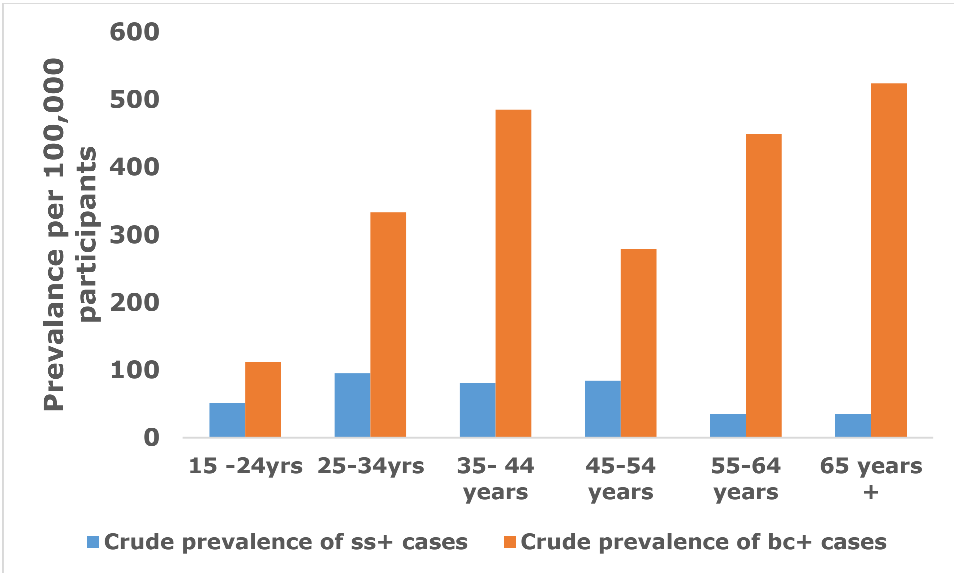


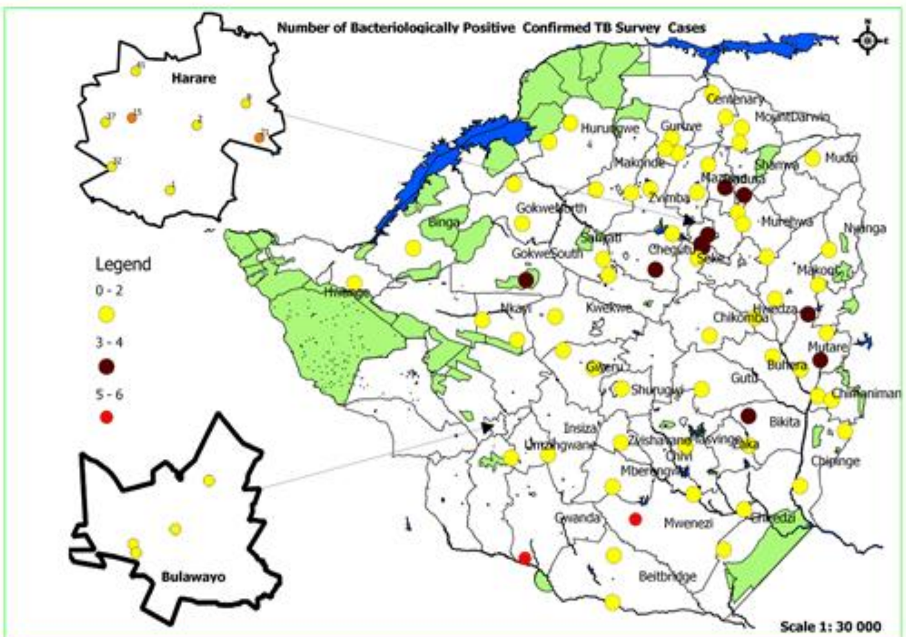
Figure 15 below shows the Zimbabwe NTPS in summary.

Figure 15 Summary Zimbabwe NTPS - 2014

4.3 Characteristics of patients identified during the survey

Figure 16 shows the characteristics of bacteriologically confirmed cases and Figure 16 shows how they were distributed among clusters. Harare, Manicaland and Mashonaland contributed close to 50% of all the confirmed cases. The age group 25-44 years contributed more than 50% of the cases. Despite the male to female ratio of 0.73 among participants, males contributed 58% of the cases. More than 80% of the cases had attended at least primary level of school. All of the identified cases were in the very poor category according to self-reported earnings, with none earning more than $500.

Figure 16: Distribution of Bac+ cases from NTPS(71)



About 40% of the confirmed cases were from the Zionic and apostolic sects. Almost 40% of the bacteriologically confirmed cases were smokers despite the fact that only 21% of men aged between 15-54 years and less than 1% of women aged 15-44 were found to be smokers according to the ZDHS 2010-11.(13). Most (95%) of these smokers were male. Almost 1 in five of the cases had a positive history of TB contact within the last 2 years.

Table 3 Characteristics of bacteriologically confirmed cases (N=107)

Province	***n***	***%age***
Bulawayo	6	5.6
Harare	19	17.8
Manicaland	17	15.9
Mashonaland Central	16	15.0
Mashonaland East	3	2.8
Mashonaland West	11	10.3
Masvingo	12	11.2
Matabeleland North	4	3.7
Matabeleland South	9	8.4
Midlands	10	9.4
Rural/Urban		
Urban	31	29.0
Rural	76	71.0
Age groups		
15 -24yrs	11	10.3
25-34yrs	28	26.2
35-44yrs	30	28.0
45-54yrs	10	9.4
55-65yrs	13	12.2
65yrs+	15	14.0
Sex		
Male	58	54.2
Female	49	45.8
Level of education		
No Schooling	16	15.0
Primary	37	34.6
At least Secondary	53	49.5
Missing	1	0.9
Occupation		
Unemployed	7	6.5
Farmer	53	49.5
Formal work (Office)	6	5.6
Formal work (Non office)	16	15.0
Informal work	9	8.4
Student	4	3.7
Miner	4	3.7
Housewives	7	6.5
Missing	1	0.9
Monthly earnings		
Zero	32	29.9

Less than $200	59	55.1
$201 - $400	7	6.5
$401-$500	4	3.7
Student	4	3.7
Missing	1	0.9
Religion		
Catholic or Protestant	25	23.4
Pentecostal	16	15.0
Zionic or apostolic sects	40	37.4
Traditional	7	6.5
Others	18	16.8
Missing	1	0.9
Smoking		
Answered no	65	67.7
Answered yes	41	38.3
Missing	1	0.9
Takes alcohol		
Answered no	77	72.0
Answered yes	29	27.1
Missing	1	0.9
Contact history		
No history of TB contact	85	79.4
History of TB contact	21	19.6
Missing	1	0.9
HIV Prevalence in Province		
< 17%	88	82.2
>17%	19	17.8
Previously Treated for TB		
Answered no	88	82.2
Answered yes	18	16.8
Missing	1	0.9
CXR appearance		
No abnormality noted	7	6.5
Abnormal other than suggestive of TB	1	0.9
Abnormal suggestive of TB	93	86.9
Not taken	6	5.6
Currently on TB Treatment		
Answered no	104	97.2
Answered yes	2	1.9
Missing	1	0.9
TB Symptoms		
No symptom reported	46	43.0

Symptoms negative with NTP TBSCT	10	9.3
Symptoms positive with NTP TBSCT	50	46.7
Missing	1	0.9

Table 4 Risk analysis for the diagnosis of bacteriologically confirmed TB cases

	Cases (N=107)	Participants (N=33,736	/100 000	OR	95% CI	p>z	aOR*	95% CI	p>z
Province									
Bulawayo	6	1,382	434.2	Reference					
Harare	19	5,792	328.0	0.75	0.30-1.89	0.549	0.74	0.29-1.86	0.516
Manicaland	17	4,315	394.0	0.91	036-2.31	0.838	0.80	0.30-2.15	0.660
Mashonaland Central	16	3,743	427.5	0.98	0.38-2.52	0.974	0.83	0.30-2.26	0.715
Mashonaland East	3	2,807	106.9	**0.25**	**0.06-0.98**	**0.047**	**0.21**	**0.05-0.88**	**0.033**
Mashonaland West	11	3,976	276.7	0.64	0.23-1.72	0.374	0.50	0.17-1.49	0.215
Masvingo	12	3,483	344.5	0.79	0.30-2.12	0.643	0.64	0.22-1.84	0.409
Matabeleland North	4	1,998	200.2	0.46	0.13-1.63	0.230	0.37	0.10-1.40	0.143
Matabeleland South	9	2,088	431.0	0.99	0.35-2.78	0.989	0.73	0.24-2.16	0.566
Midlands	10	4,152	240.8	0.55	0.20-1.53	0.253	0.47	0.16-1.36	0.164
Rural/Urban									
Urban	31	9,097	340.8	Reference					
Rural	76	24,639	308.5	0.90	0.60-1.37	0.640			
Age groups									
15 -24yrs	11	9,798	112.3	Reference					
25-34yrs	28	8,413	332.8	**2.97**	**1.49-5.97**	**0.002**	**2.62**	**1.19-5.78**	**0.017**
35- 44 years	30	6,182	485.3	**4.33**	**2.17-8.66**	**0.000**	**3.30**	**1.48-7.37**	**0.004**
45-54 years	10	3,583	279.1	2.49	1.06-5.87	0.037	1.98	0.77-5.13	0.159
55-64 years	13	2,898	448.6	**4.01**	**1.79-8.96**	**0.001**	**3.30**	**1.34-8.15**	**0.009**
65 years +	15	2,862	524.1	**4.69**	**2.15-10.22**	**<0.001**	**4.32**	**1.79-10.43**	**0.001**
Sex									
Male	58	14,195	408.6	Reference					
Female	49	19,541	250.8	**0.61**	**0.42-0.89**	**0.012**	0.66	0.44-1.01	0.054
Occupation									
Unemployed	7	1,194	586.3	Reference					
Farmer	53	14,679	361.1	0.61	0.28-1.35	0.227	0.60	0.25-1.41	0.241
Formal work (Office)	6	1,780	337.1	0.57	0.19-1.71	0.319	0.45	0.15-1.37	0.158
Formal work (Non office)	16	4,407	363.1	0.62	0.25-1.51	0.289	0.47	0.19-1.17	0.106
Informal work	9	1,744	516.1	0.88	0.33-2.37	0.800	0.70	0.25-1.91	0.484
Student	4	3,614	110.7	**0.19**	**0.05-0.64**	**0.008**	0.42	0.11-1.63	0.211
Miner	4	471	849.3	1.45	0.42-4.98	0.553	1.13	0.30-4.21	0.858

Housewives	7	4,037	173.4	**0.29**	**0.10-0.84**	**0.022**	0.34	0.12-1.01	0.051
Missing	1	1,810	Omitted						
HIV Prevalence in Province									
< 17%	88	28,268	311.3	Reference					
>17%	19	5,468	347.5	1.12	0.68-1.83	0.663			
Previously Treated for TB									
Answered no	88	32,313	272.3	Reference					
Answered yes	18	1,377	1,307.2	**4.85**	**2.91-8.08**	**<0.001**	**3.65**	**2.16-6.18**	**<0.001**
Missing	1	46	Omitted						

1* Adjusted odds ratios (aOR) were calculated by including all variables with odds ratio(OR) < 0.05 in the univariate analysis

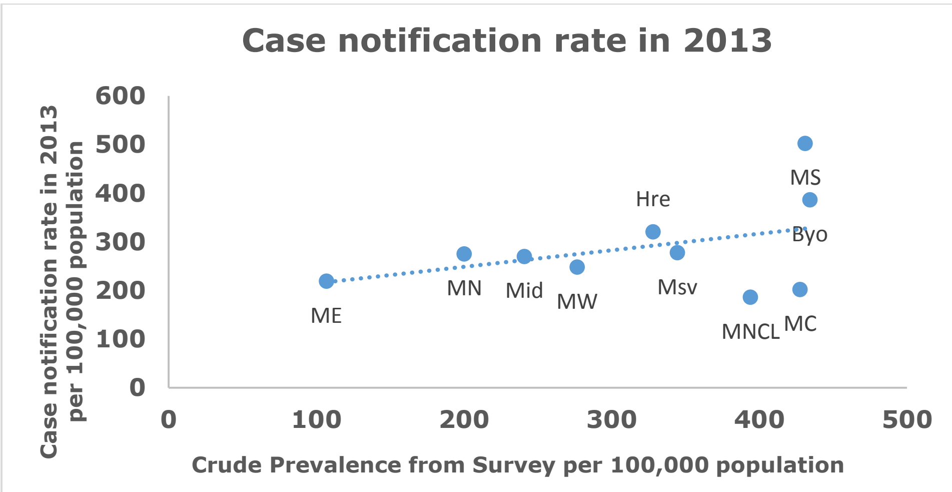
4.4 Risk analysis for the diagnosis of bacteriologically confirmed TB cases

The TB prevalence survey does not assess risk of developing TB but is important to understand the risks of TB patients at community level. It is also likely that the survey will miss those patients who progress fast and either die or seek care early. Therefore the survey will likely detect cases that are likely be in community for long time undetected by the system. And besides, the analysis does not include clinically diagnosed and extra pulmonary TB cases.(72)

Mashonaland Central and Manicaland are among the highest according to crude prevalence (428 and 394 per 100,000 participants respectively) of bacteriologically confirmed TB from the survey results as shown in

Table 4 Risk analysis for the diagnosis of bacteriologically confirmed TB case. However, this was not found to be statistically significant but it may still be indicative of a higher burden and poor case finding in these two provinces. These provinces have been recording the lowest case notification rates(10). This relationship is shown in Figure 17.

Figure 17 Relationship between provincial crude prevalence from survey and case notification rates for 2013



2 Byo=Bulawayo, Hre= Harare, MNCL=Manicaland, MC=Mashonaland Central, ME=Mashonaland East, MW=Mashonaland West, Msv=Masvingo, MN=Matebelend North, MS=Matabeleland South, MN=Matabeleland North, Mid=Midlands

Another notable finding is that Beitbridge, located in Matabeleland South(Southern part of the country), had no cases detected in the survey despite it being one district that has consistently recorded high case notification rates(10) and had two clusters in the survey that were represented of both rural and an urban setting with good participation rate. Its neighbours, Gwanda and Mwenezi, that had clusters representing rural settings recorded the highest cases (6 and 5 cases respectively) detected from rural clusters as shown in Annex 4 and 5. On the other hand, clusters in Mudzi and Gutu yielded 3 cases each despite the low participation rates and the fact that they usually report low case notifications as shown in Annex 4 and 5.

The crude odds and crude prevalence, of bacterially confirmed cases among participants increased with increasing age as shown in the

Table 4 and Figure 14, and this was statistically significant in both the Univariate and the Multivariate analysis save for the dip in the age group 45-54 years that was not statistically significant in the multivariate analysis. The odds of being male among bacteriologically confirmed cases was 1.6 (95%CI 1.1-2.4) times higher than being female and this was statistically significant in the univariate analysis but on the marginal (*p=0.054)* in the multivariate analysis. Similar findings were observed in the first Tanzanian and Nigerian surveys.(3,4) However, in the Tanzanian survey the dip was in the 55-64 age group and the prevalence did not rise above the younger age groups in the 64+ age group.(4)

4.5 Absence of symptoms suggestive of TB among prevalent cases

A small proportion (2%) of identified cases were already on treatment. Of the 101 cases that were screened with CXR, more than 90% were correctly identified by field medical officers as suggestive of TB. Of note is that 43% of the cases did not report any symptoms. An additional 9% would have been missed by symptom screening using the NTP TB screening tool in a general outpatient setting even if they sought care with their symptoms. The analysis of the association of not reporting symptoms and possible risk factors is presented in Annex 7. It must be noted that since TB is a rare disease in the community, the yield of Bac+ cases available from TB Prevalence surveys for this analysis is small and not all relevant factors can be properly analysed due to poor representation since the survey sample size was powered for the prevalence of TB in the country and not for associations of such factors with certain characteristics. However, there is no other opportunity available to analyse such important associations from a nationally representative sample other than the TB Prevalence Survey. For this reason many associations may actually be not statistically significant due to the low numbers but may be indicative of some problems.

From this analysis factors that were found to be statistically significant and those that had p-value below 0.1 in the multivariate analysis are presented in Table 5 below. The crude and adjusted odds ratios for the rest of the analysis are presented in Annex 7. Part of forms used for symptom screening during the survey are presented in Annex 8 and 9 to demonstrate the type of questions asked and how they were asked.

Table 5: Factors associated with reporting symptoms among Bac + cases

	Cases (N=107)	**OR**	**95% CI**	**p>z**	**aOR***	**95% CI**	**p>z**
Sex							
Male	58	Reference					

Female	49	**1.82**	**0.83-3.99**	**0.133**	**12.61**	**1.97-80.79**	**0.008**
Level of education							
No Schooling	16	Reference					
Primary	37	0.79	0.21-2.99	0.726	0.32	0.03-2.71	0.297
At least Secondary	53	**0.24**	**0.67-0.83**	**0.025**	0.11	0.01-1.24	0.074
Missing	1	Omitted					
Occupation							
Unemployed	7	Reference					
Farmer	53	5.29	0.93-30.11	0.060	11.55	0.68-196.91	0.091
Formal work (Office)	6	0.50	0.03-7.45	0.615	0.28	0.01-13.20	0.518
Formal work (Non office)	16	1.94	0.29-13.19	0.496	7.70	0.33-180.22	0.205
Informal work	9	8.75	0.90-84.90	0.061	16.65	0.50-550.87	0.115
Student	4	2.50	0.19-32.19	0.482	41.30	0.67-2560.26	0.077
Miner	4	**All reported symptoms**					
Housewives	7	**0.42**	**0.10-0.84**	**0.522**	0.21	0.17-3.29	0.404
Missing	1	Omitted					
Religion							
Catholic or Protestant	25	Reference					
Pentecostal	16	0.61	0.17-2.16	0.445	0.11	0.01-1.17	0.067
Zionic or apostolic sects	40	0.87	0.32-2.37	0.783	0.32	0.04-2.30	0.256
Traditional	7	4.71	0.49-45.15	0.179	1.87	0.07-47.65	0.704
Others	18	1.57	0.45-5.53	0.482	0.65	0.07-5.90	0.706
Missing	1	Omitted					

This indicates that females had more odds of having reported symptoms than the males in the multivariate analysis at *p-value* 0.008.

Though not statistically significant, for reasons stated above, there seems to be an association for level of education (at least secondary level, *p-value* = 0.074), the religious denomination (Pentecostal, *p-value* = 0.067), occupation (farmers, *p-value*=0.91; Students *p-value* = 0.077; miners, all 4 reported symptoms). Farmers, miners and students seem to have higher odds of having reported symptoms compared to the unemployed. While those that had higher education (at least secondary) and those for the Pentecostal religion had higher odds of not having reported symptoms.

Effect modification especially from HIV infection and smoking may have affected these results. HIV information was not available to the author since this was only collected post survey.

The absence of symptoms among bacteriologically confirmed cases in population based prevalence surveys has been observed in other surveys as presented in section 3.2.1.

4.6 Non-Tuberculosis Mycobacterium (NTMs) and diagnosis of TB

The survey identified a high prevalence of NTMs among participants. There were 1097 cases of NTMs and this had a crude prevalence of 33 (95%CI 31-34) per 1,000 population. Odds ratios and adjusted ORs were calculated for these. The aORs were calculated by including all factors with *p-value* < 0.05 in the univariate analysis and they are shown in

Table 7. The odds for NTMs were higher for Matabeleland North and less in Manicaland as shown below. The odds of having NTM were 3.3 (*p-value <0.001)* higher for previously treated cases. CXR findings and symptoms suggestive of TB were strongly associated with diagnosis of NTM.

NTM is not notifiable in many countries because the disease is not considered of public health importance since there has been no evidence of human-human transmission, and that NTMs are ubiquitous in the environment and has been found common in water supplies and more than 125 different types exist. However, there are indications that pulmonary disease caused by NTM is on the increase. Those causing disease in humans may have a wide range of non-specific symptoms ranging from no symptoms to fatal disease. Signs and symptoms of disease caused by NTMs including radiological findings are similar to mycobacterium TB (MTB) disease.(73,74) In an editorial published earlier in 2015 by Wing Wai Yew et al it was noted that the poor notification system, limited availability of NTM diagnostic tests and the fact that the isolation of NTM in a specimen does not mean a diagnosis of NTM disease compromises epidemiological assessment of NTMs.(75)

Of concern to TB control programmes is the confounding effect of NTM in the diagnosis and management of pulmonary specimens.(75) In one study it was found that 21.9% of culture positive isolates of presumptive TB cases submitted between 2004 and 2009 were NTM.(76) Similar findings were confirmed in Cambodia were 25% of presumptive MDR-TB cases were positive for NTM.(77) In Mali 18% of cases diagnosed as chronic TB were NTM infected and yet a presumptive diagnosis of MDR-TB was made. In some patients co-infection of NTM and MTB was documented.(74)

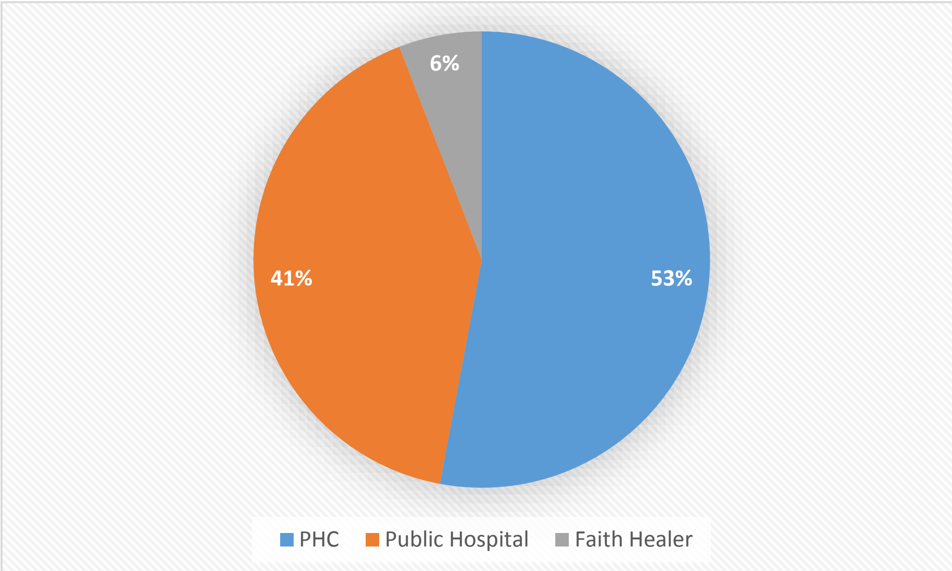
4.7 Health Seeking Behaviour

Health seeking information was limited due to missing information that was probably due to skip patterns related to the questionnaire. It is not clear whether this error was random or systematic.

4.7.1 Where people sought care

Of the 60 people who had symptoms of any duration, 36 had information on health seeking behaviour and of these, only 19 (47%) had sought care. Those people sought care as shown in Figure 18 below.

Figure 18 Where people sought care (N=17)



4.7.2 Management of presumptive TB cases at formal health institutions

The median number of visits for people who sought care was 2 (IQR 1-3) and range of 1-8. The median number of weeks was 2 (IQR 2-4) range 1 – 28. Table 6 below summarises management of presumptive TB cases where they sought care.

Table 6 Management of cases at public health facilities

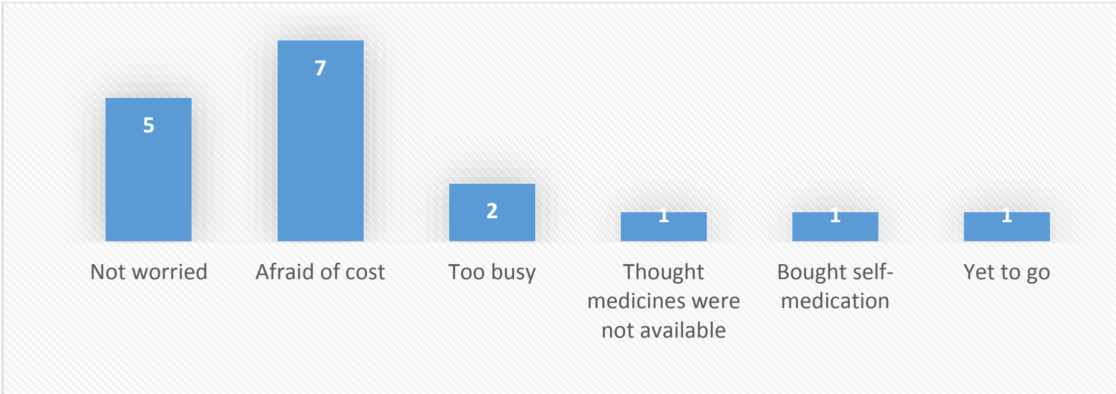
Management of cases (N = 17)	First visited PHC (n=9)	First visited Public Hospital (n=7)
Cough more than 2 weeks	8 (89%)	7 (100%)
Sputum taken	4 (50%)	6 (86%)
Sputum results negative	2 (50%)	5 (83%)
Not told results or did not collect	2 (50%)	1 (17%)
CXR taken	0	3* (43%)
CXR normal	N/A	2 (66%)
Not told or did not collect	N/A	1 (33%)
Given antibiotics	6 (75%)	7 (100%)
Improved on antibiotics (Completely or partially)	5 (83%)	6 (86%)
Referred	2 (25%)	0

3*Sputum also taken

4.7.3 Reasons for not seeking care

The figure below summarise the reasons given for not visiting care from those who were aware of symptoms but did not seek any care. Information from 17 people was available.

Figure 19 Reasons for not seeking care (N=17)



Health insurance coverage was only 9/106 (8.5%) among bacteriologically confirmed cases.

4.7.4 Where do TB patients prefer to visit?

Figure 20 below summarise responses given by bacteriologically positive cases when they were asked where they preferred to seek when they fell ill regardless of current behaviour.

Figure 20 Where people found to have TB prefer to seek care (N=106)

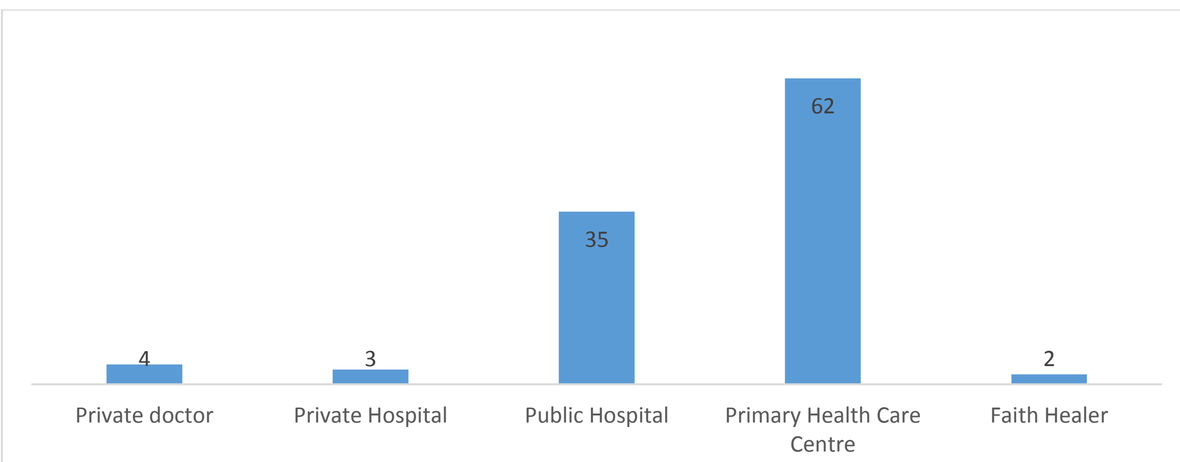


Table 7 Analysis of factors associated with NTM

	NTMs (N=1,097)	Participants (N=33,736)	/1,000	OR	95% CI	p>z	aOR*	95% CI	p>z
Province									
Bulawayo	31	1,382	22.4	Ref					
Harare	98	5,792	16.9	0.75	0.50-1.13	0.167	0.76	0.50-1.15	0.195
Manicaland	209	4,315	48.4	**2.22**	**1.51-3.25**	**<0.001**	1.45	0.91-2.32	0.116
Mashonaland Central	45	3,743	12.0	**0.53**	**0.33-0.84**	**0.007**	**0.37**	**0.22-0.62**	**<0.001**
Mashonaland East	135	2,807	48.1	**2.20**	**1.48-3.27**	**<0.001**	1.43	0.88-2.32	0.148
Mashonaland West	72	3,976	18.1	0.83	0.53-1.23	0.314	**0.59**	**0.36-0.96**	**0.035**
Masvingo	106	3,483	30.4	1.37	0.91-2.05	0.130	0.84	0.51-1.38	0.491
Matabeleland North	152	1,998	76.1	**3.59**	**2.42-5.31**	**<0.001**	**2.19**	**1.35-3.55**	**0.001**
Matabeleland South	90	2,088	43.1	**1.96**	**1.30-2.97**	**0.001**	1.30	0.80-2.12	0.281
Midlands	159	4,152	38.3	**1.74**	**1.18-2.56**	**0.006**	1.20	0.76-1.91	0.431
Rural/Urban									
Urban	169	9,097	18.6	Ref					
Rural	928	24,639	37.7	**2.07**	**1.75-2.44**	**<0.001**	1.18	0.89-1.58	0.257
Age groups									
15 -24yrs	178	9,798	18.2	Ref					
25-34yrs	189	8,413	22.5	**1.24**	**1.01-1.53**	**0.040**	0.96	0.77-1.19	0.706
35- 44 years	206	6,182	33.3	**1.86**	**1.52-2.28**	**<0.001**	**1.26**	**1.01-1.57**	**0.042**
45-54 years	141	3,583	39.4	**2.21**	**1.77-2.77**	**<0.001**	**1.36**	**1.09-1.76**	**0.008**
55-64 years	149	2,898	51.4	**2.93**	**2.35-3.66**	**<0.001**	**1.78**	**1.40-2.26**	**<0.001**
65 years +	234	2,862	81.8	**4.81**	**3.94-5.88**	**<0.001**	**3.01**	**2.41-3.75**	**<0.001**
Sex									
Male	484	14,195	34.1	Ref					
Female	613	19,541	31.4	0.92	0.81-1.04	0.163			
Occupation									
Unemployed	36	1,194	30.2	Ref					
Farmer	673	14,679	45.8	**1.55**	**1.10-2.17**	**0.012**	1.14	0.79-1.64	0.476
Formal work (Office)	36	1,780	20.2	0.66	0.42-1.06	0.086	0.66	0.41-1.06	0.087

Formal work (Non office)	141	4,407	32.0	1.06	0.73-1.54	0.747	1.01	0.69-1.48	0.941
Informal work	47	1,744	26.9	0.89	0.57-1.38	0.607	0.96	0.61-1.51	0.861
Student	35	3,614	9.7	**0.31**	**0.20-0.50**	**<0.001**	**0.40**	**0.25-0.66**	**<0.001**
Miner	15	471	31.8	1.06	0.57-1.95	0.856	1.24	0.66-2.35	0.502
Housewives	103	4,037	25.5	0.84	0.57-1.24	0.382	0.87	0.59-1.29	0494
Missing	11	1,810	Omitted						
HIV Prevalence in Province									
< 17%	824	28,268	29.1	Ref					
>17%	273	5,468	49.9	**1.75**	**1.52-2.01**	**<0.001**	Omitted because of collinearity		
Previously Treated for TB									
Answered no	948	32,313	29.3	Ref					
Answered yes	148	1,377	107.5	**3.98**	**3.32-4.78**	**<0.001**	**3.27**	**2.70-3.97**	**<0.001**
Missing	1	46	Omitted						
CXR appearance									
No abnormality noted	233	27,214	8.6	Ref					
Abnormal other than suggestive of TB	24	1,856	12.9	**1.59**	**1.04-2.42**	**0.033**	1.10	0.71-1.71	0.658
Abnormal suggestive of TB	634	3,431	184.8	**27.43**	**23.44-32.11**	**<0.001**	**12.69**	**10.53-15.28**	**<0.001**
Not taken	216	1,228	175.9	**25.83**	**21.20-31.47**	**<0.001**	**25.03**	**20.03-31.28**	**<0.001**
Missing	0	7	Omitted						
Currently on TB Treatment									
Answered no	1,085	33,612	32.3	Ref					
Answered yes	12	84	142.9	**4.10**	**2.70-9.23**	**<0.001**	1.17	0.57-8.38	0.671
Missing	0	40	Omitted						
TB Symptoms									
No symptom reported	554	31,076	17.8	Ref					

Symptoms negative with NTP TBSCT	132	680	194.1	**13.27**	**10.78-16.34**	**<0.001**	**6.56**	**5.13-8.38**	**<0.001**
Symptoms positive with NTP TBSCT	411	1,943	211.5	**14.78**	**12.88-16.96**	**<0.001**	**4.13**	**3.51-4.85**	**<0.001**
Missing	0	37	Omitted						
CXR appearance									
No abnormality noted	233	27,214	8.6	Ref					
Abnormal other than suggestive of TB	24	1,856	12.9	**1.59**	**1.04-2.42**	**0.033**	1.10	0.71-1.71	0.658
Abnormal suggestive of TB	634	3,431	184.8	**27.43**	**23.44-32.11**	**<0.001**	**12.69**	**10.53-15.28**	**<0.001**
Not taken	216	1,228	175.9	**25.83**	**21.20-31.47**	**<0.001**	**25.03**	**20.03-31.28**	**<0.001**
Missing	0	7	Omitted						

4 *The Adjusted ods ratios were calculated by including all factors with ORs having p-values < 0.05 in the Univariate analysis but those considered prognostic factors such as CXR findings, being on treatment and symptoms were not included.

5 Chapter 5: Good practices

5.1 Chapter Introduction

In this chapter, strategies for increasing TB case notifications in low resource settings are presented.

5.2 Improving Knowledge and awareness

In Adamawa State, Nigeria interventions were implemented to target rural migrants and indigenous populations. The population covered was about 3.7 million people of which 12% was nomadic. The Nomads were identified as a vulnerable population. Key strategies used included improving access to and provision of TB care among nomads, awareness raising activities, active case finding and introduction of Xpert^{R} MTB/Rif testing. Key activities consisted of improving diagnostic capacity by renovating diagnostic facilities, procuring reagents microscopy and renovating the laboratory for installation of Xpert^{R} MTB/Rif services. HCWs were trained to strengthen capacity to improve TB care practices.

Radio messages were aired in both English and local languages and intended at improving knowledge of TB symptoms and available TB services. Jingles in English were also aired to target policy makers but these were run for a shorter period. The NTP manager featured regularly on State television to discuss project activities. The project established a committee to spearhead project advocacy activities which resulted in significant co-funding from local sources.

378 screening days were organised at nomads resting stations, settlement areas and community market places during market days. Community volunteers provided systematic screening to attendees. People with suspected TB were asked to submit 3 sputa. These sputa were submitted to the closest microscopy centre for reading. Those with sputum negative TB were asked to submit a 4th sputum for Xpert^{R} MTB/Rif but this was only utilised by 20% due to transport challenges, rough terrain, security issues, challenges related repeated visits by suspects. During the screening days activities aimed at increasing TB knowledge on risks and symptoms were conducted. Additionally, medicines for common ailments such as de-worming, anti-malarias and multivitamins were distributed as incentives. This intervention led to a 41% increase in Bac+ TB cases despite the target population being only 12%.(78)

In this case study increasing knowledge and awareness of TB symptoms and treatment services was implemented together with strengthening capacity to diagnose, treating cases and treating additional common ailments.

Transportation of sputa in complex settings was also noted to be a challenge and yet access to health facilities is also problematic to the community.

5.3 Minimising barriers to health care access

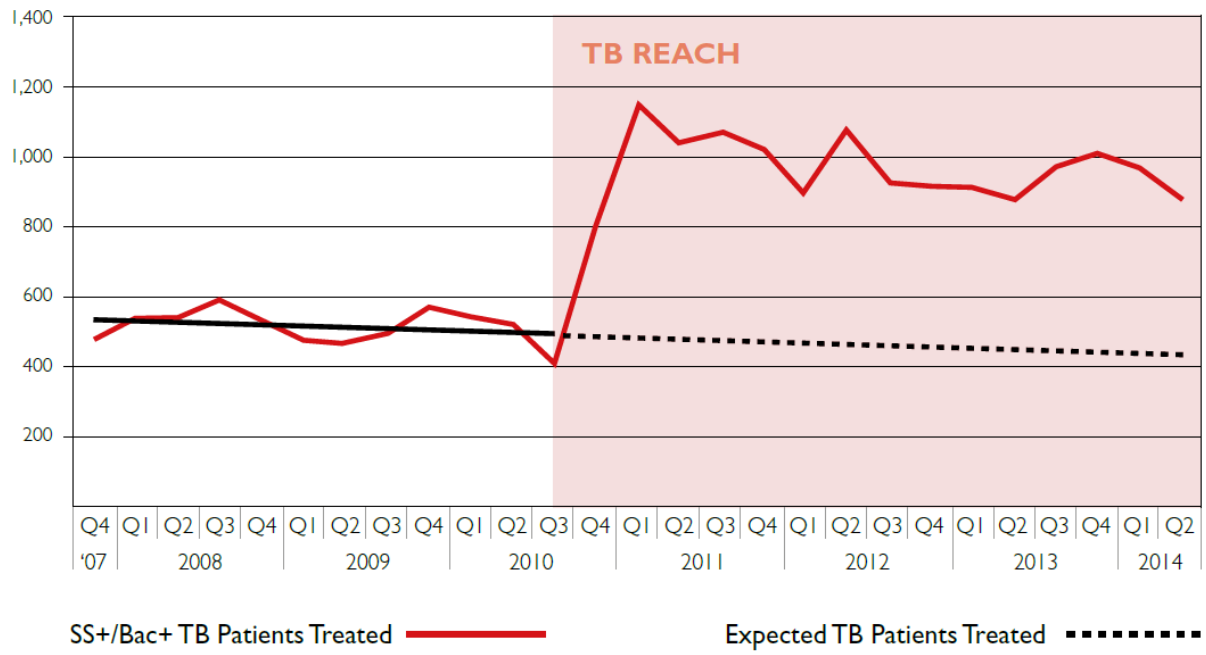
Community based interventions were implemented in Sidama, Ethiopia with a population of 3 million in 19 districts and 524 *kebeles* (smallest administrative unit with a population of about 5,000 people). The background was that, the NTP relied on passive case finding for symptomatic individuals visiting health institutions. This was a challenge to more than 80% of the population which lived in rural areas while health facilities are located in urban areas. Travelling was an issue especially the fact that people had to make several visits for diagnosis and the poor, vulnerable people like woman, children and the elderly were the most affected.

Ethiopia has a Health Service Extension Programme (HSEP) that has Health Extension Workers (HEW) at Kebele level that administers preventive and curative services supported by Community Health Promoters (CHP) (lay people selected by the community). The HSEP was limited to awareness creation and advice on treatment adherence.

Key interventions implemented were: 1. Capacity strengthening component that included training of Health Bureau staff and HEWs, sensitisation for community leaders and stakeholders. 2. ACSM component that included delivery of TB messages and availability of services during community meetings, campaigns and the local radios. 3. Active case finding by HEWs was conducted were house to house visits identifying people with chronic cough and asking them to submit sputum and prepared slides. 4. Communication and transport component including airtime for HEW and motorbikes for supervisors. 5. Treatment component including home based treatment and contact screening for symptomatic individuals, IPT for children under 5 years and follow up of sputum negative individuals.

Results: In about one year, case notification rates doubled. 2,262 PTB Bac+ individuals were identified by the project. Male to female ratio of cases was changed from 1.3:1 before intervention to 1:1 after intervention. Figure 20 shows a summary intervention results.

Figure 21 SS+/Bac+ TB patients treated before and after TB Reach project in Sidama, Ethiopia(78)



Children under 15 years represented 15% of symptomatic individuals and 9% of PTB BAC+ cases. 1,080 under-fives offered IPT. Services were acceptable because they were carried out by community members. The HEW had job satisfaction in serving their communities. Increased community based interventions reduced challenges of adherence. Equity and gender issues improved access to the poor and women.(79)

In this case study services were brought to the community level so that patients did not have to travel for diagnosis and treatment. Acceptability was increased by having local people conduct interventions.

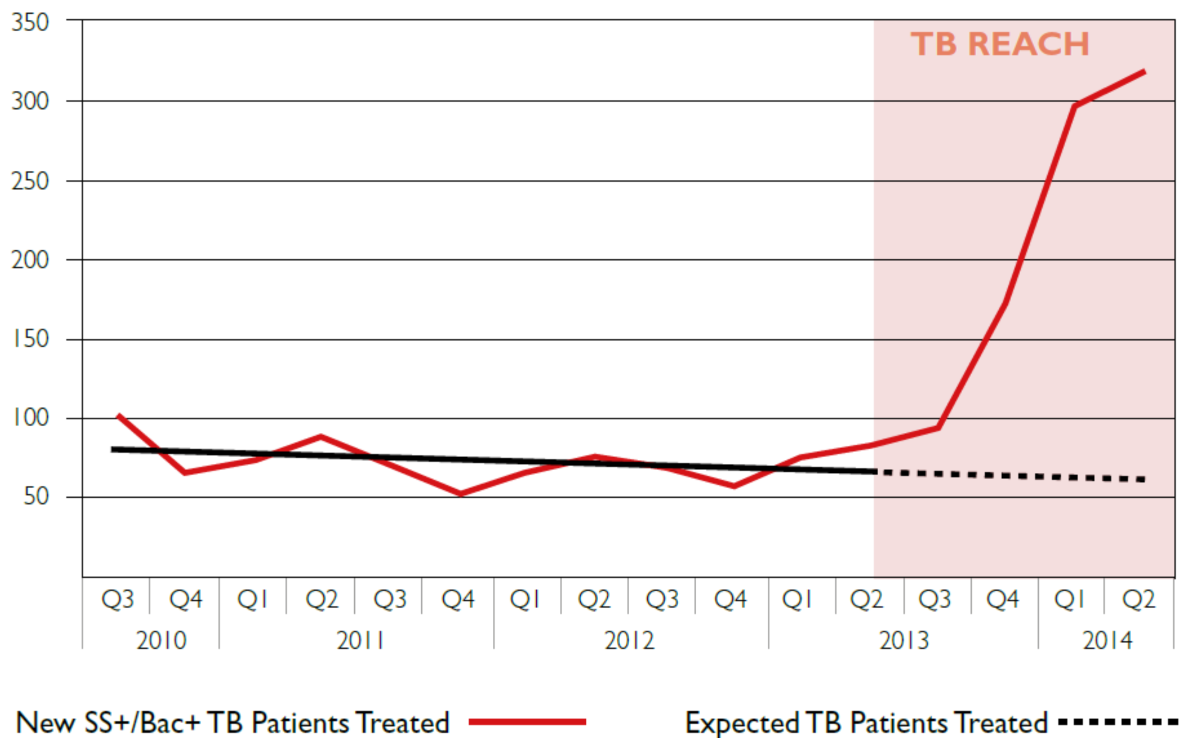
5.4 Strengthening identification of patients with suspected of TB

In Tajikistan, TB services were delivered in a vertical nature. Most people who presented to Government polyclinics that were non-TB services had missed opportunities. The country has high drug resistance that further complicates accurate case detection and treatment success. A project that included 17 government polyclinics which together serve a population of 1.4 million was implemented. Two health workers in each facility were trained and given incentives to verbally screen all individuals visiting polyclinics for symptoms of TB using a standardised questionnaire loaded into mobile phones. Two sputum samples were collected from symptomatic individuals. Smear microscopy was performed in parallel with Xpert^{R} MTB/Rif.

All activities were monitored electronically through data collected on mobile phones to minimise delay and limit pre-treatment loss to follow up. Some volunteers from NGOs supported the project by giving information sessions about TB in the community. A high volume diabetic clinic and pre-trial detention facility was also included in the project.

Figure 22 shows a summary of results before and after project.

Figure 22 Number of SS+/BC+ patients treated before and after the TB Reach project in Tajikistan(78)



The project saw a 201% increase in SS+/Bac+ cases in one year compared to the pre-intervention period. 850,000 people were verbally screened. 9,700 were suspected and 1,383 cases were confirmed and 333 rifampicin resistant patients confirmed.(78)

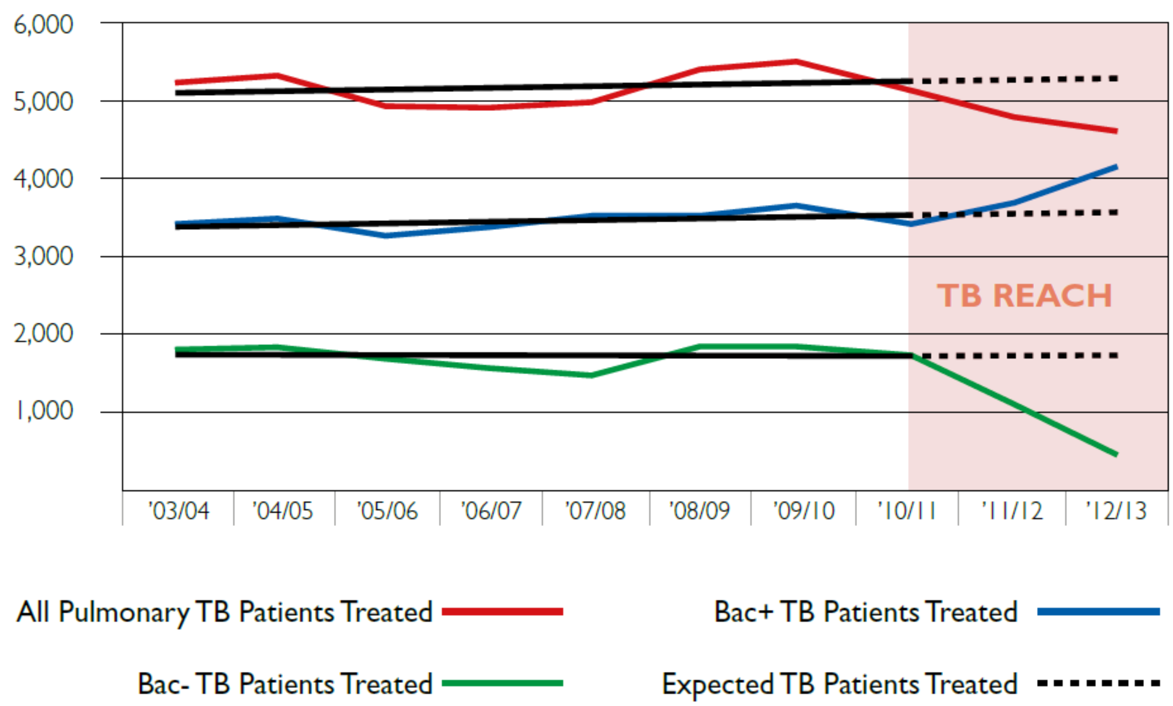
In this case study it is was demonstrated that intensified case finding among people who visit health institutions can yield more Bac+ cases. Innovations such as use of mobile phones to improve outcomes were used.

5.5 Ensuring quality assured diagnosis

A project in Nepal was implemented covering a population of 6.6 million people. Xpert[R] MTB/Rif machines with generator, stabilisers and Uninterrupted Power Supplies were procured and installed at diagnostic facilities. Orientation workshop on Xpert[R] MTB/Rif testing and short brochure was produced and distributed in the community to improve awareness of the testing service. Routine screening and treatment procedures continued at more than 130 government health facilities. Anyone with positive results was initiated on treatment and those with negative results were sent for CXR and those suggestive of TB underwent Xpert[R] MTB/Rif testing. PLWHA were eligible for direct Xpert[R] MTB/Rif testing.

9 723 Xpert[R] MTB/Rif tests were performed resulting in the detection of 1,553 rifampicin sensitive and 109 rifampicin resistant cases of which were from sputum smear negative cases. The project achieved a 21.9% increase in SS+/Bac+ notifications as compared to the pre-intervention period as shown in Figure 23.

Figure 23 Number of patients treated before and after TB Reach Project in Nepal(78)



Interestingly the number of PTB cases diagnosed actually decreases because a lot of empirical treatment was given prior to the intervention. This meant that with Xpert MTB/Rif testing resulted in clinicians interpreting the Xpert negative test to rule out TB.(78)

In this case the intervention was targeted at improving diagnosis and this showed that improving quality of diagnosis can also reduce unnecessary empirical treatment and save costs.

5.6 Improve referral and notification practices

In Kampala, Uganda, a project was implemented in a population of 1.6 million people. The background was that the private sector offered poor quality services. These services were preferred because of their closer proximity to the people and shorter waiting times. 100 private facilities in slums or adjacent to slums were selected. People paid for sputum collection so that the business model was maintained, however those that were unable to pay were referred to nearby NTP facilities. PLWHA who had negative smear results were referred for Xpert^{R} MTB/Rif testing. Newly diagnosed cases received quality assured diagnosis. Village health teams were engaged to raise awareness on the services offered by the clinics.

Capacity building in the project was an issue as they was unanticipated high turnover of staff from the private facilities coupled with the general low TB knowledge among staff members. This led to the need for regular support and supervision and repeated trainings to maintain the TB care improvement. Several private clinics voluntarily joined the national EQA programme for smear microscopy.

The project detected 2,141 additional smear positive cases. Compared to the pre-intervention period, this represented a 24% increase in notifications. Unfortunately, during the period the country experienced shortage of drugs and this led to stock outs at the project site.(78)

This project showed that engaging private providers utilised by the poor and strengthening referral with public facilities can increase case detection and strengthen case management of cases, but needs special attention to implementation challenges.

6 Chapter 6: Discussion

6.1 Main Discussion

Diagnosis of Bac+ TB in people that did not report symptoms poses a challenge to the NTP. This was reported in other surveys.(3,4,46) In Asia this was very high and found to be incremental in repeat surveys.(47) The fact that this was found to be incremental in repeat surveys may be a sign that improvement of programme performance mops out the severe cases and leaves milder forms. This may indicate that that NTPs are faced with new challenges to increase case detection further.

From the analysis of factors associated with not reporting symptoms, females had 12.6 times odds of having reported symptoms than males among those with Bac+ TB in the multivariate analysis. Issues of masculinity may be the reason for this finding since males may be seen to have a higher threshold for symptom awareness than females. Some studies have confirmed that males delayed seeking care.(45)(53) However, it is possible that this finding is confounded by smoking because 67% of males found to be Bac+ were smokers and they constituted 95% of all smokers among diagnosed cases.

Farmers and miners seemed to have higher odds of reporting symptoms among Bac+ cases while Pentecostal religion and higher education were associated with less odds though not statistically significant at 95% level of confidence. It is important to note that a lot of effect modification and confounding on these factors may make it difficult to make conclusions especial from a small sample size. However, this is a nationally representative sample and perhaps the only available opportunity to explore such factors at population level. Perhaps beliefs and stigma may explain why Pentecostal religion and higher education was associated with less odds of having reported symptoms among Bac+ cases. The Pentecostal religion contributed the highest numbers of BC+ cases (37.4%) in the survey despite the fact that in the ZDHS 2010-11, only 21% of respondents believed in this religion. Further studies to explore these issues may yield valuable information in Zimbabwe. Other studies have reported such beliefs and stigma.(38,39)

It would have been interesting to review this finding by HIV status, but this information was not captured at individual level per participant. However, Bac+ cases from provinces with lower prevalence of HIV reported symptoms less than those from higher prevalence. Some studies have suggested that at population level, it is likely that undetected cases are more from HIV negative individuals because the HIV positive have disease that progresses faster. It may be possible that BC+ cases from these provinces may have lower prevalence of HIV. Despite this fact though, people with HIV are difficult to diagnose even if they present to health facilities because their symptoms are usually atypical and CXR changes may be minimal.(26,34)

Results from the survey also show that about 55% of bacteriologically confirmed cases were males while in the population males constitute 48%. TB notifications also demonstrate a higher burden among males. This was reported in other studies as well.(3,4,46)

The Burden seem to be increasing with increasing age with a dip in the 45-54 years age group. This was similar to findings in other surveys.(3,4). The dip in the 45-54 age group may be due to the lower HIV prevalence in this age group compared to younger adults.(80) The higher prevalence noted in younger adults indicates active transmission in the community. Strategies focused on contacts management may be very useful in identifying cases early and reducing transmission. This may be particularly important since a significant proportion of Bac+ people in the community will not be having symptoms that will prompt them to visit health facilities. About 20% of Bac+ cases in the survey had a positive history of contact with a TB patient in the past 2 years.

Provinces that traditionally have low notification rates may be having a higher burden of undetected cases at population level. It may be possible that in the provinces with higher HIV prevalence TB-HIV co-infection may be higher leading to these patients getting ill and presenting to health facilities or unfortunately dying; while in places where HIV is less prevalent, HIV negative people may be spreading TB over a longer period before becoming very ill to present to facilities. Studies have reported on this possible scenario as stated above.(26,34) However, they seem to be a gap in these provinces as seen in the difference between Beitbridge and Mudzi which are located in the southern and northern parts of Zimbabwe and, respectively. These districts have different case notification rates with with Beitbridge among the highest and Mudzi among the lowest. However in the survey, Mudzi had a typical rural cluster that is probably similar to many places in the districts and yielded 3 Bac+ cases at 56.6% participation rate. On the other hand, Beitbridge did not yield any Bac+ cases despite having 2 clusters and higher participation rates than Mudzi.

While western countries and some Asian countries such as Japan implemented population level CXR screening in the past as a method of identifying TB cases in the community, this has been generally been discouraged by WHO.(47) While CXR use is generally discouraged for screening TB at population level, it may have a role in NTP algorithms especially if it is targeted to certain populations identified to be of special attention. For, instance CXR can still have a bigger role in the screening of TB among people living with HIV, diabetics, children, sputum negative suspects, screening of TB contacts, regular screening of certain populations such as miners, prisoners, people in urban slums and certain high density areas.(49)

In Zimbabwe, CXR equipment is not readily available in many facilities or it is available but dysfunctional or obsolete. The results of the survey may be used to review the screening algorithms to incorporate CXR for certain situations and also using the findings for resource mobilisation.

Repeated visits to health facilities and having test results that are negative may be frustrating for patients.(50,54,59–61) This has been documented in studies before and associated with delayed diagnosis of TB and further risking transmission of TB in the community. It was noted that a number of these cases had been in contact with health facilities but had negative tests. This is also confirmed by the wide gap between SS+ and Bac+. This was also observed in other surveys.(3,4,46,47,72)

Another notably finding from the NTPS is that a significant proportion of smear positive cases detected were NTM. While this may be explained by the fact that the specimens from the survey were not clinical specimens, the issue needs to be explored further. It is also possible that some of the NTMs are causative agents of symptoms and radiological findings. Several studies have noted the increase of NTM in many communities.(75) NTMs complicate diagnosis and management of TB.(74,75) In a setting were many people are started on treatment based on sputum smear results, this may mean that a number of people are treated for TB when they actually exhibit TB. This is unfortunate and increases treatment costs.

Among the Bac+ cases who sought care, more than 40% went to district hospital. And half only a quarter of those who sought care at a PHC with cough more than 2 weeks, were properly investigated with smear microscopy. Others did not have sputa taken while others were not told results. These two observations, even though the numbers are small, may indicate that the quality of services offered at PHCC level is poor and this leads to people wanting to seek care at a higher level. This presents problems because, it is not cost effective and not the best way to use scarce resources. This results in a paradox for investment of resources since the higher levels may see a disproportionately higher numbers of cases and then pull more resources compared to PHCCs. There is no doubt that the nearer services are to the people the more the impact and value for money.

While TB diagnosis and treatment is free in public institutions, it is interesting to note that a very high proportion of those who were aware of symptoms and not sought care cited fear of cost. Similar findings were also reported elsewhere.(38,39,56,57) This might suggest that awareness is not adequate on this issue. However, it is possible that patients incur a lot of costs that may be opportunity costs or costs related to transportation and purchasing of food when they travel to health facilities. This is also worsened by the fact that despite reaching the facilities, the disease may not be picked as noted earlier. This inefficiency of our systems may affect patient perceptions to services offered and the investment they have to put to access this care.

6.2 Limitations of the study

The researcher used literature from published, unpublished sources and reports and any error that may have occurred in the processing of data for those sources is beyond control of the researcher. The sub-analysis from the survey is affected by the challenges encountered in conducting the survey. This includes logistics challenges, data quality issues, planning problems leading to change of clusters, poor participation rate and high contamination rate in the laboratory. All these factors will affect the reliability and validity of my work. Lack of data on the HIV status of the Bac+ TB cases from the survey could have affected interpretation of some findings in this paper.

7 Chapter 7: Conclusion and Recommendations

7.1 Conclusion

The identification of Bac+ cases that do not have symptoms poses a challenge to the NTP. The gap between total Bac+ and SS+ was also noted to be very wide. This is an important issue considering that smear microscopy may be the only available diagnosis test to the majority of presumptive TB patients in Zimbabwe. A number of BC+ cases had been in contact with health services but were not diagnosed because of a negative sputum result.

Improving management of sputum smear negative cases, contacts of TB cases and previously treated cases may be good strategies to improve case detection.

The isolation of NTMs in a number of presumptive TB cases may indicate a high burden of NTMs in the country and these may be confounding diagnosis and management of TB.

In this paper it was noted that quality or acceptability of services offered at PHC level may be questionable and this may present a paradox in the allocation of resources. Investment of resources at this level and the community level can reverse this paradox.

A gap in awareness of TB symptoms, available services and the fact that TB diagnosis is free may exist. Financial barriers (real or perceived) is a challenge to improving case detection. Special attention to males, people with Pentecostal church beliefs and provinces that have low case notifications, like Mashonaland Central and Manicaland, may yield more cases.

These findings show that more needs to be done if the End TB Strategy goals are to be realised which has one of the its pillars as ensuring early diagnosis.(81)

7.2 Recommendations

7.2.1 World Health Organisation

Needs to review the role of CXR in the diagnosis of TB in resource limited settings with a higher TB burden so that resources can be availed to increase access to CXR for presumptive TB cases.

7.2.2 NTP

a. Needs to review algorithms for diagnosis of TB in Zimbabwe, in particular management of sputum smear negative cases should be strengthened and ensure access to Xpert^{R} MTB/Rif, culture and CXR
b. Needs to advocate for more resources to procure CXR machines and Xpert MTB/Rif. These machines need to come with power guarantee such as solar power and uninterrupted power supply backup in centres with unreliable power supply.
c. Needs to conduct further research on NTMs. Capacity to perform speciation tests for these needs to be developed. An initial practice may be to confirm sputum smear cases with Xpert^{R} MTB/Rif and culture. This needs to go hand in hand with development of guidelines for the management of NTMs. Capacity building for HCWs will be needed. Diagnostic algorithms need to be adjusted to deal with this challenge. Proper investigation of those people who have their sputa failing to convert is also important to avoid people to be wrongfully treated for DRTB. A surveillance system for NTMs may also need to be established to inform policy decisions.
d. Strategies to strengthen services at PHCC level needs to be developed, including an efficient system for communication and transportation of specimens from the peripheral centres to microscopy, Xpert^{R} MTB/Rif and culture services.
e. Need to conduct case finding strategies that are community based such as utilising community based health care workers, community based organisations, past TB patients to screen for TB at household level/community level and community sputum collection. Incentives to make this possible need to be put in place such as conditional cash transfers. This needs to be supported by support and supervision from PHCC level.

f. A review of management of presumptive TB cases especially follow up of those with negative tests may be useful since a number of these BC+ cases in the community have been in contact with health services. Screening of presumptive cases must be a process with active follow up to ensure that maximum yield is achieved.
g. Regular follow up of previously treated cases can be a useful strategy to identify relapses since a high proportion of Bac+ cases in the community were previously treated.
h. Needs to strengthen management of contacts since this may have a yield of cases and may be an opportunity to identify risk factors at community level such as overcrowding and poor housing.
i. Increased awareness of TB symptoms and services available needs to be done through various media platforms, but more importantly identification of champions at community level that can be trained can lead to sustainable message delivery during community gatherings.
j. Capacity strengthening needs to be prioritised in provinces that are notifying fewer cases since they seem to have a high burden. This can take the form of increased trainings and support and supervision.
k. Operations research should be strengthened to find sustainable solutions to local problems. This can be done by appointing an operations research officer within NTP to spearhead the idea and lead a committee of stakeholders to push the research agenda.
l. Documentation of good practices should be strengthened and used as a tool to improve TB care in other areas.

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Annexures

Annex 1: Main roles and responsibilities MOHCC Survey Focal Point(23)

1. Work closely with NTPS Survey Coordinator (SC) and enable him/her to discharge his duties easily.
2. Organize documentation such as MOHCC support letters for the smooth implementation of the survey
3. Organize and coordinate steering committee and Technical Advisory Group (TAG) meetings
4. Liaise with ZIMSTAT, NMRL, BRTI and Radiologist on all survey activities conducted by these institutions.
5. Assist BRTI on the recruitment of survey personnel
6. Organize and coordinate sensitization of government structures at provincial and district level
7. Organize and coordinate Pre-survey visits
8. Maintain operational plan for the survey and track progress on a weekly basis
9. Lead the medical panel to assess information on cases that are detected during the survey, maintain a register of all detected cases and promptly report all survey cases
10. Monitor all survey activities and update the PI on all issues of the survey on a weekly basis and report immediately any threats to the survey
11. Work with TB prevalence survey coordinator and Co-PI on survey plans and budget
12. Liaise with MOHCC Human Resources (HR) Directorate on HR issues involving survey staff that are government employees
13. Participate in support and supervision of field teams
14. Active member of the NTPS Survey management Committee (SMC)

Annex 2: TB Screening form(82)

Approved

PRIMARY HEALTH CARE
A HEALTHY NATION
MINISTRY OF HEALTH & CHILD WELFARE
ZIMBABWE

MINISTRY OF HEALTH & CHILD WELFARE, ZIMBABWE
NATIONAL AIDS & TB PROGRAMMES

TB Screening Tool

ASK AT EVERY VISIT THE FOLLOWING QUESTIONS:	YES	NO
✓ Do you have a cough? For how long? YES if for 2 weeks or more		
✓ Do you have night sweats? For how long? YES if for 3 weeks or more		
✓ Have you lost weight in the past 2 months? YES if patient has lost weight		
✓ Do you have fever or "hot body"? For how long? YES if for 3 weeks or more		
✓ Has someone in your household had TB?		

TAKE THE FOLLOWING ACTION

→ Patient is TB suspect, if 'YES' to any of above questions:

- Collect 2 sputum specimens for AFB microscopy and send to laboratory.
- Enter patient's information into TB suspect register.
- Ensure that you receive AFB results and manage patient as follows:
  - If one or more AFB results are positive, start TB treatment and notify.
  - If AFB results negative, refer to doctor for further assessment.

→ If 'NO' to all questions, patient is not a TB suspect:

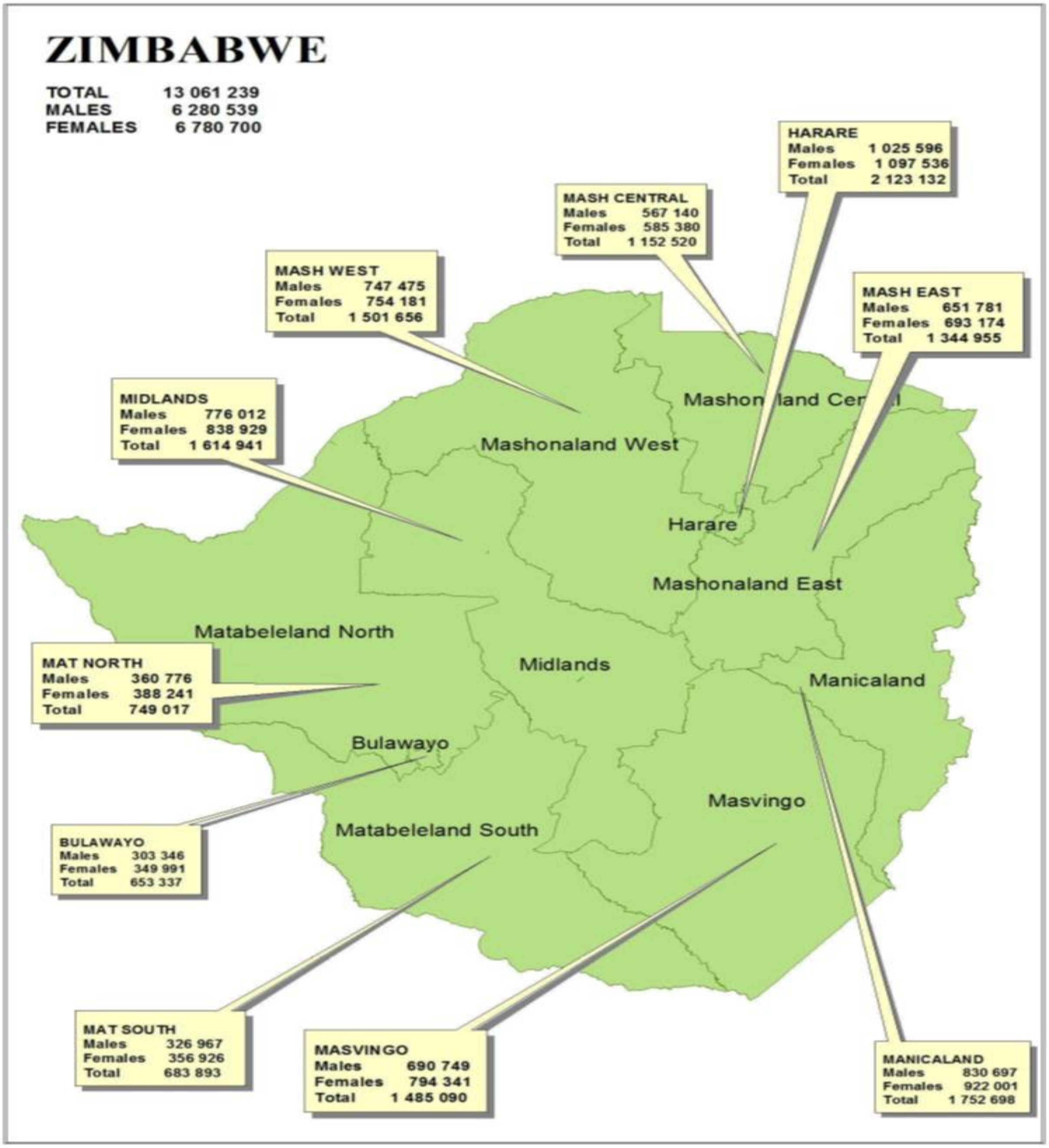
- Repeat symptom screening at another visit.
  (for OI patients once every 3 months)

TBCTA The Tuberculosis Coaliation for Technical Assistance

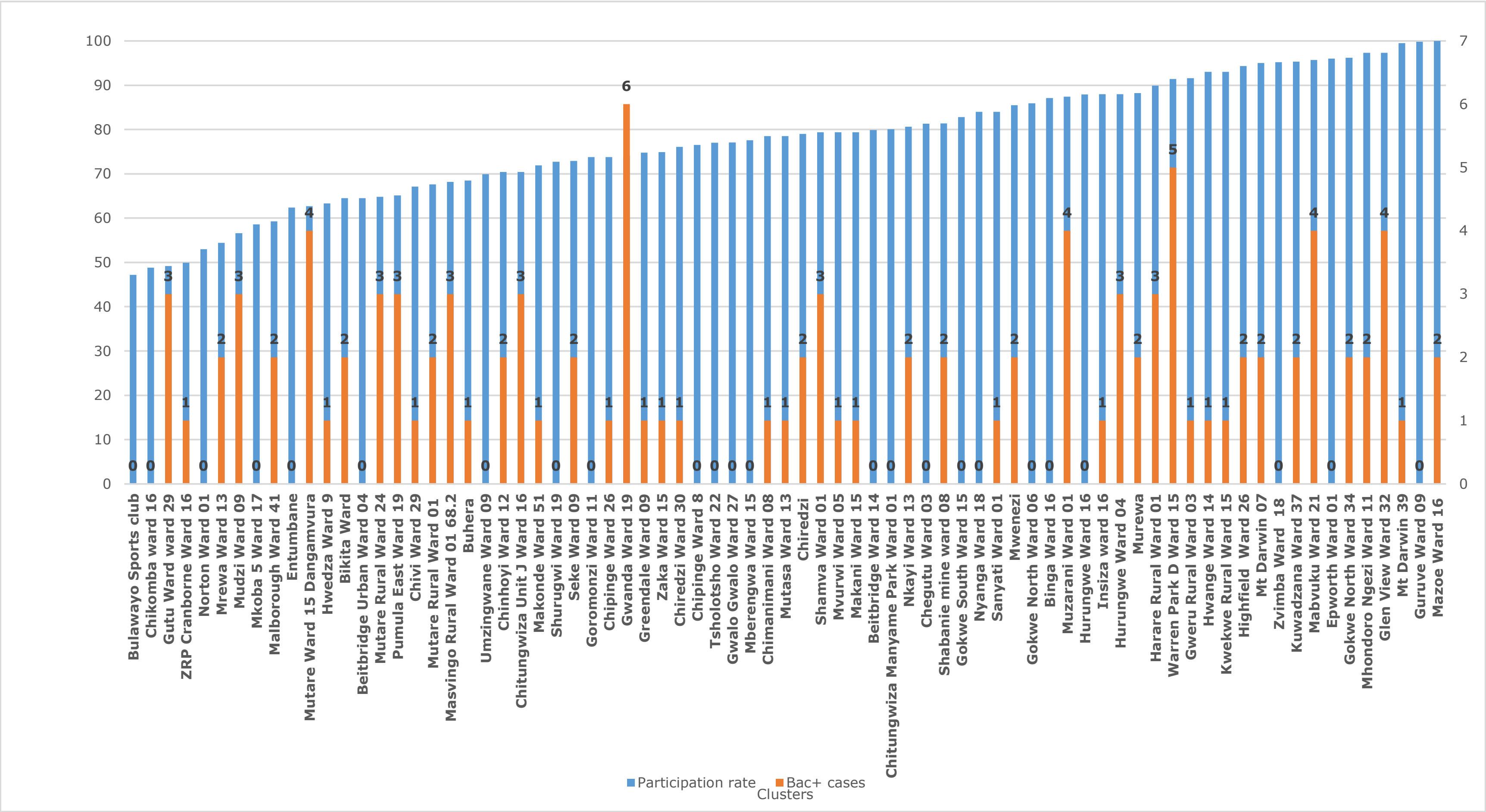
USAID FROM THE AMERICAN PEOPLE

International Union Against Tuberculosis and Lung Disease
Health solutions for the poor

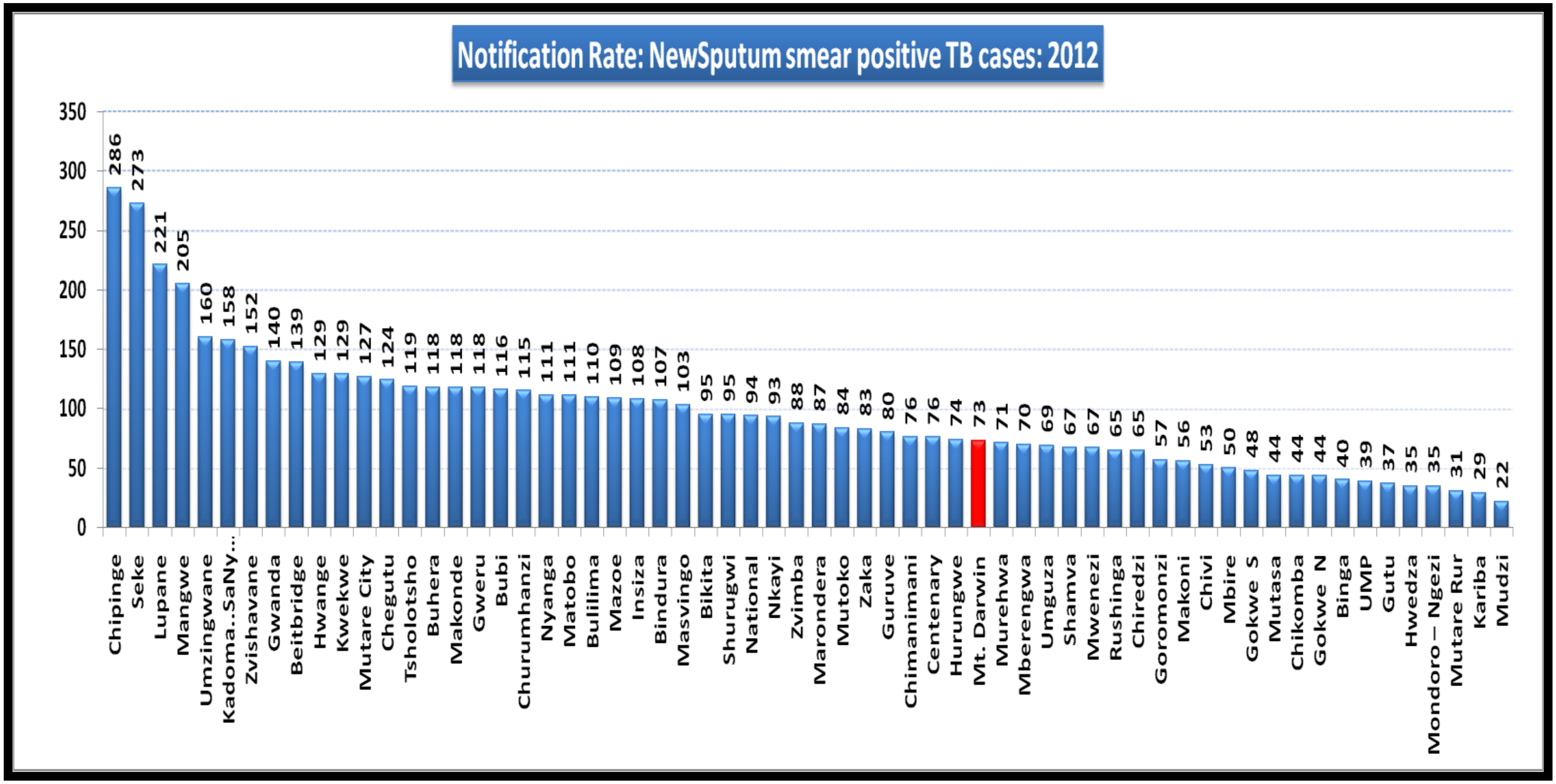
Annex 3: Map of Zimbabwe with populations per province(14)



Annex 4: Participation rate per cluster and number of Bac+ cases detected



Annex 5: Notification Rates of new SS+ cases: 2012(83)



Annex 6: Characteristics of participants

Province	***N***	***%age***
Bulawayo	1,382	4.1
Harare	5,792	17.2
Manicaland	4,315	12.8
Mashonaland Central	3,743	11.1
Mashonaland East	2,807	8.3
Mashonaland West	3,976	11.8
Masvingo	3,483	10.3
Matabeleland North	1,998	5.9
Matabeleland South	2,088	6.2
Midlands	4,152	12.3
Rural/Urban		
Urban	9,097	27.0
Rural	24,639	73.0
Age groups		
15 -24yrs	9,798	29.0
25-34yrs	8,413	25.0
35-44yrs	6,182	18.3
45-54yrs	3,583	10.6
55-65yrs	2,898	8.6
65yrs+	2,862	8.5
Sex		
Male	14,195	42.1
Female	19,541	57.9
Occupation		
Unemployed	1,194	3.5
Communal Farmer	14,679	43.5
Formal work (Office)	1,780	5.3
Formal work (Non office)	4,407	13.1
Informal work	1,744	5.2
Student	3,614	10.7
Miner	471	1.4
Housewives	4,037	12.0
Missing	1,810	5.4
HIV Prevalence in Province		
< 17%	28,268	83.8

>17%	5,468	16.2
Previously Treated for TB		
Answered no	32,313	95.8
Answered yes	1,377	4.1
Missing	46	0.1
CXR findings		
No abnormality noted	27,214	80.7
Abnormal other than suggestive of TB	1,856	5.5
Abnormal suggestive of TB	3,431	10.2
Not taken	1,228	3.6
Missing	7	0.0
Currently on TB Treatment		
Answered no	33,612	99.7
Answered yes	84	0.3
Missing	3	0.0
TB Symptoms		
No symptom reported	31,076	92.1
Symptoms negative with NTP TBSCT	680	2.0
Symptoms positive with NTP TBSCT	1,943	5.8
Missing	37	0.1

Annex 7: Association of TB symptoms of any duration with diagnosis of Bac+ TB

	Cases (N=107)	OR	95% CI	p>z	aOR*	95% CI	p>z
Rural/Urban							
Urban	31	Reference					
Rural	76	2.12	0.90-5.00	0.086	1.11	0.20-6.15	0.904
Age groups							
15 -24yrs	11	Reference					
25-34yrs	28	1.38	0.34-5.62	0.659	2.09	0.12-35.99	0.610
35- 44 years	30	2.28	0.56-9.36	0.253	5.68	0.28-116.46	0.260
45-54 years	10	1.80	0.32-10.20	0.507	4.98	0.13-195.39	0.391
55-64 years	13	1.92	0.38-9.80	0.433	1.19	0.04-33.17	0.918
65 years +	15	1.05	0.22-5.00	0.951	0.21	0.01-5.18	0.344
Sex							
Male	58	Reference					
Female	49	**1.82**	**0.83-3.99**	**0.133**	**12.61**	**1.97-80.79**	**0.008**
Level of education							
No Schooling	16	Reference					
Primary	37	0.79	0.21-2.99	0.726	0.32	0.03-2.71	0.297
At least Secondary	53	**0.24**	**0.67-0.83**	**0.025**	0.11	0.01-1.24	0.074
Missing	1	Omitted					
Occupation							
Unemployed	7	Reference					
Farmer	53	5.29	0.93-30.11	0.060	11.55	0.68-196.91	0.091
Formal work (Office)	6	0.50	0.03-7.45	0.615	0.28	0.01-13.20	0.518
Formal work (Non office)	16	1.94	0.29-13.19	0.496	7.70	0.33-180.22	0.205
Informal work	9	8.75	0.90-84.90	0.061	16.65	0.50-550.87	0.115
Student	4	2.50	0.19-32.19	0.482	41.30	0.67-2560.26	0.077
Miner	4	**All reported symptoms**					

Housewives	7	**0.42**	**0.10-0.84**	**0.522**	0.21	0.17-3.29	0.404
Missing	1	Omitted					
Monthly earnings							
Zero	32	Reference					
Less than $200	59	**2.39**	**0.99-5.77**	**0.054**	0.75	0.17-3.29	0.707
$201 - $400	7	**0.85**	**0.16-4.43**	**0.847**	0.89	0.04-19.02	0.938
$401-$500	4	**All did not report symptoms**					
Student	4	**1.13**	**0.14-9.07**	**0.900**	**Empty**		
Missing	1	**Omitted**					
Religion							
Catholic or Protestant	25	Reference					
Pentecostal	16	0.61	0.17-2.16	0.445	0.11	0.01-1.17	0.067
Zionic or apostolic sects	40	0.87	0.32-2.37	0.783	0.32	0.04-2.30	0.256
Traditional	7	4.71	0.49-45.15	0.179	1.87	0.07-47.65	0.704
Others	18	1.57	0.45-5.53	0.482	0.65	0.07-5.90	0.706
Missing	1	Omitted					
Smoking							
Answered no	65	Reference					
Answered yes	41	0.70	0.32-1.54	0.375	0.33	0.06-1.79	0.201
Missing	1	Omitted					
Takes alcohol							
Answered no	77	Reference					
Answered yes	29	1.12	0.47-2.66	0.797	3.72	0.56-24.67	0.173
Missing	1	Omitted					
Contact history							
No history of TB contact	85	Reference					
History of TB contact	21	2.22	0.79-6.28	0.132	1.47	0.29-7.50	0.645
Missing	1	Omitted					
HIV Prevalence in Province							

< 17%	88	Reference					
>17%	19	1.84	0.79-6.28	0.132	1.80	0.34-9.64	0.490
Previously Treated for TB							
Answered no	88	Reference					
Answered yes	18	0.82	0.30-2.23	0.700	0.64	0.13-3.19	0.585
Missing	1	Omitted					

8 *aORs were calculated by adding all variables in the logistic regression analysis

Annex 8: Part of survey questions for all presumptive PTB cases(23)

Are you coughing currently? ***(Muri kukosora here mazuva ano?)*** *(UYAKHWEHLELA YINI KULEZINSUKU)*	Yes .... 1 No 2	***IF 2 SKIP TO F18***
For how many weeks have you had a cough? ***Give number of weeks – calculate to the nearest week.*** ***(Mave nema svondo kana mwedzi mingani muchikosora?)*** *(Ulamaviki kumbe inyanga ezingaki ukhwehlela?)*	Weeks.......................................___ ___ DK.. 98	
Have you currently coughed up blood at any time? ***(Munombokosora gararwa rine ropa here?)*** *(Ukewakhwehlela igazi yini kunsukwana ezidlulileyo?)*	Yes .... 1 No 2	
Do you currently have a fever? ***(Munombopisa muviri kana kupindwa nechando here?)*** *uzwa ukutshiselwa yini emzimbeni kulezinsuku*	Yes .... 1 No 2	***IF 2 SKIP TO F20***
For how many weeks have you had a fever? ***1 (Give number of weeks – calculate to the nearest week).*** ***(Mava ne ma Vhiki mangani muchipisa muviri)*** *usulamaviki amangaki usizwa ukutshiselwa emzimbeni*	weeks.......................................___ ___ DK.. 98	
* Do you have drenching night sweats? ***(Munombodikitira zvakanyanyisa usiku zvokunyorovesa machira here?)*** *(Uyaginqa ebusuku yini okumanzisa amasheets kumbe izigqoko zokulala)*	Yes .... 1 No 2	***IF 2 SKIP TO F23***
Do you have to change sheets/bed clothes during the night due to drenching night sweats? ***(Munombo chinja machira kana mbatya husiku nekuda kwekudikitira here?)*** *(Uyatshintsha yini amasheets kumbe impahla zokulala ebusuku sezimanzi ngamaginqo?)*	Yes .... 1 No 2	
For how many weeks have you had drenching night sweats? ***(Give number of weeks – calculate to the nearest week.)*** ***(Mave nema Vhiki mangani muchidikitira husiku?)*** *(Usulamaviki amangaki uginqa ebusuku okumanzisa amasheets lempahla zokulala?)*	weeks.......................................___ ___ DK.. 98	
Are you losing weight? ***(Murikudzikira muviri here?)***	Yes .... 1 No 2	

Annex 9: Part of survey symptom screening form.(23)

TB HISTORY

P07	Are you on TB Treatment now? *(Muri kurapwa TB iyezvino here?)* *(Uyelatshwa yini umkhuhlane wofuba(TB) khathesi?)*	1 = Yes 2 = No	[
P08	Have you been treated for TB at any other time in the past? **Do not include current episode of treatment** *(Makam borapwa chirwere cheTB here pane imwe nguva yapfuura muupenyu hwenyu?)* *(Sowake walatshwa um khuhlane wofuba(TB) ensukwini ezadlulayo yini?)*	1 = Yes 2 = No	[

TB SYMPTOMS

P09	*Are you currently coughing? *(Muri kukosora here?)* *(Uyakhwehlela yini?)*	1 = Yes 2 = No Skip to P1	[
P10	For how long have you been coughing? *(Mavanenguva yakareba zvakadii muchikosora?)* *Usulesikhati esingakanani ukhwehlela?)*	1 = 2 weeks or more 2 = Less than 2WKS	[ ]
P11	*Do you have drenching night sweats? *(Munombodikitira zvakanyanyisa usiku zvokunyorovesa machira here?)* *(Uyaginqa ebusuku yini okumanzisa amasheets kumbe izigqoko zokulala)*	1=Yes 2= No. Skip to P12	[
P11a	For how long have you been experiencing drenching night sweats? *(Mavanenguva yakareba zvakadii muchidikitira zvakanyanyisa usiku zvokunyorovesa machira ?)* *(Uyaginqa ebusuku yini okumanzisa amasheets kumbe izigqoko zokulala)*	1=2 wks or more 2=Less than 2 wks	[
P12	*Have you coughed up blood at any time in the last 12 months? *Matimambokosora ropa here kana ipinguva mumwedzi gumi nemiviri yapfuura?* *Uke wakhwehlela igazi enyangeni ezilitshumi lambili ezidlulileyo yini?*	1=Yes 2= No	[