UNIVERSITY OF CAPE COAST

SOCIAL AND POLICY CONTEXT OF TUBERCULOSIS CONTROL IN GHANA

BY

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THESIS SUBMITTED TO THE DEPARTMENT OF POPULATION AND HEALTH, FACULTY OF SOCIAL SCIENCES, UNIVERSITY OF CAPE COAST, CAPE COAST, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF DOCTOR OF PHILOSOPHY IN POPULATION AND HEALTH

JANUARY 2014

DECLARATION

Student’s Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate’s signature……………………………… Date……………..

Joshua Amo-Adjei

Supervisors’ Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor’s Signature………………… Date..……………

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ABSTRACT

Tuberculosis (TB) continues to exert significant influence on the disease profile of countries, especially in Asia and sub-Saharan Africa. Recent evidence shows that timely chemotherapy and proactive community response can avert deaths associated with TB. This thesis explores TB control in Ghana from 1900 to 2010.

Data were collected from four major sources: archival materials from the national archives of Ghana and United Kingdom, the 2008 Ghana Demographic Health Survey, TB surveillance data between 1997 and 2010, and in-depth interviews with some stakeholders in TB and HIV control in the country.

The study revealed that the presence of TB on the epidemiological profile of the country predates independence and the anecdotal evidence suggests that the disease originated from contact with Europeans and Arabian traders who came through the coastal south and the northern regions respectively. Following the initial introduction, mining, urbanisation, and the opening up of hinterlands through improved transportation fuelled its internal spread. It was also observed that over the years, there have been significant improvements in completion of dosage and cure and reduction in default and fatality. These positive outcomes could be attributed to better case management, through fixed-dose combination, advances in diagnosis, community treatment care, and incentives for demand generation and public-private partnership. It is envisaged that an inclusive approach involving well coordinated TB and HIV services, as well as public-private partnership, could result in better TB control in the country.

ACKNOWLEDGEMENTS

It is said that "turtles advance only when they stick their necks out", a typical reality with respect to this thesis. On my own, I could not have stuck my neck out without the support, encouragement and mentoring of certain individuals. In this light, I am exceptionally grateful to my supervisors, Professor Kofi Awusabo-Asare and Dr. Akwasi Kumi-Kyereme, through whose motivation and good counsel I have come this far in my pursuit of knowledge.

I am also grateful to all my respondents in the study sites. Again, I wish to acknowledge Dr. Frank Bonsu (Programme Manager) and Mr Felix Kwame Afutu (Monitoring and Evaluation Coordinator) respectively of the National Tuberculosis Control Programme, through whose unflinching interest in this work provided me access to NTP materials and funding to access data from the National Archives of UK. My appreciation also goes to the Director and Staff of National AIDS Control Programme as well as the University of Cape Coast for sponsoring the entire study. I am also grateful to Dr. Samuel Kobina Annim of the Department of Economics, UCC, who constantly urged me on to complete this work on time.

The meticulous search assistance I received from the Public Records, Archives and Administration of Ghana deserve mention. I am also grateful to Professor James C. Riley, a retired Professor of the University of Indiana, US, who whipped-up my interest in the historical study of TB and directed my attention to the National Archives of the UK as an important source of information. MEASURE DHS is also acknowledged for the timely response to my request to use the data of 2008 Ghana Demographic and Health Survey.

To my siblings: Steve, Emma, Esther, Joyce, Sammy, Hannah and Sarah who served as positive models before me are ever appreciated. My parents, Papa Amo Kwaku and Maame Margret Amoakoa, who, though never had formal education, ensured that I obtained formal education also deserve special mention.

In the course of this thesis, I benefited from the fruitful discussions and encouragements I often had with colleagues in the Department of Population and Health, particularly Maafio, Fred Gbagbo, and Nana Owusu Boampong and of course, my office mate Yaw Asamoah (alias Why Not?). Mr Isaac Mwinlaaru’s editorial assistance is also appreciated. Nonetheless, I wholly remain responsible for any lapses in the work.

DEDICATION

To Maame Margret Amoakoa (late), Mrs Mavis Amo-Adjei and Maame Amma Amoakoa Amo-Adjei

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LIST OF ACRONYMS

ACET	Advisory Council for Elimination of Tuberculosis
ADM	Administrative
AGC	Ashanti Goldfields Company
AIDS	Acquired Immune Deficiency Syndrome
ART	Antiretroviral Therapy
BCG	Bacilli Calmette-Guérin
CDC	Centres for Disease Control and Prevention
CHPS	Community-based Health and Planning Services
CSO	Colonial Secretary's Office
DALY	Disability-adjusted life-years
DANIDA	Danish International Development Agency
DDMM	Disclosure Decision-making Model
DfID	Department for International Development
DHS	Demographic and Health Survey
DOTS	Directly Observed Therapy, Short course
FDC	Fixed-dose combination
GAPT	Ghana Association for Prevention of TB
GDF	Global Drug Facility
GDHS	Ghana Demographic and Health Survey
GFATM	Global Fund to Fight AIDS, TB, and Malaria
GHS	Ghana Health Service
GLC	Green Light Committee
GoG	Government of Ghana
GSS	Ghana Statistical Service

GTS	Ghana Tuberculosis Services
HAART	Highly active antiretroviral therapy
HIV	Human Immunodeficiency Virus
IDI	In-depth Interview
IEC	Information, Education and Communication
IOM	International Organisation for Migration
IPT	Isoniazid Preventive Treatment
IRR	Incident Risk Ratio
ISTC	International Standards for TB Care
IUATLD	International Union against TB and Lung Diseases
KATH	Komfo Anokye Teaching Hospital
KBTH	Korle-Bu Teaching Hospital
LI	Legislative Instrument
M&E	Monitoring and Evaluation
MCH	Maternal and Child Health
MDG	Millennium Development Goals
MDR	Multi-drug resistant
MOH	Ministry of Health
NACP	National AIDS Control Programme
NGO	Non-governmental Organisation
NMCP	National Malaria Control Programme
NTP	National TB Control Programme
PAL	Practical Approach to Lung Diseases
PET	Punctuated Equilibrium Theory
PPP	Public-private partnership

PRAAD	Public Records and Archives Administration
PWLA	Persons Living with AIDS
SARS	Severe Acute Respiratory Syndrome
SSNIT	Social Security and National Insurance Trust
TB	Tuberculosis
UK	United Kingdom
UN	United Nations
UNAIDS	United Nations AIDS Programme
USA	United States of America
USAID	United States Agency for International Development
VAT	Value Added Tax
WHO	World Health Organisation
XDR	Extra drug resistant
YLD	Years of Life Lived
YLL	Years of Life Lost

CHAPTER ONE

INTRODUCTION

Background to the study

Global disability-adjusted life-years (DALYs) reports have, over the years, shown that communicable diseases contribute about 24 per cent of years of life lived with disability (YLD) and 19 per cent of years of life lost (YLL) (WHO, 2004a; 2008a). While some of the communicable diseases such as tuberculosis (TB) are curable, others such as Human Immunodeficiency Virus (HIV)/Acquired Immune Deficiency Syndrome (AIDS) are incurable. Yet of the curable communicable diseases, TB is reported to be the most predominant cause of death around the world due to high infectivity rates, and other socioeconomic inequalities such as poor housing and under nutrition (WHO, 2004a).

TB is a bacteria (mycobacterium tuberculosis) disease that is caused by M. TB complex, commonly called the tubercle bacillus. Various etiologic mediators of TB have discrete hosts, zoonotic budding and reservoirs (Barrera, 2007). The bacteria (*M. tuberculosis*) causing TB was scientifically discovered by Koch in 1883. Until then, TB was popularly described with the Greek term phthisis, which means consumption or waste away. This description of TB as consumptive was due to the deleterious effects that were associated with the epidemic (Tami, 2008).

Available data indicates that traces of TB exist across all regions of the world and overtime. Common progenitors of present TB bacteria were known about 15,000 to 35,000 years ago in several parts of Europe (Cristina, Brisse & Brosch, 2005). Outside Europe, historical evidence shows the existence of TB in India, China and Egypt about 3,300, 2,300 and 5,000 years ago respectively (Daniel, 2006). In US, it is believed that TB existed before Columbus reached America (Leão & Portaels, 2007). It is on record that in 460 BC, Hippocrates cautioned medical practitioners not to visit consumptives at their terminal stages. Aristotle (384-322 BC cited in Leão & Portaels, 2007) also considered consumption as a transmittable disease, though other Greek authors linked consumption to heredity and partly to mental and moral predispositions of patients (Leão & Portaels, 2007). Clarissimus Galen (131-201 AD), another philosopher after Hippocrates, defined phthisis as an "ulceration of the lungs, chest or throat, accompanied by coughs, moderate fever, and wasting away of the body because of pus" (Leão & Portaels, 2007, p.29).

Fairchild and Oppenheimer (1998) described TB as the "captain of all these men of death of the 17^{th} century" and the 19^{th} century "White Plague" (p.1105). Daniel (2006), recounting the history of TB, observed that TB has always been with humanity and its history goes back to the beginning of recorded history and further noted that the agent of TB transmission, mycobacterium TB, has probably caused more deaths than any microbial pathogen in the world. The contagious nature of consumption (TB) resulted in intermittent epidemics whenever the social and environmental circumstances for such plagues were available.

The evidence about the existence of TB varies by world regions: they are more profound in present developed countries, but scanty in developing countries. In Britain, for instance, TB is noted to have started from the beginning of the 17^{th} century and persisted for approximately 200 years. In the 1600s, the emerging industrial revolution and urbanisation in Britain (London in particular) provided suitable environments for TB transmission, making it the leading cause of death in Britain (Leão & Portaels, 2007), and, in the US, the impacts were estimated to have been much higher, with about 900/100,000 deaths around 1880 (Bates & Stead, 1993). The rate in 2011 was 3/100,000, an indication of substantial improvement (Centres for Disease Control and Prevention, 2012).

There is also evidence from Asia, particularly India and China, pointing to the existence of TB in pre-historic times, and particularly towards the end of the 19th century (Leão & Portaels, 2007). For Africa, only hints of TB exist from recorded history and available information on morbidity and mortality of TB dates from the 1800s (Leão & Portaels, 2007). Bates and Stead (1993), for example, argued that no records of TB existed in Africa until the arrival of the Europeans. From the Ghanaian perspective, Dumett (1993) believes that TB may not have existed prior to the arrival of Europeans in the country.

Tuberculosis: from infection to disease

Knowledge on TB epidemiology is immense, especially the transition from infection to disease stages is now well known (Floyd, 2003; Dye, 2006). In most cases, unless a later defect occurs in cell-mediated immunity, the infection remains contained within the granulomas (spherical mass of immune cells that forms when the immune system attempts to truncate substances that it perceives inhibitory or foreign) (Floyd, 2003; Dye, 2006). However, when the immune reaction fails to hold back the replication, primary infection leads to active TB (progressive primary TB). An infection could be active, where the immune system of an infected person is unable to suppress the transformation from infection to a disease level. Active TB is infectious through coughing, sneezing and spiting. Inactive or latent TB exists in infected people but does not result in disease. People with latent TB may not become diseased and are also unable to infect others. It is, however, believed that HIV/AIDS infection has the ability to convert latent TB to an active condition (Lee, Hwang, Oh, Kee, Oh, An, et al., 2010).

TB infection will spread within the body when infected macrophages moving through the blood and lymph transport the bacteria to other sites. Once infected, the infection is described broadly based on the infected part. Thus, it could be pulmonary or extra pulmonary TB. Pulmonary TB is when the lungs are affected while extra pulmonary TB can be identified in the lymphatic, pleural, bone and/or joint, genitourinary and the peritoneal systems, the meninges and/or the central nervous system and virtually in almost any part of the body (Parimon et al. 2008; Sreeramareddy, Panduru, Verma, Joshi & Michael, 2008; Othman, Ibrahim & Raja'a, 2011).

In most infectious patients, bacilli can be detected microscopically on stained sputum smears (60 to 70 per cent of pulmonary cases) (Marais et al., 2004). Smear-negative patients may also be infectious but on the balance of probability, contribute relatively little to transmission (Hernandez-Garduno et al., 2004). Extra-pulmonary TB is more common among women and children (particularly lymphatic TB) and among people infected with HIV and contributes 10 to 30 per cent of TB disease burden. Pulmonary TB is more common in men (Aaron et al., 2004).

Perspectives on epidemiology of tuberculosis

In every 15 seconds, someone in the world dies from TB, and that infection occurs every second of every day. Infections, which remain untreated, have the potential of inducing 10-15 other infections per annum (Dye, 2006). To meet the challenge of TB, WHO declared TB as a public health emergency in 1993 (WHO, 2009a), the only disease with that description since the establishment of WHO in 1948.

Since then, there have been several interventions at the international and national levels to deal with the disease. At the international level, the Millennium Development Goal Six (MDG 6) and the Stop TB Partnership targets represent the highest levels of commitment to eliminate TB. Target eight, under MDG 6 seeks to halt, and beginning to reverse the incidence of malaria, TB and other major diseases by 2015. Indicators 23 and 24 of MDG 6 involve measuring the prevalence and death rates associated with TB and the proportion of TB cases detected and cured under the directly-observed treatment short course (DOTS). Parallel to the MDG targets, the Stop TB Partnership seeks to reduce the prevalence and death rates by 50 per cent by 2015 (base year 1990) and achieve less than one active TB case per one million population by 2050 (WHO, 2010a).

The key programmatic interventions outlined in the MDG target eight are also included in the Stop TB Strategy, namely, to pursue high-quality DOTS expansion and enhancement; to address TB/HIV, multi-drug resistant TB (MDR-TB) and the needs of poor and vulnerable populations; to strengthen health systems based on primary health care; to engage all care providers; to empower people with TB, and communities through partnership; and to enable and promote research. All these efforts are geared towards TB-free world by 2050 (WHO, 2009a).

Before TB was described as an emergency in 1993, the estimated number of infections was 70 million with 1.6 million deaths at that time. Between 2007 and 2009, there was approximately an estimated one per cent increase in global TB incident cases: from 9.3 million incident cases to 9.4 million, equivalent of 139 per 100,000 population or one out of every three people. Of the estimates in 2009, 55 per cent was reported in Asia, which has 57per cent of the world's population and 30 per cent in Africa, which has 14 per cent of the world's population (Table 1).

Table 1: Estimated epidemiological burden of tuberculosis in WHO regions

WHO Region	2009 (%)	% of world population
Asia	55	56.6
Africa	31	14.3
Eastern Mediterranean	7	3.5
Europe	4	12.0
America	3	13.7

Source: WHO (2010a): Estimated percentages for 2008 and 2009 are the same

The countries with highest burden of TB diseases around the world in 2009 were India (1.6-2.4 million), China (1.0-1.6 million), South Africa (0.38-0.57 million), Nigeria (0.37-0.55 million) and Indonesia (0.34-0.52 million). Out of the present 22 high burden countries, eight are in Africa (Kenya, South Africa, Zimbabwe, Ethiopia, Nigeria, DR Congo, Uganda and Mozambique).

In countries where TB cases are high, the rates of infection are generally parallel with HIV/AIDS rates of infection.

Some simulation models have predicted limited likelihood for Africa and Eastern Europe to achieve the MDG targets on the prevalence and deaths due to TB by 2015. For instance, the 70 per cent target of TB case detection and 85 per cent treatment success rates set for 2005 could not be achieved in Africa and Eastern Europe. In the highest possible scenario, 59 per cent of case detection was achieved while in the lowest scenario, 46 per cent was estimated for 2005 (Dye, Watt, Bleed, Hosseini & Raviglione, 2005). In the case of treatment success, only one of the six world regions was successful - Asia (South East Asia and Western Pacific) (WHO, 2009a).

Challenges and opportunities for tuberculosis prevention and control

One of the factors affecting TB control around the globe is the interface between TB and HIV, which has been described as lethal, with mutually dependent progression rates of infection (Dye, 2006). Out of the total TB cases in 2009, between 1.0 and 1.2 million had co-infections with HIV. Seventy-eight per cent of new HIV cases in 2008 was recorded in the African region and 13 per cent in Southeast Asian region. About four hundred thousand deaths (range 0.32-0.45 million) were recorded among TB incident cases that were doubly infected with TB and HIV/AIDS globally (WHO, 2010a).

Studies have shown that HIV infection does not only reactivate latent TB infection but also accelerates new infections and re-infections (Corbett et al., 2003; Aaron et al., 2004). The lifetime risk of an individual infected with dormant TB developing an active TB ranges from 10 to 20 per cent. Regardless of the fact that TB is preventable and curable, it is one of the commonest causes of morbidity and mortality among people living with HIV (Corbett et al., 2003; Aaron et al., 2004).

Another factor defining the epidemiology of TB is default and noncompliance to treatment therapies. Empirical studies from different parts of the world have reported varied factors accounting for defaults in treatment. Among a cohort of TB patients investigated for drug resistances in a southern Ethiopian hospital, Shargie and Lindtjørn (2007) found physical distance (from home and access to public transport) as the key hindrances to compliance. In India, Vijay et al. (2010) found alcoholism, illiteracy, inadequate knowledge on TB, poor patient-provider interaction, perceived side effects of TB drugs while Hasker et al. (2008) found unemployment as contributing to default in treatment. In Ghana, age (Abuaku, Tan, Chen & Huang, 2010), income, ability to afford complimentary drugs and social support (Dodor & Afenyadu, 2005) have been identified as some of the factors accounting for default. With emerging multidrug resistant mycobacterium, Holtz et al. (2006) have noted smoking marijuana or mandrax during treatment and patients' perception of unsatisfactory attitudes of health care workers as barriers to treatment adherence in South Africa.

Perceptions relating to TB transmission, cure and stigma also shape the patterns of infection, prevention and treatment across the globe. Available studies present some contrasting findings relating to routes of transmission, cure and status disclosure. In South Africa, Peltzer, Mngqundaniso and Petros (2006) found that traditional healers were highly knowledgeable about TB being curable, though many of the sampled population had misconceptions about transmission (example, acquiring TB through smoking, and mosquito bites). Deribew et al. (2010) have also reported deep-seated misconceptions about TB in some rural Ethiopian communities. Exposure to cold air is particularly implicated as the cause of TB, accompanied by high prejudices towards TB patient. Similarly, Wieland et al. (2010) found among foreign-born populations in US misperceptions on TB, such as how the disease could be transmitted. For instance, Weiland et al. (2010) noted that TB was perceived as a curse and a result of overworking. Issues such as status concealment, fear and shame among populations at risk of infection were also common. However, a common finding that is evident from studies on perceptions is that formal education can improve perceptions (Peltzer et al., 2006; Deribew et al., 2010; Abebe et al., 2010; Haasnoot, Boeting, Kuney & van Roosmalen, 2010).

Prior to the early 1990s, the threat of TB to public health had been well managed and these were mainly attributed to the availability of effective chemotherapies, using drugs such as isoniazid, rifampicin, pyrazinamide, streptomycin and ethambutol (WHO/IUATLD, 2008). However, some TB treatment surveys by WHO suggested the presence of strains that was resistant to, at least, one of the major TB drugs. These drug resistances were caused by relapse in treatment compliance, wrong drug prescriptions and unreliable drug supplies (WHO, 2010b). Similarly, some precarious strains, which were also multiple drugs resistant (MDR-TB) and defined as strains that were resistant to first line TB drugs, namely, isoniazid and rifampicin, have been reported in some countries (WHO, 2010b). Though these strains are curable, they require extra efforts in ensuring strict compliance to treatment, with some of the drugs containing high toxicities as well as additional costs (WHO, 2010b). Owusu-

Dabo et al. (2006) found high levels of mycobacterium resistant to streptomycin and isoniazid among TB patients at Komfo Anokye Teaching Hospital, Kumasi (KATH). Forson, Kudzawu, Kwara and Flanigan (2010) have also reported that 10 out of 28 (36%) patients had varying levels of resistance to rifampicin and isoniazid and 70 per cent of them had received more than two retreatment courses. Some of these second line drugs included ethionamide, kanamycin, cycloserine, thioacetazone, p-aminosalicylic acid and oxfloxacin.

In 2008, an estimated 440,000 cases of MDR TB emerged globally (WHO, 2010c), with the highest burden of MDR recorded in India and China, two countries accounting for almost 50 per cent of the world's total cases. Out of the global numbers, more than three quarters occurred in previously treated patients. The proportion of MDR cases among new cases and previously treated cases of TB reported globally from 1994 through 2009 ranged from 0 to 28 per cent and from 0 to 62 per cent respectively (Nathanson et al., 2010).

Other strains of TB are evolving and are extensively multi-drug resistant (XDR-TB), defined as M. TB resistant to at least rifampicin and isoniazid (the definition of MDR-TB), in addition to any fluoroquinolone and to at least the following injectable drugs for TB treatment: capreomycin, kanamycin and amikacin (WHO, 2006). By 2009, 58 countries had reported at least one case of XDR TB. In eight countries, reported cases of XDR TB account for more than 10 per cent of all cases of MDR TB. As of 2012, South Africa was estimated to account for 10.5per cent of XDR TB. In the Msinga district of KwaZulu Natal Province, for example, 53 possible cases of XDR were reported between 2005 and 2006. Fifty-two (52) of these died within an average survival interval of 16 days (Migliori, Loddenkemper, Blasi & Raviglione, 2007). This is mainly attributed to the accelerated increase in human immunodeficiency virus (HIV) (Nathanson et al., 2010).

Notwithstanding these threats, several countries do not have policies to address diagnostic and treatment difficulties. WHO (2010b) has noted: “Countries face enormous hurdles in accelerating access to diagnostic and treatment services for drug resistant TB, and previous efforts to address this epidemic have clearly been insufficient … epidemiological impact is possible when certain conditions are met namely, political commitment and sound use of available tools. Positively, greater political commitment by national health authorities in addressing M/XDR-TB has emerged” (p.4).

While wealthy industrialised countries (with good public health care systems) can be expected to keep TB under control, in much of the developing world there is the absence of timely and effective interventions, which deal with the dynamics associated with TB patterns and trends progression or decline.

In spite of the prevailing challenges to the control of TB, the broad framework of DOTS provides some globally shared opportunities for control of the disease. Among such opportunities are the Global Drug Facility, Green Light Committee, Practical Approach to Lung diseases (PAL), and public-private partnership (PPP) in TB detection and management. In the case of PPP, the evidence generally supports its effectiveness to TB management. For instance, Dewan et al. (2006) and Ahmed et al. (2009) have found convincing evidence to support the involvement of private health facilities in case identification and treatment.

Evolutions in tuberculosis control

Throughout history, different forms of measures and interventions have been advocated to control the spread of TB (Fairchild & Oppenheimer, 1998). At the individual level for instance, WHO (1998) noted that: “Purging, bed rest, horseback riding, the mountains, the seashore, cod-liver oil, castor oil, chalmoogra oil, phrenic nerve interruption, thoracoplasty, pneumothorax, lucite ball or paraffin plombage, air in the chest, air in the abdomen ... the list of attempted remedies from the Greeks to the moderns seems nearly infinite” (p.11). Measures such as these provide an indication about the frustrations and discomforts that individuals infected with the disease went through.

At the societal level, the provision of sanatoria was seen as one of the effective broad scale approaches at controlling TB infection and cure (Wilson, 1990). Sanatoria provided two key safety nets: one, for the infected to resuscitate and second, a mechanism for isolating the patients from the communities to cut back further infections (Leão & Portaels, 2007). In a synthesis of evidence on history, politics and control of TB, Fairchild and Oppenheimer (1998) have shown that the contribution of segregation of TB patients to reduce infection and deaths were profound in the later part of the 19th century. Present TB management strategies include treatment, which aim at reducing progression from infection to active TB (Ochieng, 2008). Even though past and existing interventions proved effective to an extent, comprehensive, conclusive as well as generally acceptable quantitative evidence still remain terse.

The lack of conclusive evidence to back specific control measures have resulted in controversial interpretations, especially in reference to indirect interventions such as nutrition, housing and income. McKeown's (1976) thesis on the decline of mortality in Britain is believed to have ignited the debate on interventions that could have heralded TB reductions. He argued that declines in TB deaths could solely be accounted for by improvement in immune resistance, preceded by nutritional improvements.

Szreter (1988), on the other hand, has argued that the method of studying airborne diseases in an aggregated manner as approached by McKeown obscures cause-specific mortality rates. Rather, disaggregated analysis yields a better presentation of contributions of various efforts towards dealing with general mortality and TB in particular. Although Szreter (1998) accepted the nutritional hypothesis, he further contended that, TB, like all other diseases, benefited from multi-factorial interventions such as legislations against overcrowding and poor ventilation both at home and work places.

Others have argued that the focus of public health agencies on individual health behaviours rather than on broad social reforms such as poverty reduction (Brudney & Dobkin, 1993; Landesman, 1993) were responsible for the periodic resurgence of TB. To Landesman (1993), the deteriorations in public health infrastructure since the 1980s, reductions in public health financing, declines in TB screening programmes as well as treatment relapse were accountable for the re-emergence of TB in early 1990s. Some discussions have identified poverty and deprivation (Myers, Westenhouse, Flood, & Riley, 2006; Coker, McKee, Atun, Dodonova, Kuznestsov & Drobnieswki, 2006), migration to previously controlled regions and population displacement as major factors for TB infections and re-emergence. Though these risk factors are important, pertinent questions surrounding these factors remain unresolved due to inconsistent findings, which are mainly linked to study designs (Baker, Das, Venugopal & Howden-Chapman, 2007).

A synthesis of literature on TB control globally suggests three eras of TB control. The first period spans from around the 19th century (e.g. Newsholme, 1906) to the end of the 1940s. This period saw intense and sustained efforts at preventing and controlling the deleterious impacts of TB. Interventions to address TB were mainly social and political such as segregation and pasteurisation of milk (Szreter, 1988).

The second era was from 1944 to late 1980s and was characterised by development of TB antibiotics (e.g. Landesman, 1993) and different strategies. Among the strategies were vertical programmes (1948-1964), integration of service delivery (1964-1976) and integration of managerial functions (1977-88) (Raviglione & Pio, 2002). But this period saw disjoints and flaws in control measures at the international and local levels. For instance, TB was perceived as ‘ordinary’ respiratory infectious disease (Raviglione & Pio, 2002). The declines in control efforts have been attributed to the availability of antibiotics to fight TB, which created the impression of complete eradication. This era has been described as the era of “dormancy” in control efforts (Raviglione & Pio 2002).

The last epoch started around 1989 through the 1990s. This period consisted of specialised managerial approach (1989-98), renewed integrated approach (1999-2000) and postmodern control measures (Raviglione & Pio, 2002). Each of these approaches had different outcomes on TB control. While some approaches were effective, others did not yield the needed impact on epidemic levels, especially in economically distressed African and Eastern European countries (after the collapse of the Soviet Union). For instance, the vertical approach achieved immense benefits in terms of control in developed countries. However, with the developing countries, much could not be achieved due to weak health systems (Raviglione & Pio, 2002).

The discussions thus far suggests that in the available literature on epidemiology of TB, control strategies and approaches as well as methods have led to mixed results. This study attempts to build on existing literature on eras and paradigms for TB control in Ghana, and further explore the context of TB control in Ghana (Gold Coast) from 1900 to 2010.

Problem statement

Historical and present evidence on TB suggest that the disease has been a challenge to population health and has contributed to political and social distress. Strategies such as confinement/segregation of infected people (in the past and presently) and the DOTS were developed to reduce morbidity and mortality associated the disease. While enough evidence exists on efficacy of the wide-ranging interventions (e.g. segregation, and chemotherapy) since 1944 (Szreter, 1988), TB continues to pose challenges to national health systems in terms of morbidity and morality.

In the last decade, efforts to manage the effects of TB on health have been intensified through concerted global actions. At the international level, the sixth goal of the Millennium Development Goals aims at reversing the trends of TB, malaria and HIV, with 2015 as the target date. However, the situation prevailing in some developing countries, such as Ghana brings to question the ability of these countries achieving this goal. For instance, of the estimated 47,632 TB cases in 2010 in the country, only 15,145 of both relapsed and new cases, were detected and of those detected, about 8.7 per cent died while on treatment (WHO, 2011). The situation becomes even more challenging when gauged against the pressure of HIV, which accentuates the incidence, and prevalence of TB in settings where the diseases subsist (Corbett et al., 2003). For instance, in Ghana, HIV/AIDS and TB accounted for 7per cent of deaths in all age groups, the second highest to malaria (13%) in 2009 (Ghana Health Service, 2010).

A search on existing literature on TB in Ghana yielded seventy-seven published studies, either directly or indirectly on TB in Ghana. The earliest was by Todd in 1947. Table 2 provides a summary of the studies on TB classified by broad themes: clinical research, TB mortality, and clinical linkages of TB with HIV, stigma and non-compliance to treatment.

Clinical studies constituted 62 per cent and largely concentrated on evidence and manifestation of TB bacteria, prevalence, characteristics and progression dynamics. For instance, Lawn et al (2001) assessed TB manifestations and drug resistance in Kumasi and found some primary resistances to isoniazid with no such results for other TB treatment drugs. Wurapa and Belcher (1976), Agadzi, Pobee, Ikeme and Chowdhury (1980) and Addo et al. (2010) used techniques such as tuberculin skin test to study TB prevalence among some Ghanaian population. Other studies were on resistance of TB bacteria to first-line drugs in Korle Bu, Accra (Forson et al., 2010) and TB mortality (Lawn & Acheampong, 1999; Gyasi, Kumpji & Akosa, 2000).

Table 2: Studies on tuberculosis in Ghana: 1947-2011

Focus of studies	Frequency	Per cent
Clinical	48	62.3
TB & HIV interaction clinical	11	14.3
Compliance	5	6.5
Stigma	4	5.2
Assessment of treatment in facilities	4	5.2
TB mortality	2	2.6
Post-treatment behaviour	1	1.3
Treatment seeking behaviour	1	1.3
Community participation in treatment	1	1.3
Total	77	100.0

Source: Author's construct

Fourteen per cent of studies examined clinical interconnections between TB and HIV/AIDS (Frimpong, Lawn, Dwemoh, Afful & Acheampong, 1997; Adjei, Adiku, Ayeh-Kumi & Hesse 2006; Meyer et al., 2010) and five studies discussed various aspects of TB-related stigma and discrimination of community members towards TB patients (Dodor, Neal & Kelly, 2008), stigmatisation by health workers towards patients and patients' perceptions about health workers' attitudes towards them (Dodor, Neal & Kelly, 2009; Dodor & Kelly, 2009; 2010).

The remaining studies, accounting for 17 per cent, were on aspects of TB such as compliance to treatment studies at Agogo (van der Werf, Dade & van der Mark, 1990), Takoradi (Dodor & Afenyadu, 2005) and a cross-national study of compliance in China and the Eastern Region of Ghana (Abuaku, Tan, Li, Chen & Huang, 2010).

To a large extent, the studies have leaned towards bio-medical individualism and as Gandy and Zumla (2002) note, a tilt towards the individual behavioural and clinical dimensions of the disease. As Fee and Krieger (1994) have pointed out, epidemiologic studies have often focused much on the individual patient and are devoid of broader structural contexts. Chintu and Zumla (1995), Chowdhury, Chowdhury and Islam (1997), for instance, have contended that the concept of non-compliance to TB treatment blame patient(s), although default in therapy could result from poor health systems delivery such as geographical access, cost of service, and attitudes of health personnel towards TB patients (See Lawn, 2000). So far, the policy environment for TB control appears inadequate. Among the areas that need consideration are the historical perspectives, perceptions about transmission, status disclosure and cure of disease, policy/strategies directions pursued over the years to confront TB morbidity and mortality and the perspectives of main actors, to which this thesis makes a contribution.

Objectives of the study

The general objective of the study is to discuss historical, social and policy environment of TB control in Ghana. The specific objectives are to:

1. Analyse the time-space dimension of TB in Gold Coast/Ghana from 1900 to 2010;
2. Assess the perceptions and knowledge of Ghanaians towards TB transmission, status disclosure and cure;

3. Assess the policy strategies that have been adopted for TB control;
4. Analyse the interface between TB and HIV in the control efforts.

Hypotheses for the study

The thesis is guided by the following hypothesis:

1. H_0: There is no relationship between region of residence and myths and misconceptions about TB transmission.

2. H_0: There is no relationship between region of residence and knowledge about cure for TB.

3. H_0: Attitudes towards TB status disclosure are not related to region of residence.

Data for examining these hypotheses was generated from the 2008 Ghana Demographic and Health Survey. Intuitively, it is expected that there will be no variations in the country by region of residence and other socioeconomic characteristics. While acknowledging the limited literature on this hypothesis within countries, there are few cross-country studies that have reported country-level differences in misconceptions and myths about TB transmission. For instance, Khandoker, Khan, Krämer and Mori (2011), observed differences in misconceptions about TB in Metro Manila, Mwanza, New Delhi, Kuala Lumpur, and among aboriginal population of Montreal.

Knowledge of cure for diseases may be one of the first steps towards seeking cure. Ahmada, Richardusb and de Vlasb (2012) and Ukwaja, Alobu, Nweke, and Onyenwe (2013) have shown that treatment-seeking delays, one of the major factors for continuous spread of the disease, can be negatively affected by knowledge of availability of cure. This hypothesis is therefore directed at exploring differences, which can provide opportunities for identifying populations unaware of the availability of cure for TB.

There is evidence that when TB patients disclose their status to trusted relations, they are often supported and encouraged (Zolowere, Manda, Panulo & Muula, 2008). Nonetheless, there are occasions when people infected with stigmatised diseases such as TB may be apprehensive of self-disclosure because of potential stigmatisation. Diseases that are associated with stigma and possible discrimination are often difficult to disclose. Fear of disclosure largely centres on fear over the question of how the disease was acquired (Rwemisisi, Wolff, Coutinho, Grosskurth & Whitworth, 2008). This hypothesis therefore tests whether attitudes about disclosure vary by space.

Overall, the three related hypotheses are intended to test for consistency on the three outcomes: knowledge about infection and cure as well as attitudes towards disclosure.

Rationale for the study

Goal six of MDGs proposes to halve and reverse the incidence of HIV, malaria and TB and other diseases by 2015 (WHO, 2012a). Since the year 2000 when these goals were set, a number of interventions have been initiated to deal with further TB infections. As part of the strategy to control TB to the lowest levels, the WHO launched the Stop TB Strategy. One thematic area of the strategy is to promote research with the objective of identifying localised factors, which provide insights into the trajectories of routine policy and programme evolution as well as strategies for post-agenda sustainability. This study in part contributes to exploring best practices for TB control.

Stigma associated with diseases such as TB negatively affect case identification and reporting, with a synergistic effect on additional infections. Some studies in Ghana (for example, Dodor & Kelly, 2010) have reported some stigma-related behaviours among a cross section of Ghanaians and health workers towards TB patients in the Sekondi-Takoradi Metropolis. It is generally acknowledged that stigma directed at some health conditions are informed by negative perceptions about causes, prevention and treatment options available. Understanding perceptions about a disease is critical for the design of interventions. Therefore, the perceptions about TB, which are explored in this thesis, will be relevant for TB education purposes. Using the 2008 Ghana Demographic and Health Survey, which is nationally representative, will allow a detailed analysis of determinants of knowledge on causes, prevention and cure of TB. Such information can provide areas for programmatic efforts for control and stigma reduction.

A number of interventions/strategies have been designed to control TB in Ghana. This study, although not an exhaustive evaluation of policies, is intended to provide policy makers with clues about the strategies that have worked or have not worked over the years. Diseases, which have high international support, in terms of funding and transfer of strategies risk over-reliance on donor initiatives. However, it is important that the differences in context are given important attention. This study then attempts to point to interventions that could be pursued intensively based on the Ghanaian setting. For instance, WHO (2012b) is vigorously promoting integration of TB and

HIV controls, at least at the point of care. The important question is to find out how policy makers and implementers view such a proposal, taking cognisance of local issues.

Finally, findings from the historical perspective adopted will yield lessons that could be relevant to current control measures. The identification of good practices could inform strategies on how to reduce new infections. On the other hand, understanding the measures that worked, can inform future policy directions. Gaps that will be observed from this study could then provide pointers for further research on TB.

Organisation of the study

Chapter One of this thesis has introduced the entire study, beginning with a general background to the study, current global epidemiology, challenges and opportunities for TB prevention and control, evolutions in TB control, problem under study, objectives, hypotheses, justification of the study and the structure of the study. The second chapter reviews empirical evidence on various aspects of TB control. Chapter Three discusses theoretical issues in disease control, with specific attention health policy environment and concludes with a framework that links the various concepts emerging from the literature review. The fourth chapter focuses on methods of data collection and analysis, matters arising from the field and ethical issues. In Chapter Five, historical evidence is adduced to explore the trajectory of TB control in the country, beginning from 1900. Efforts that were used in the past are discussed vis-à-vis present interventions. The sixth chapter, based on data from the Ghana Demographic and Health Survey (GDHS), examines myths and misconceptions about TB transmission, knowledge about cure and attitudes towards status disclosure by spatial and socio-economic-demographic characteristics. In Chapter Seven, current policies for TB are discussed while Chapter Eight deals with linkages between TB and HIV as well as public-private partnership for TB. The final chapter summarises the entire study, draws conclusions based on evidence and then makes recommendations for policy.

CHAPTER TWO

PERSPECTIVES ON, AND STRATEGIES FOR TUBERCULOSIS CONTROL

Introduction

TB has received public attention for the many years it has existed and in the last 100 years, management and control of the disease has benefited from social and technological advancement in public health. But amidst all the innovations in chemotherapy and behavioural adjustments recommended for TB prevention, the numbers of infections have not declined as expected and there have also emerged multi-drug and extra multi-drug resistances. Endemic trends have led to a collection of academic papers, and other literary works as well as policy directions on the disease. The situation has been attributed to the complexities of the infection and the deaths the disease brings and continues to exert on populations.

This chapter presents a review of existing studies on TB from historical to present times, and at the global, regional to country levels. Issues that are explored in this chapter are historical perspectives on control strategies as well as the social and behavioural issues in infection and management.

Historical perspectives on tuberculosis control

The ancient civilisations of Babylon, Egypt, Rome and Inca are replete with measures that were taken to improve health and prevent illnesses. Much of the efforts at the time were intended to control communicable diseases, one of which was TB.

The approaches then were informed by the adoption of physical measures and were more reactive than proactive (Bloom & Murray, 1992). From the early 1800s, public health was perceived as the "science and art of preventing disease, prolonging life and promoting physical health and efficiency through organised community efforts for sanitation of the environment, the control of community infections, the education of the individual in principles of personal hygiene, the organisation of medical and nursing services for early diagnosis and preventive treatment of disease, and the development of social machinery which will inure to every individual in the community a standard of living adequate for the maintenance of health" (Winslow, 1920, p. 23).

Baggot (2000) makes the point that prior to the 20th century, the interpretation of issues of public health importance was essentially a political process in which the actors sought to impose their interests. Recently, Mackenbach (2013) underscored the interplay between politics and public health and show how political decisions affect public health. In terms of interpretations, the medical models were geared towards preventive measures (through immunisation, selective and mass screening), surveillance and treatment of diseases before they culminate into terminal stages. Social scientists promoted health education and advocated for healthy lifestyles at the individual level, and sometimes, at the societal levels. Those oriented towards political economy of health drew attentions to the role of the state in providing economic, social and environmental conditions, which promoted or impeded quality health (Baggot, 2000).

Past and present discourses on mortality transition in western countries are usually situated in the contributions of declines in communicable diseases and how they impacted on health transitions. Diseases whose conclusive declines could not be contested include smallpox (the only infectious disease eradicated so far), TB and scarlet fever. Like all other issues that evoke memories of social, economic and medical political interests, discussions pertaining to effective methods for TB control in several developed countries have been diverse.

One influential author whose works have usually served as a point of departure on decline of communicable diseases is Thomas McKeown. After two decades of analysis of British mortality data from around 17th century, McKeown (1976) argued that mortality decline was almost exclusively propelled by nutritional improvements, following improved income arising from the industrial revolution. Szreter (1988) summarises McKeown's thesis as follows:

"A conceptual revolution in the disciplines of history and medicine, overturning a long-standing general orthodoxy regarding the importance of medical science and the medical profession in bringing about the decline in mortality which accompanied industrialisation in Britain. It effectively demonstrated that those advances in the science of medicine which form the basis of current conventional clinical and hospital teaching and practice, in particular the immuno- and chemotherapies, played only a very minor role in accounting for the historic decline in mortality levels" (Szreter, 1988, p. 2).

The basic point he raised concerned the depth of impact of changes in socioeconomic conditions on infectious diseases (fevers, TB, typhoid, dysentery influenza). McKeown and Record (1962) asserted that nutritional advancement accounted for the decline in infectious diseases mortality up to 1935. McKeown, Brown and Record (1972) argued that between 1901 and 1910, mortality in Britain was 3027/1,000,000 and this was basically due to infectious disease. By 1947, total deaths attributable to infectious diseases had declined to 730/1,000,000. McKeown, Brown and Record (1972) therefore concluded that from 1838 onwards, when living standards and diets improved, mortality due to TB declined significantly, an observation that could not be attributed to advancement in medical control measures or decline in bacillus virulence levels. In a 1976 publication, McKeown (1976) contended that:

Any real decline in the incidence of mortality from the airborne (including TB) diseases could only be the result of improvements in the potential victim's resistance to the disease by virtue of an improved nutritional and dietary status, since the chances of initial exposure to the disease could not be affected by public health preventive measures" (McKeown, 1976, p.78).

Studies on the history of TB in other parts of the world have directly or indirectly confirmed the conclusions drawn by McKeown and others. In a study of the history of TB in Japan, Johnston (1995) re-affirmed the nutritional hypothesis thus: "nutrition is one of the most powerful of all socially and environmentally determined influences on the development or retardation of active TB … neither medicine nor public health measures had a significant impact on mortality from the disease until after World War II" (Johnston, 1995, p. 34).

Fairchild and Oppenheimer (1998) partially supported this line of debate, submitting that the surge in TB in some Eastern European countries since the last two decades where economic conditions had worsened were indications that improved socioeconomic indicators were and are important in reducing TB epidemics. Nonetheless, some critics (e.g. Szreter, 1988; Grundy, 2005) have criticised McKeown's thesis, for emphasising nutritional and neglecting the impacts of broad social interventions including nutrition.

Another public health intervention on TB control was the provision of sanatoria, with the first sanatorium established in Germany around the mid-18th century. Bryder (1988) has contended that the process of selecting patients for cure in Britain under the sanatoria system favoured patients whose conditions were at the early stages rather than the chronic "incurables". Bates (1992) has described the philosophy behind the sanatoria as "spartan, austere, and sometimes punitive … prison-like to be hospitals and too hospital-like to be prisons" (p. 72-73). In the view of these authors, the sanatoria approach was ineffective.

In contrast, Fairchild and Oppenheimer (1998) noted that the overriding intention of establishing the various sanatoria was to facilitate the cure of TB through fresh air, exercise, diet, and graduated labour. Given that no therapeutic treatment was available for most part of the existence of TB, isolation of consumptives reduced further infections compared to home-based care.

The third argument is the impact of broad social interventions on TB in the western world. The broad social policies identified include meat inspection and pasteurisation (against bovine TB), housing and industrial regulations (Szreter, 1988). Some scholars have argued that the early stages of the industrial revolution provided a catalyst for the spread of TB due to the poorly ventilated factories people worked in. As noted by Dubos and Dubos (1996), "TB was, in effect, the first penalty that capitalistic society had to pay for the ruthless exploitation of labour" (p. 207). And so, it is alleged that when living conditions of urban labourers improved in industrialised countries, the rate of TB decreased in the first half of the twentieth century (Ho, 2004).

Social actions such as the clear guidelines regulating consumption of cattle products (milk and meat) has also been identified to have shaped the course of TB, specifically, bovine trait. As a way of preventing bovine TB, which had shown some clear associations with human TB, some restrictions were initiated on cattle products such as pasteurisation and meat inspection, which are believed to have had some positive impacts on the fight against bovine TB. In some parts of US where pasteurisation was strictly enforced, the incidence of TB among children was reported to have receded (Myers & Steele, 1969) compared to countries such as Britain, where pasteurisation was not rigorously pursued (Bryder, 1988; Smith, 1989). The Meat Inspection Act of 1906 of the US ensured that all cow carcasses were investigated for bovine TB before consumption and this caused significant declines in TB in humans in US (Fairchild & Oppenheimer, 1998).

The variations in perspectives on factors responsible for the decline of TB with frequent mentioning of nutrition, public health and broad social reforms have been attributed to political and philosophical values of authors (Fairchild & Oppenheimer, 1998). Political influences came through depending on whether authors supported the prevailing system of political governance and the measures that were undertaken to solve social problems. The philosophical dimension rested on researchers support for social medicine, public health or biomedical/clinical science. For instance, McKeown, although a medical doctor by training, was believed to have abandoned clinical practice, following his personal frustrations associated with clinical practice, which made him loose confidence in clinical science (Szreter, 1988). It would appear that the political and philosophical persuasions influenced the questions framed, leading to the various standpoints. What is clear though is that the combination of the various activities contributed in diverse ways to shape TB patterns and levels.

Paradigms in tuberculosis control policies: A global outlook

At the time of the formation of the World Health Organisation in 1948 as an organ of the United Nations (UN), the predominant diseases around the world were mainly infectious and parasitic diseases (Omran, 1971). Among the array of diseases that the newly established body had to contend with was TB, which was subsequently enlisted among priority diseases. Initially, there was some optimism surrounding the possibility of eliminating the disease since feasibility studies had shown that timely administration of combined Bacilli Calmette-Guérin (BCG) and streptomycin, a newly developed anti-TB drug, could improve TB control (Raviglione & Pio, 2002).

As part of the strategy to effectively deal with the disease, a TB Section was created by WHO in 1949 to serve as the anchor for developing and managing BCG vaccination and case management programmes. Case management was considered successful and this was attributed to the discovery of isoniazid, pyrazinamide, and rifampicin (Fox, Ellard & Mitchison, 1999). The next section traces the evolutions of TB control paradigms, drawing extensively on the work of Raviglione and Pio (2002), whose work remains exceptional on this subject.

Vertical programmes (1948-1963)

Between 1948 and 1963, the control of several infectious diseases was bolstered by the discovery of antibiotics, especially after World War II. The first chemotherapy for TB control had been developed four years earlier in 1944. The successes of these control mechanisms provided an impetus for establishing vertical programmes to deal with diseases of public health importance. The specialised or vertical programmes existed separate from the existing mainstream health systems infrastructure because they required experimental treatment strategies, which made specialised services necessary (Raviglione & Pio, 2002). Suspected TB patients were referred to specialised clinics, diagnosed and treated in such facilities. Personnel as well as data management were all situated in the specialised units. The vertical programmes were successful in developed countries, largely due to availability of financial resources and country level political commitment. On the other hand, the vertical programmes were not as successful as the observation in developed countries. This is partly because drugs such as rifampicin and pyrazinamide for the treatment of TB were expensive for such countries and therefore they could not afford the cost of treatment and this accounted for their inability to deal with the disease (Mahler, 1966; Raviglione & Pio, 2002).

Integrated service delivery (1964-1976)

The poor results achieved in developing countries under the vertical programme resulted in paradigm shifts in managerial functions. The shift was largely influenced by results from operational studies that had proven the need to integrate TB programmes into existing public health infrastructure (Raviglione & Pio, 2002).

This phase of TB control involved an integrated service delivery (1964-76) approach. Three categories of integrated healthcare services emerged in this period - functional, physician and clinical integrations (Shortell, Gillies, Anderson, Mitchell, & Morgan (1993; 1996). Functional integration involved support for functions and activities such as financial management, human resources, strategic planning, information management, social marketing and quality improvement. These were coordinated through operating units and the objective was to add the greatest value to the system. Physician integration considered the extent to which physicians could be nested in a common system of shared facilities and services as well as contributing to planning, management and governance. Key relationships included the development of a common medical staff and shared accreditation. Finally, there was clinical integration, which encompassed coordination of care, disease management, and good communication among caregivers, smooth transfer of information and records, improvement in diagnostic procedures. The general idea was to ensure improved services and continuity of care (Shortell, Gillies, Anderson, Mitchell & Morgan, 1993; 1996). Integration involved shared or common policies and practices for each of the health system functions.

The integrated approach was based on studies that had been conducted mostly in India. For instance, studies at the Madras Chemotherapy Centre showed that home delivery of TB treatment was as equally good as hospital treatment (Banerji, 1965). A study by the National TB Institute at Bangalore revealed that bacteriological investigation of patients who reported respiratory symptoms to the generalised health system were potential TB patients. For instance, through this study, annual diagnosis moved from 200 - 300 patients to 1,630 sputum-positive TB cases (Banerji, 1965). Results from these interventions provided some empirical basis for mass integration of TB services into mainstream health services in countries where TB was still endemic. However, TB specialists retained managerial functions regarding logistics, training and supervision, health education, management information system and operational research (Banerji, 1965).

The integrated paradigm suffered some setbacks. While in some countries the transfer of case finding and treatment to the general health service providers was supported by increased funding, in several developing countries, such conducive environments for integrated delivery did not exist (Cauthen, Pio, & ten Dam, 1988). Towards the end of the 1970s, some concerns were raised about challenges inherent in ceding service delivery functions to existing public health stream without adding managerial functions. Following this observation, management integration replaced integrated service delivery, which was facilitated by the then emerging primary health care concept (Shortell et al., 1993).

Management integration (1977-1988)

Management integration occurred between 1977 and 1988. Proponents of managerial integration argued on the basis of the need to avoid duplication of efforts in terms of finance, logistics and human resources. The mainstream health system was considered capable of increasing efficiency of resources. This quest was primarily based on successes achieved in Expanded Programmes on Immunisation, nested within the regular health system (Raviglione & Pio, 2002). However, the integration led to oversimplification of TB issues by general medical and nursing practitioners as well as generalisation of health information systems. This made case detections and monitoring of treatment outcomes practically impossible. Similarly, academic and research interest on TB reduced and some publications devoted to TB ceased. For instance, the WHO's special series on TB closed down (Raviglione & Pio, 2002). The International Union Against TB and Lung Diseases (IUATLD) journal on TB was expanded to include lung diseases, as papers on TB alone could not fill the pages of the journal (Shiffman, Beer & Wu, 2002). In some medical schools, TB was virtually removed from curriculums and funding for research by pharmaceutical companies faded (Holmes, 1998). Public administration reforms (including health) undertaken in the late 1980s excluded experts in the health system reforms (Berman, 1995). Although the integration approach was reasonable in theory, in the case of TB, it pushed workable programmes into oblivion (Raviglione & Pio, 2002).

The loss of interest in the control efforts was so obvious that by 1989, there were only two experts on TB at the WHO headquarters (Ogden, Lush & Walt, 2003). At the WHO regional offices too, activities on TB were considered one of the general responsibilities of epidemiologists and their budgets could barely fund control activities. Margaret Thatcher disbanded the British Medical Research Council on TB Unit in 1986, which had negative impacts on TB policy formulation (Holmes, 1998; Raviglione & Pio, 2002; Ogden, Lush & Walt, 2003).

Specialised management (1989-1998)

Around 1989, TB could no longer be ignored. A need for specialised management (1989-1998) era emerged. This strategy was partly influenced by studies on the duration of treatment in Tanzania and Malawi, which suggested the possibility of achieving eighty per cent cure rate of the TB given effective case management (Styblo, 1989). The studies also influenced the six-month duration instead of the prevailing eighteen months duration for directly observed therapy short course (DOTS) (Styblo, 1989). This paradigm focused on improving cure rates through short-course chemotherapy, regular supply of drugs, comprehensive supervision of treatment, and meticulous cohort analysis (Kochi, 2001).

To improve the management of TB, the 1991 World Health Assembly, set targets of case detection rate of 70 per cent and treatment success of 80 per cent were set as targets by 2000 (WHO, 1991). These targets were situated within the DOTS strategy (WHO, 1994). Between 1991 and 1999, approximately 127 countries had opted for DOTS as the main programme to controlling TB (WHO, 2001). The specialised managerial concept, however, maintained case management within the primary health care concept (Raviglione & Pio, 2002).

Renewed integrated approach (1999-2000)

In 1999 - 2000, there was a structural organisation in the WHO, known as the resurgence of integrated approaches (Raviglione & Pio, 2002). This new strategy was characterised by the combination of managerial responsibilities of WHO's separate control programmes. With this, subunits working on TB were organised around surveillance, prevention and control, and research and development. The focus was the establishment of one body to deal with TB (Raviglione & Pio, 2002). Under the new approach, a new department known as the Stop TB was created. The general view was that "wider implementation of DOTS was through a clearly defined managerial approach and a more visible structure" (Raviglione and Pio, 2002, p. 779). Two related threats to TB were addressed during the re-alignment: dealing promptly with co-infections of HIV and TB and the spread of multi-drug resistant TB (MDR-TB). Efforts were also made to deal with emerging unhealthy competition between HIV/AIDS and TB programmers for funding. Reciprocal beneficial relationship between HIV and TB were emphasised in programmes, for instance, by pointing out that highly active antiretroviral treatment (HAART) improves immune-competence and this, in turn, reduces chances of activating latent TB among people with HIV/AIDS (WHO Global TB Programme & United Nations AIDS Programme, 1998).

Postmodern tuberculosis control (2001-present)

The final era, described as post-modern TB control, started with the creation of partnerships portraying TB as part of health systems, an aspect of human rights and poverty reduction strategies. Under this approach, activities pursued included providing technical, financial and human resources to countries depending on their epidemic level (Raviglione & Pio, 2002). One lesson that emerged from all the approaches - vertical, specialised, integrated (service delivery and management), and specialised management was that the paradigms were/are not mutually exclusive. Whereas some aspects of a disease control may require a specialised approach, other components would need an integrated system to achieve intended benefits. The recognition of the inter-relatedness of the approaches could have partly influenced the development of the DOTS strategy.

The Stop Tuberculosis Partnership strategies

DOTS was launched globally in 1994, a year after declaring TB a public health emergency. Subsequently, DOTS became the nerve centre for the entire TB prevention strategy and was later branded as ‘Stop TB Strategy’ (hereafter referred to as the “Strategy”). The strategy essentially advocated for multi-sectoral approach to deal with TB. In the preface to the strategy’s manual, it was stated that:

“The steps that national TB control programmes and their partners need to take, assisted by all stakeholders ... is based on both experience gained over the past decade and on continuing consultations with stakeholders at the global, regional, national and local levels” (WHO, 2006, p.3).

At the core of the strategy was that the control of diseases needs to proceed at the endemic, epidemic or pandemic levels and this usually required comprehensive, sustainable and multifaceted approach to address the environmental, social and economic factors that expose people to infection. To implement the strategy, six broad interventions were identified, namely expanded and enhanced high quality DOTS, addressing TB, MDR-TB and the needs of poor and vulnerable populations, health system strengthening, engagement of all service providers, empowering people and communities living with TB and research and development towards programmes, diagnosis, and drug and vaccines development.

Expanded and enhanced high-quality directly observed treatment short-course

At the core of the efforts at controlling TB is DOTS, which serves as the fountain from which the remaining five strategies spring. This sub-strategy involves five subs-themes: political commitment, case detection, standard treatment, reliability in drug supplies and management and monitoring, evaluation and impact assessment.

Political commitment

The role of political commitment in the presence of epidemics has always been an issue of concern in public health (Coker et al., 2007). Orosz (2000) has, for instance, argued that political commitment is even more critical under public policy landscape than expert knowledge of public health professionals. Although this proposition might be considered extreme, the fact that the present strategic framework for TB control highlights political commitment as the first factor in pursuing high quality DOTS underscores the importance of political commitment.

The POLICY Project (2000) defined political commitment in disease control as “decision of leaders to use their power, influence, and personal involvement to ensure that ... programs receive the visibility, leadership, resources, and on-going political support that is required to support effective action to limit the spread of, and mitigate the impacts of the epidemic” (p.4). Shrestha (2005) also defined political commitment in disease control as decisions taking by leaders at the highest political governance, either within or outside government to combat existing, re-emerging or new diseases. The political commitment needed for TB control is not, however, limited to national governments: it includes the role of civil society and health activists recognising that TB epidemic is also a developmental crisis. Political commitment for TB control may be expressed through the formulation of policies and laws for public health and promotion of human rights, human and financial resources allocation, strengthening and provision of public health infrastructure and civil society participation (Shrestha, 2005; Coker et al., 2007).

Provision of policies and laws are relevant for TB control. Gostin (2000) has argued that protecting public health is one of the critical functions of governments. In 2001, WHO indicated that one of the crucial expressions of political will is to have in place an up-to-date legislation on communicable disease control and, on the basis of that legislation, to adopt regulations which apply the principles and provisions of that legislation to TB control (WHO, 2001).

According to Coker (2003), legislations and laws for TB control could be expressed in compulsory examination, compulsory screening, compulsory detention, compulsory treatment and compulsory vaccination as well as mandatory free treatment for TB patients. But while these legislations are relevant, appropriate balance has to be struck between protection of public health and human rights (Pinet, 2001).

The provision of financial and human resources are also relevant for TB control. Availability of financial resources is a key element of political commitment and this can reflect at three levels: micro, macro and supra. At the micro level, the challenge has to do frequently with financial barriers to patients' accessing treatment facilities or opportunities. In Haiti for instance, Farmer (1997) found that inadequate health infrastructure coupled with poorly developed transportation infrastructure hindered some TB patients from accessing treatment. At the country level, some studies (example, Sterling, 2006) have found that inadequate infrastructure and poor financing is partly responsible for the emergence of MDR-TB in New York. The willingness of political office holders, whether at the country or sub-national levels in making needed funds as well as infrastructural and human resources available for TB control may provide insights into their commitment towards TB control (Needham, Godfrey-Faussett & Foster, 1998; Rajeswari et al., 1999; Wyss, Kilima & Lorenz, 2001; WHO, 2009a).

Currently, the Global Fund to Fight AIDS, TB and Malaria (GFATM), with the political support from the United Nations (UN) has provided funding for HIV, TB and Malaria since its inception. As of 2009, the estimated global funding gap was half a billion dollars (WHO, 2009b). However, in certain countries, especially in resource poor countries, it appears that the GFATM funding has replaced funding for TB in those countries, leading to financial stress on local National TB Control Programmes (Atun, Weil, Eang, & Mwakyusa, 2010). This defeats the intentions of GFATM as it is meant to be supplementary. The inability of countries to provide counterpart funding is a clear manifestation of weak political commitment.

Case detection

Another strategy under the pursuance of high quality DOTS is the acceleration of case detection through quality assured bacteriology. Case detection and treatment scale-up have been recommended as two relevant areas to hasten TB impacts assessment in terms of incidence, prevalence and deaths. Low rates of case detection are considered dominant challenges to TB control. Prolonged delay among patients to seek treatment may lead to more advanced disease, high mortality, and enhance continual transmission in communities. Diagnostic delays longer than two months are considered long enough to spread the disease through domestic contacts (Riley & Moodie, 1974).

In line with this, WHO (2009c) recommended the following interventions: national standards comparable to international guidelines, decentralisation of diagnostic services, effective communication at various levels of health systems, and functioning internal and external quality management and supervision. With the discovery of MDR-TB and XDR-TB, the move is to encourage establishment of national reference laboratories since most public and private health institutions may not have the capacity to do so (WHO, 2009c).

At the end of 2012, the total global case detection was estimated to be around 5.8 million, comprising new and relapsed cases and the majority of these cases were detected NTPs (WHO, 2012a). However, there is the belief that a lot more cases go undetected, particularly in Africa. This challenge is exacerbated by the intricacies involved in calculating case detection rates because of lack of incidence data (Dye, Watt, Bleed, Hosseini & Raviglione, 2005). Secondly, quality-assured bacteriology suggested by WHO, which is deemed appropriate to identify cases, is unreliable in some developing countries. Case detections in many resource-poor countries (especially in Africa) are mainly through passive surveillance, which is not very reliable (Ngadaya, Mfinanga, Wandwalo & Morkve, 2009).

In Ghana, a diagnostic delay study among 100 newly detected TB cases observed average delays of four months (Lawn, Afful & Acheampong, 1998). In countries such as Taiwan, the average waiting time was seven to eight days (Lin, Deng & Chou, 2009) while 30 or more days' delays have been reported from Nigeria and Ethiopia (Demissie, Lindtjorn & Berhane, 2002; Odusanya & Babafemi, 2004; Fatiregun & Ejeckam, 2010). Variations in patient motivation, quality of laboratory services and the general health service coverage are some of the factors influencing the patterns of case detection (WHO, 2012a).

Besides the regional variation in case detections, there are variations by sex. For instance, the male:female ratio of TB diagnosis 2011 was 1.7 (range 1.1-2.2) globally. The reasons for this male-female disparity in infection are unclear. However, factors such as smoking among males may account for higher progression from latent infection to active disease (WHO, 2009c; 2012a).

Standardised treatment

Erratic or inconsistent treatment regimens contribute to emergence of MDR-TB and extra drug resistant TB (XDR-TB). Standardised treatment is minimum level of care that all practitioners, public and private, are expected to provide for all patients who have or are suspected to have TB (Hopewell, Pai, Maher, Uplekar & Raviglione, 2006). Standardised treatment also embraces regimens with first-line drugs (isoniazid, rifampicin, pyrazinamide, and streptomycin or ethambutol or both) under direct observation, at least in the intensive treatment phase, regardless of patient drug-susceptibility pattern (WHO & World TB Programme, 1997). As a result, availability of treatment drugs, supervision and patient support and improved access to TB treatment are necessary to improve standardised treatment (WHO, 2006).

The reasons for standardisation in treatment is that effective and routine standardised short-course therapy with a fixed-dose drug combinations (FDCs) can improve cure rates and consequently result in curtailing evolution of more drug resistance TB traits (WHO, 2006). Although there is no evidence that fixed-dose combinations (FDCs) are superior to individual drugs, expert opinion suggests that they may minimize inadvertent monotherapy and decrease the frequency of acquired drug resistance and medication errors (WHO, 2003b; American Thoracic Society et al., 2003). FDCs also reduce the number of tablets to be consumed, which has the potential of increasing patient adherence to recommended treatment regimens (Blomberg, Spinaci, Fourie & Laing, 2001; Panchagnula et al., 2004).

The DOT concept emerged from the need to directly observe TB patients ingesting drugs, either at home or health facility or the workplace, especially, during the intensive phase of the disease (Meulemans, Mortelmans, Liefooghe, Mertens, Zaidi et al., 2002). Studies have shown that TB patients who are supervised have increased odds of completing the full course of anti-TB therapies (Cramm, van Exel, Møller & Finkenflügel, 2010).

As part of maintaining standardised treatment, direct observation of patients has to be backed by standard support and care from health workers, family and the community, which are considered generous motivation for adherence. A case study of Chinese migrants in New York and their compliance to treatment regimens showed that care and attention provided by kin members improved adherence. This was made possible since patients were relieved of their other social responsibilities (Ho, 2004). The use of nurses for follow-up to ensure adherence to treatment has shown promise in Russia (Borowitz et al., 2008). However, some authors have argued that the procedure provides some grounds for stigmatisation because community members easily identify TB patients (Borowitz et al., 2008). Some innovative support services presently being used include text messaging which serve as reminders to patients to take their drug regimens (Barclay, 2009).

Support to TB patients at the governmental level is another necessary indicator for assessing standardised treatment. In a South African study that compares non-adherents and adherers to TB treatment, governmental support such as provision of enablers' package to health workers, patients and their care givers was found to be key determinants of compliance, especially among physically challenged persons (Cramm et al., 2010). However, factors responsible for non-compliance comprised stigmatisation, which was more profound, the burden of disease, the arrangements involved with receiving treatment, restrictions accompanying treatment, and the relationship between TB and HIV/AIDS (Cramm et al., 2010).

Reliable drug supply

Enhancement of DOTS is the need for effective drug supply and management chains. Chemotherapy has had strong impacts on TB control. For this to be implemented, there is the need for reliable supply of drugs, which is an uninterrupted and sustained supply of quality-assured anti-TB through a reliable system of procurement and distribution of all essential anti-TB drugs to all relevant health facilities. To achieve this, there should be in place a system of recording and reporting on drugs, which is needed to plan, procure, distribute and maintain adequate stocks of drugs. Again, reliable drug supplies means that anti-TB drugs should be available free of charge to all TB patients, both because many patients are poor and may find them difficult to afford, and because treatment has benefits that extend to society as a whole (cure prevents transmission to others). Legislations on drug regulation as monitoring of use of anti-TB drugs by all providers are embodied in reliable drug supply (WHO, 2006).

The establishment of Global Drug Facility (GDF) in 2001 (WHO, 2005) and the Green Light Committee (GLC) in 2009 were intended to ensure effective drug supplies in both developed and developing countries. The Global Drug Facility was established in 2001 to address problems related to financing and regular procurement of quality-assured drugs and diagnostics for TB, and thereby help the expansion of DOTS (Kumaresan, Smith, Arnold & Evans, 2004). The Global Drug Facility operates a direct procurement system to achieve competitive prices for anti-TB drugs that meet the WHO's stringent standards, and provides in-country assistance on supply chain management. Similarly, the Green Light Committee contributes to improving access to high-quality second-line anti- TB drugs for MDR TB at reduced prices, and assist countries in programmatic management of MDR TB (WHO, 2009d). Atun et al's (2010) assessment of the GDF and GLC have showed that in Tanzania and Bangladesh, where the two establishments have been involved in drug procurements, the reliability of drug supplies have improved.

Tuberculosis/HIV, multi-drug resistance, and the needs of poor and vulnerable populations

The positive relationship between HIV and TB has been widely acknowledged (Dlodlo, Fujiwara & Enarson, 2005). Among the reported opportunistic infections associated with HIV/AIDS, TB is the most common. It accounts for about 25 per cent of deaths among people living with HIV/AIDS (WHO, 2009c), and also manifestation of HIV (Wallis et al., 1996). The evidence available indicates that treatment outcomes in HIV/AIDS patients with smear-negative pulmonary TB are more deleterious than a combination of HIV with smear-positive pulmonary TB. This is because among smear-negative patients, the TB bacilli cannot be detected in sputum of patients though the bacterium may exist in the patient (WHO, 2002). Empirical analysis of surveillance data between 1995 and 2002 shows that in high HIV prevalence African countries, incidence of TB increased averagely by eight times with HIV/AIDS (Dlodlo, Fujiwara & Enarson, 2005).

Clinically, the manifestations of TB/HIV co-infection differ with the extent of immune suppression. At the onset of TB, the immune system can be suppressed and manifest symptoms akin to HIV even when such patients are not co-infected with TB. For this purpose, concurrent TB and HIV testing is recommended to facilitate early detection and treatment of the two diseases (Dlodlo et al., 2005). The intention is to ensure that TB patients are detected appropriately without being mistaken for HIV.

The available evidence suggested that the global caseload of TB had not declined as expected and therefore the targets of achieving treatment completion rate of 80 per cent and case detection of 70 per cent between 2000 and 2005 respectively were deferred to 2015 (Dlodlo et al., 2005; WHO, 2006). It is expected that NTPs around the world would establish effective and efficient working interface between TB and HIV control programmes. Harries et al. (2010) contended that for the past thirty years, the world has been at a watershed with dual epidemic of TB and HIV, describing the transition towards integration as "half-hearted and ineffectual". The needs of prisoners, refuges and high-risk groups are also considered.

The burden of TB in some parts of the world seems unending anytime soon and the major reason accounting for this setback is the prevalence of HIV/AIDS. Again there is also the perception that responses to the surge have not been well coordinated, "timid and slow" (Harries et al., 2010).

Multi-drug resistant tuberculosis

The first global surveillance of MDR-TB (1994) took place in 1994 and that of XDR-TB in 2004 (WHO, 2010a). WHO (2010b) showed that, of the estimated 390,000-510,000 cases of MDR-TB identified globally, 3.6 per cent (95% CI=3.0-4.4) died. Clinical and demographic factors that account for MDR cases are prior exposure to TB drugs and incomplete treatment and HIV/AIDS (WHO, 2010a).

It has been reported that previous exposures to TB drugs are relevant risk factors. The prior exposure group is heterogeneous, and involves relapse (re-occurring TB after successful treatment), failed first- or second-line treatment drugs or more regimens and treatment default (World Health Organisation/International Union against TB and Lung Disease (IUATLD), 2008). Some country-level surveys have found evidence to support these claims: of the 17 countries that had conducted national surveys on MDR-TB in 2008, ten countries reported at least one case of MDR strain in new and relapsed cases. Out of these, the proportion of MDR among new cases was 1.5 per cent (95% CI: 0.5-2.6) compared to 7.9 per cent (95% CI 2.9-12.9) among relapsed cases. In all the survey sites, the odds of diagnosing an MDR-TB among relapse patients were 5.5 (95% CI: 4.4-6.8) times (WHO, 2010b).

The relationship between multi-drug resistant TB and HIV/AIDS is also not fully established. At country levels, some correlations have been reported between HIV and MDR-TB. Out of the 11 countries with continuous surveillance of MDR, eight found drug resistances among both HIV-positive and negative patients.

Previous studies by WHO/IUATLD (2008) reported high risks of MDR-TB in HIV-positive patients in Latvia, Estonia and the Republic of Moldova. Another study in Mozambique has also confirmed the link between MDR and HIV (Gudo et al., 2011). Based on the evidence, it could be hypothesised that countries with low rates of HIV can be predicted to have lower incidence rates of MDR-TB.

To deal with challenges posed by drug resistant TB, an integrated approach has been advocated, including ambulatory services in case management, national level surveys, motivated and improved TB control efforts (WHO, 2006). In Peru for instance, the use of ambulatory or community-based MDR-TB treatment routines have had positive impacts on MDR treatment (Mitnick et al., 2008; Shin et al., 2004; Matnick et al., 2008). Similar evidence has been reported from Nepal (Malla et al., 2009).

Social, economic and political factors can subject certain categories of populations to higher risks of being infected and infecting other people with TB in varied forms (MDR and XDR). Evidence from countries that report TB trends and patterns to the WHO showed that, in approximately 95 per cent of countries, the burden of ordinary TB was disproportionately higher in males than females (WHO, 2010b). However, evidence on MDR-TB disaggregated by sex showed unclear or weak differences between males and females in prevalence of MDR. For instance, from pooled data from 38 countries on MDR-TB barely suggests relationships (OR=1.1: 95% CI: 0.9-1.4) by sex. Nonetheless, for South Africa, the odds were 1.2 times higher in females than males among 81,794 patients (WHO, 2010b).

In the literature, age, sex, prison populations and overcrowding have been observed. Prisoners and refugees have emerged as one of the most vulnerable populations due to poor housing and nutrition (Borgdorff, Floyd & Broekmans, 2002). Equally, nosocomial (hospital-based infections) and congregate settings are known to be predisposing environments that can fuel the spread of bacteria resistant to first-line and second-line drugs (WHO 2009e).

The current observation of high infection among prisoners is similar to earlier formal surveillance of TB, particularly during and after World War II. Cochrane (1945), a physician attached to prisons in Germany during World War II, detected high incidence of TB among prisoners and reported a quickened rate of re-infection and activation of latent infection in in-mates. This was because the prison environment provided classic case of overcrowded setting. Malnutrition, homelessness, inability to access community-based health care, poor ventilation and over-crowding promote transmission of TB in prisons (MacNeil, Lobato & Moore, 2005; Dara, Grzemska, Kimerling, Reyes & Zagorskiy, 2009). The effective combination of these varying factors coupled with late diagnosis and poor treatment have, in some cases, resulted in epidemic of infectious diseases, including multi-drug resistant TB (Onorato, 2003; Sosa, Lobato, Condren, Williams & Hadler, 2008).

March et al. (2000) have noted that prisoners constitute a disproportionate population with social and clinical risk factors for infection and development of active disease, such as TB and HIV infection. It is believed that TB is the major health problem in African prisons (Banda, Guasi, Harries & Salniponi, 2009) and prevalence studies in some African countries have reported between 4-6 per cent prevalence in Zambia, Malawi and Ivory Coast (Nyangulu et al., 1997; Koffi et al., 1997; Habeenzu, et al., 2007). Total infectivity of TB among prison inmates is estimated at 67 per cent plus and about one-third resistance to isoniazid drug. Treatment completion rate is also poor (Anderson, Story, Brown, Drobniewski & Abubaka, 2010).

Estimates show that about 10,000 million people are imprisoned annually, with the highest burden of disease being mental and infectious diseases. Although information on the contribution of prisoners to ill health presently remains limited, what is clear is that prisoners experience poor treatment, care and support, resulting in adverse health outcomes (Gignon, 2011).

Several studies (Lienhardt, Fielding, Sillah et al., 2005; Myers et al., 2006; Wanyeki et al., 2006) have explored the link between TB infection and crowding, particularly at the household level, and have evidence to support the correlation between overcrowding in households and TB infection.

The upsurge in armed conflicts in African countries over the last two decades exacerbated the phenomenon of refuges across sub-Saharan Africa and contributes to fuelling the spread of TB among marginal populations (Baker et al., 2007). Nevertheless, the long latency period (occasionally, decades) that are sometimes associated with TB makes linking current rates to prevailing environmental circumstances difficult.

Population movement also accounts for substantial proportion of distribution of infectious diseases and there are historical evidences that support this phenomenon. For instance, Martens and Hall (2000) and Mangili and Gendreau (2005) have shown how international movement fuelled malaria and Severe Acute Respiratory Syndrome (SARS) transmission. Forced migrants could be high-risk group since studies have shown that the abrupt changes in living circumstances and unregulated movement along formal-informal routes can contribute to transmission of diseases and being infected with diseases (Shears, 1984; Porter & Kessler, 1995).

The International Organisation for Migration (IOM) (2004) has estimated that about 700 million people influence public health globally, particularly in the area of infectious diseases. In US, Hadzibegovic, Maloney, Cookson and Oladele (2005) have shown that refugees are about seven times higher, in contrast to foreign-born people in contracting TB.

The evidence thus far points to a dire need to respond to special populations such as refugees and prisoners as well as conflict situations. TB services need to proceed in a dynamic and more inclusive orientation. Responding to the needs of special and marginal populations can be expected to move control efforts beyond rhetoric, given that marginalised and special populations often possess minimal political, economic and social power and may not be in a position to mobilise mass action to receive attention of health policy makers. In that way, TB control becomes an index of social justice, apart from being a public health good.

Health systems and tuberculosis control

Health reforms have occurred around the world, especially towards the end of the 1980s, and African countries have followed the bandwagon in most cases. The intentions of these reforms were to achieve improved access, equity and efficiency in access to health services (Cassels, 1995; Weil, 2000). Some authors have, however, hinted that the reforms have not favoured TB control (Frieden & Driver, 2003; Khaleghian, 2004).

Strengthened health system at all levels of the health continuum is considered a fundamental ingredient for achieving all the health-related MDGs (WHO, 2010a). In the 2000 World Health Report, health system was defined as "all organisations, people and actions whose primary intent is to promote, restore or maintain health" (WHO, 2000, p.5). Health system strengthening embraces attempts at resolving both proximal and distal determinants of health (WHO, 2000); capacity development that is founded on equitable and sustainable improvement and all forming integral parts of health system strengthening (WHO, 2005c).

Some reforms such as the introduction of cost sharing throughout the health systems affected TB control programmes (Atun et al., 2010). Countries such as Kenya (Hanson & Kibuga, 2000), and Nepal (Newell et al., 2005) did not gain much from health reforms due to structural weaknesses in those health systems (Atun et al., 2010). On the other hand, in some countries such as South Africa (Wilkinson, 1999) and Cambodia (Hill & Tan Eang, 2007) have recorded positive benefits from such reforms because of strong political commitment.

According to Atun et al. (2010), because of the "unrestrained" calls for reforms in several developing countries without due consideration of prevailing contextual factors, programmes in such countries encountered operational difficulties, probably as a result of overgeneralised health system.

Following these experiences, the WHO established clear instructions on strengthening health systems for TB control. These included Practical Approach to Lung Health (PAL) and adapting workable innovations from other public health fields (for example, child immunisation) as well as building and strengthening new public health structures without compromising on the core services of public health (WHO, 2003a).

Practical approach to lung health

Practical approach to lung health is an encompassing way of treating all lung diseases as potential TB cases. This is intended to ensure that wrong diagnosis of respiratory diseases are minimised (WHO, 2006). In assessing the viability of PAL, Ottmani (2005) concluded that PAL was a feasible means of reducing avoidable cost associated with wrongful diagnosis of respiratory diseases as well as a reduction in the odds of "inviting" new resistances to anti-TB drugs. Shrestha et al. (2006) have provided evidence to suggest that PAL promoted reasonable use of drugs by reducing multiple but improved prescriptions of essential medicine. For instance, in Algeria, the adoption of PAL technique by general practitioners resulted in advancement of identification of respiratory disorders and TB, fewer secondary investigations, reduction in travel cost and time and overall increase in the competence of medical practice by lowering treatment cost (Zidouni, Baough, Laid, Chaulet & 2009).

Engagement of service providers for tuberculosis control

Access to and utilisation of health services are underpinned by economic, social, cultural and physical/geographical settings. These lead to inclusive mechanisms in dealing with diseases such as TB.

This inclusiveness has been found useful in South Africa, where traditional healers have become integral stakeholders in identifying TB cases (Peltzer et al., 2006). Similarly, studies show that private providers of TB services play important roles in reaching populations that would usually not be noticed by the mainstream public health system (Bangladesh Ministry of

Health and Family Welfare, 2006). To engage all health service providers, the two key components are the involvement of the private sector and application of International Standards for TB Care (ISTC)

Public-private partnership

There is currently a strong interest for involving the private sector in TB control. This has come at the back of challenges faced by the traditional public health system in identifying all potential cases. It is estimated that a proportion of TB cases go unnoticed (Lönnroth, Aung, Maung, Kluge & Uplekar, 2007; Pantoja et al., 2009; Nathanson et al., 2010; Khan et al., 2012).

Public-private partnerships are being increasingly encouraged as part of the comprehensive development framework and partly due to the observation that the public sector is unable to provide public goods entirely on their own in an efficient, effective and equitable manner because of lack of resources and management issues. These considerations have necessitated the development of different interface arrangements which involve bringing together organisations that have the mandate to offer public good on the one hand, and those that could facilitate this goal, on the other hand (Ritcher, 2004).

The relevance of partnerships to current development paradigm has led to a burgeoning of definitions of the concept, which are often anchored around objectives, responsibilities and gains that are to accrue from such partnerships (Buse & Walt, 2000). According to Nelson (2002), “partnership is a voluntary and collaborative agreement between one or more parts of the state system and non-state actors, in which all participants agree to work together to achieve a common purpose or undertake a specific task and to share risks, responsibilities, resources, competencies and benefits" (p. 47). Buse and Walt (2000) define public-private partnership in health as a "collaborative relationship, which transcends national boundaries and brings together at least three parties, among them a corporation (and/or industry association) and an intergovernmental organization, so as to achieve a shared health-creating goal on the basis of a mutually agreed division of labour" (p. 550). The import of partnership is centred on mutual agreement, reflecting mutual responsibilities in furtherance of shared interests (Organisation for Economic Co-operation and Development (OECD), 1996).

Buse and Harmer (2007) also conceptualised PPP as "institutionalised initiatives which are established to address global health problems where public and for-profit private sector organisations have a voice in collective decision-making" (p. 259). Kickbusch and Quick (1998) also conceptualised partnership as a means of bringing together a set of actors for the common goal of improving mutually agreed roles and principles. Inferring from this conceptualization, the realization of partnership goals could be assumed to be dependent on the kind of agreement and the balance of power between parties to an agreement to the extent that each partner retains their personal or organisational core values and identities. At any particular point, partners may bring on board varying depths of knowledge, expertise and finances. Roles of partners are not also stable: just like all other social constructs, they may be subjected to incrementalism and disequilibrium (Buse & Walt, 2000).

In this study, public-private partnership for TB control is viewed as any form of arrangement between the NTP (a public institution) and private health care providers, including laboratories, clinics, and hospitals as well as folk/traditional and faith-based healers with the aim of improving the detection and treatment of TB.

A number of studies have catalogued both the positive and negative aspects of PPP for TB control (Khan et al., 2012). On the positive side, a study by TB Alliance (2007) in India, China, Brazil, Philippines and South Africa showed that first-line anti-TB and equally higher proportion of second-line treatment drugs were found to be more prevalent in private facilities than the state-owned health facilities. Another study also showed that private providers were the first point of call by TB patients seeking care, noting that more than 70 per cent of TB patients sought their first care from private service providers (Pantoja et al., 2009). A review of intervention projects on influences of PPP on TB control in India confirmed increased case notifications in five of fourteen sites that had time-series data. Of twelve sites with data on treatment outcomes too, nine of the sites exceeded the 85 per cent treatment success rate target through the PPP approach (Dewan et al., 2006). Another study in Pakistan also confirmed the effectiveness of approximately 10 per cent increase in case detection rate (CDR) in an intervention research (Ahmed et al., 2009). Uplekar, Pathania and Raviglione (2001), for example, argued that NTPs that omit private care providers from the DOTS strategy are unlikely to succeed in case detection, timely and proper diagnosis, treatment outcomes and cost reduction.

Nonetheless, there are other studies, which have expressed uncertainties surrounding the significance of the PPP strategy in TB control. For example, Probandari, Lindholm, Stenlund, Utarini and Hurtig (2010) found that some private facilities provided under-standardised DOTS services to patients.

Another study conducted in Mumbai, India, revealed that, after two decades of the PPP approach, little benefits exist to make a strong case for its mass adoption in the fight against TB, a situation which also due to unstandardized DOTS administration (Udwadia, Pinto & Uplekar, 2010).

Given the variations in cultural, economic and political settings within which such interventions evolve, such mixed results are expected. However, such occurrences cannot be solely attributed to the PPP model. There could be possible internal practices that are inappropriate in some of the private clinics offering diagnosis and treatment. Equally, supervision, normally provided by the state may be abysmal. In order to make PPP responsive, Lönnroth et al. (2004) suggest re-orientation of private providers and staff of NTPs, improving referral and information system through simple practical tools, adequate supervision and monitoring of private providers by NTPs and extension of free anti-TB services in private facilities.

International standards for tuberculosis care

Another component of engagement of service providers is the alignment of DOTS to International Standards for TB Care (ISTC), which is expected to complement PPP. The ISTC was premised on the need to have a generally agreed upon set of standards, describing the essential actions that should be taken by all practitioners in providing TB services, irrespective of where the service is being provided, whether in the public or private setting (Hopewell et al., 2006). The ISTC blends diagnosis, treatment and public health standards. There are seventeen standards internationally accepted for TB control (see Hopewell et al., 2006). Three of these standards are highlighted, since they are particularly relevant to this study. First, standardised diagnosis is considered an imperative since it encourages prompt evaluation of patients with productive cough for two-three weeks for TB. A WHO (2004b) survey of nine low and middle-income countries found approximately 5 per cent of respondents who have coughed for more than two weeks to be TB patients.

The standardised treatment concept again encourages treating TB patients with and without HIV/AIDS with internationally acceptable first-line drugs who present for treatment for the first time (Hopewell et al., 2006). Experiments have further shown that regimens containing rifampicin is a robust antidote to drug susceptible M. TB and that the standard duration for this treatment is six months (Enarson, Rieder, Arnadottir & Trebucq, 2000; American Thoracic Society, CDC, & Infectious Diseases Society of America, 2003; WHO, 2003b). Results from other investigations indicate that treatment durations less than six months are associated with increased relapse (Gelband, 2000; Santha, 2004).

Finally, continuous and close contacts with infected people are known to speed-up the likelihood of infection. At treatment centres and household settings, the evidence support isolating uninfected children and PWLA from people with infectious TB. In a systematic review of forty studies on close contacts and future infections, Morrison, Pai and Hopewell (2005) found an average of 6 per cent (95% CI=0.5%-29%) active TB among contacts. Reporting all new and recurrent cases and their treatment outcomes to appropriate primary health care outlets are the internationally acceptable public health practice (Hopewell et al., 2006).

Empowerment of people and communities living with tuberculosis

People infected with TB and their communities are categorised among vulnerable populations. TB exerts emotional, physical and economic challenges, which require power-to (decision-making), power-with (organising themselves), power-within (self confidence, awareness and assertiveness) and power-over (control) in over-coming the disease burden (Oxaal & Baden, 1997). Empowering TB patients revolves around enabling patients take increased responsibility of their health, more especially adherence to treatment, organising TB patients into groups and clubs, development of more patient-centred TB services and using TB patients advocacy skills to improve TB control (Macq, Torfos & Getahun, 2007). To enhance the empowerment of people and communities living with TB, advocacy, communication and social mobilisation, and community participation in TB care have been advanced to support TB control (WHO, 2006).

Advocacy, communication and social mobilisation

Public health advocacy is often defined as the process of gaining commitment for a particular goal or programme (Chapman, 2001; 2004). Target audiences tend to be decision-makers, policy-makers, programme managers, and more generally, those that are in a position to influence actions that affect many people simultaneously (Wallack, 2000). Public health advocacy strategies espouse an upstream approach, recognising that ‘individual’ and ‘personal’ problems can be situated in community contexts. This approach involves situating ‘individual’ health issues within the broader context of social determinants external to individuals. It also recognises the societal breadth of many public health problems, and the logistics and resource challenges inherent in approaching these challenges at the individual level (McKinlay & Marceau, 2000). Using innovative advocacy techniques to improve diagnosis of private facilities in India, Krishnan et al. (2009) found significant ($p < 0.001$) improvement in the proportion adopting DOTS. The proportion of private facilities that used X-ray alone for diagnosis declined to 16 per cent from a baseline of 45.4 per cent while those using sputum increased to 72.8 per cent.

Communication is a two-way effort between service providers and people with TB and their communities with information on prevention, policies, programmes and services. Social mobilisation is a course of gathering all acceptable and applicable multilevel agencies to increase awareness of, and demand for advanced TB care. Social mobilisation in TB control promotes availability of resources and build-up strategies that preserves community participation (WHO, 2006).

Community participation in tuberculosis care

Related to social mobilisation is community participation. This concept of community participation in health gained prominence in 1978 during the World Health Assembly where the "Health for All by the Year 2000" agenda was promulgated. Within this framework, it was postulated that health services would be based on communal involvement in planning and delivery of interventions. Community participation seeks to make services accessible, tailored to local needs, cost-effective, characterised by inter-sectoral co-operation and functionally coherent (WHO, 2006). For instance, community participation has proven effective and there is evidence from Community Health and Planning Services (CHPS) intervention to support large-scale implementation (see, Pence, Nyarko, Phillips & Debpuur, 2007).

Results of intervention studies examining effectiveness of community participation have shown some promising results. A pilot study in the Eastern Cape Province in South Africa (Achoki, Shilumani & Beke, 2009) reported more than two-fold increase in case reporting, from 145 cases in 2004 to 318 notifications in 2005 after the introduction of community participation. This has resulted in what is now known as community TB care, where opinion leaders and family members are utilised as treatment supporters to play the role of observers for home-based management of TB, as outlined in the DOTS concept. Community participation is therefore a model of shared responsibility in public health (Adatu et al., 2003).

Community treatment and care, apart from helping to increase detection and treatment success, holds assurance for cost reduction in case management to the patient, care givers and health facilities. In rural Uganda, Adatu et al. (2003) found significant cuts in cost of treatment of smear-positive cases between 1998 and 1999: among patients treated in health facilities, the cost of treatment was US$ 510 (US$419 for the health system and US$91 for the patient). For those treated under home-based care (community), the equivalent cost was US$289 (US$227 for the health system and US$53 for the patient). Another study by Miti, Mfungwe, Reijer and Maher (2003) has acknowledged the importance of community-based TB care. However, some studies have reported contrary evidence. For example, Kabongo and Mash (2010) did not observe any statistical differences in treatment outcomes among home- and facility-based patients.

Furthermore, individual as well as community level factors may serve as a hindrance to community TB treatment. At the individual level, the role of socioeconomic differences may resonate. For instance, personal knowledge about the signs and symptoms of TB may prompt early treatment seeking. Similarly, at the community level, stigmatisation of TB patients may result in the unwillingness of infected persons to come out in the community (Dodor & Kelly, 2010). What then becomes important is the need to recognise and appreciate the needs of individual patients, which are captured in TB patients' charter.

Rights and responsibilities of patients

The rights and responsibilities of TB patients have to be promoted because it is a fundamental human right. There is currently a TB patients' charter developed by TB patients around the globe in line with international protocols and conventions on health and human rights (WHO, 2006).

The charter sets out the rights and responsibilities of patients. The rights and responsibilities directly or indirectly affirm empowerment of TB patients and their communities by granting care, dignity, information, choice, confidence, justice, organisation and security to patients. Besides, TB patients have responsibilities to share information, follow treatment, contribute to community health and show solidarity with others infected with TB (WHO, 2006).

Operational research towards programmes, diagnosis, drugs and vaccines

In order to consolidate and expand gains from existing DOTS interventions, the Strategy appreciates the contribution of programmatic, diagnostic, drugs and vaccines development research.

Operations research

Diseases exist in communities and interpretations of diseases therein are shaped by cultural predispositions of people. This impedes the development of studies, which are able to identify the range of socio-cultural and economic conditions, which can influence control and treatment behaviours. Operation researches that can influence programmes are key to achieving this goal. Some studies have reported how important contextualised operational research has improved TB control. One such study is by Colvin, Gumede, Grimwade, Maher and Wilkinson (2003), which found that supervision of traditional healers' of TB patients in Hlabisa (South Africa) was effective, yielding higher treatment completion rates than those who received supervision from mainstream public health system. This finding was attributed to the fact that traditional healers were held in high esteem, coupled with the perception that failure to comply with instructions from traditional healers could result in curses (Colvin et al., 2003).

Diagnosis, drugs and vaccines research

New diagnostic techniques, drugs and vaccines constitute another domain for TB research. Although the BCG vaccine symbolises an important attempt at prevention, it has so far been unable to produce the anticipated benefits (WHO, 2006). However, it is practicable that improved techniques developed through research can improve case detection rates. Also, the development of mycobacterium TB resistant to most first-line and some second-line drugs is obstructing treatment successes in most countries. This necessitates the need to continuously pursue studies geared towards developing new diagnostic techniques, drugs and vaccines (WHO, 2006).

Advanced diagnostic processes, improved drugs and vaccines can impact on TB epidemiology in several dimensions. Improved diagnostics can shorten the duration of dormant infections and increase the probability of case detection before cases develop into terminal stage (Keeler et al., 2006). Vaccine development can improve on or replace neonatal BCG vaccine with those more effective in preventing serial infections (Skeiky & Sadoff, 2006). New drug regimens would shorten treatment and improve efficacy against resistant strains (TB Alliance, 2008).

Earlier studies either concentrated on diagnosis, drugs or vaccines (example, Vynnycky & Fine, 1997; Sánchez et al., 2008; Salomon et al., 2006; Young, & Dye, 2006; Dowdy, Chaisson, Maartens, Corbett & Dorman, 2008). Abu-Raddada et al (2009) lately used mathematical modelling to assess the effectiveness of diagnoses, drugs and vaccines on TB epidemiology. Outcomes from this modelling showed that neonatal vaccination with a collection of vaccines could reduce incidence by 39 per cent less than current rates and approximately 52 per cent in 2050. Drug regimens that condense treatment duration and are potent against drug-resistant strains reduces incidence by 10 to 27 per cent. Improved new diagnoses can result in 13 to 42 per cent reductions in TB. A triple combination of progressed vaccines, drug regimen, and diagnoses reduces incidence by 71 per cent. New vaccines and drug regimens that target inactive TB can also reduce incidence by approximately 37 per cent and 82 per cent respectively. The combination of preventive latent therapy and a two-month drug treatment regimen reduces incidence by 94 per cent. These results are mainly based on estimations, measured against present data.

It is therefore possible that these models may increase or decrease, depending on prevailing biological and socioeconomic exigencies but at the core is the need for more operations to support existing interventions. More research can make positive contributions to achieving targets of TB control.

Discussion

Historically, a number of strategies have evolved to control and manage diseases, and TB has benefited from such interventions. Among them are pasteurisation and meat inspection, isolation of patients, improvement in housing, nutritional advancement and the development of chemotherapy.

Although the contributions of each of these socio-medical interventions are variously contested, evidence indicates that they contributed to the decline of TB epidemics. For instance, segregation of TB patients to sanatoria was very common in Germany and remained popular for a considerable number of years. However, at the time TB became prevalent in US, the popularity of sanatoria had waned considerably. With such varying space-time settings, comparative studies can sometimes become contentious. Given these shades of contentions, more studies are relevant to help identify factors accounting for changes in each setting.

The paradigms of TB control at different times highlight the different approaches that have been used to deal with the disease. Viewed broadly, the various eras, provide an indications about the extent to which TB had been targeted. Nonetheless, the evidence points to the fact TB control programmes have suffered setbacks, especially during the management integration (1977-1988) period, resulting in the resurgence of epidemic in the early 1990s.

Modern TB control strategies have encompassed a number of strategies ranging from medical, political, economic to socio-cultural strategies. Nevertheless, the review undertaken in this study seems to suggest that much emphasis is on bio-medical management of TB. Of the six strategies under the current DOTS approach, more than half of the interventions are geared towards bio-medical management. For instance, while a number of studies reveal a positive correlation between poor housing, malnutrition and income poverty and TB (Lienhardt et al., 2005; Myers et al., 2006), these social interventions are given low prominence.

The health systems strengthening component of the Stop TB Strategy is envisaged to contribute to controlling the disease through a comprehensive approach to treating lung related diseases. This pushes TB from exclusive reliance on few DOTS workers to all health workers, particularly those at outpatient departments of health facilities. This is particularly important in a setting where waiting time between the onset of diseases and timing of seeking treatment can be longer than expected.

The call for an inclusive approach to TB diagnosis and treatment of infected people is promising. The current orientation, which requires that diagnosis and treatment services be provided by all available health service providers, namely orthodox, traditional/folk and faith-based are intended to reach out to as many suspected and detected TB patients as possible. Hitherto, TB control had been packaged and presented by, to and for public health service providers. Public-private partnerships have been found to be workable for TB control in some settings (Dewan et al., 2006), although there is contrary evidence (Probandari et al., 2010) to its suitability. As WHO (1999) suggests, partnership for health can be effective on the basis of beneficence (public health gain), non-maleficence (must not lead to ill-health), autonomy (should not undermine each partner's autonomy) and equity (benefits should be distributed to those most in need) (WHO, 1999).

Due to the positive connections between TB and HIV, calls have been advanced to developing strong working relations to the benefits of both diseases. So far, the evidence supports integration, at least, from implementation perspective because of double stigma associated with TB/HIV co-morbidity, clinical manifestations of TB/HIV as well as the funding of programmes.

TB control programmes also succeeds if there is political commitment at various levels - international, country, region/province, district and facility. Chapter Three, which follows, explores major theoretical issues applied to this study.

CHAPTER THREE

THEORETICAL ISSUES IN DISEASE CONTROL

Introduction

A number of theories and models have exists in both medical and social epidemiology literature which attempt to offer interpretations of patterns of diseases. Although the various perspectives sometimes differ in scope and content, a basic understanding that cuts across them is the motivation for advancing those views and which have been largely intended to promote public health through ideas. This chapter examines some of the views that have shaped ideas and programmes for disease control. These are mono-causal and multi-causal, health policies and disease control, issues of sustainability and integration in health systems

Mono-causal hypothesis

Mono-causal explanations of diseases assume that diseases of all groups transcend from single organisms. Prominent among these explanations are the miasma theory, spontaneous generation theory, the germ theory and anthropological propositions (naturalistic and personalistic views) on causes of diseases.

Miasma theory

The Encyclopaedia of Public Health states that miasma theory “dates at least from classical Greece in the fourth or fifth century B.C.E” (Last, 2001, p. 765). For instance, the Greek physician Hippocrates (c. 460-377 B.C.E.) believed bad air to be the cause of pestilence (Byrne, 2004). The miasma theory advanced that under certain conditions air could become a pathway for epidemic influence, which would translate into malignant as a result of combination of emissions of organic decomposition from the earth. This then culminates into miasms or gases capable of causing diseases (Hamlin, 2005).

The miasma theorists therefore argued that the method of prevention of infectious diseases was to clean streets of garbage, sewage, animal carcasses and wastes that were features of urban living. This formed the basis of sanitary reforms around the western world, which existed well into the 19th century (Tulchinsky & Varavikova, 2009). For instance, the Nuisances Removal and Diseases Prevention Act of Britain passed in 1846 and renewed in 1847 and which became permanent in 1848 (amended in 1855 and 1860, and finally incorporated into the general public health legislation of 1872 and 1875 (Eyler, 1979) had arisen out of the miasma concept. Some of the popular adherents of miasma theory were Sir Edwin Chadwick (1800-1890), social and sanitary reformer, William Farr (1807-83), the famous statistician, and Sir John Simon (1813-58), the first Medical Officer of Health for London (Hamlin, 2005).

In spite of the popularity of the miasma theory, it was unable to provide sufficient understanding of causes of diseases. The emerging medical and scientific revolution towards the 19th century led to the development of the germ theory as an alternative interpretation in public health (Tulchinsky & Varavikova, 2009).

Germ theory

The popularity of the miasma theory existed well into the 19th century, until around 1840s when the germ theory became the basis of explaining the occurrence of diseases (Sterner, 2007). Fundamentally, the germ theory suggested that disease microbes, rather than bad air, caused diseases and could further be transmitted from one person to another (Tulchinsky & Varavikova, 2009). For example, Pawn's (1846) study of measles provided strong basis for the germ theory when he showed that there were clear patterns of person to person infection and additionally showing the germ's incubation period as well as how persistent exposure could provide natural immunity.

Drawing inspiration from existing studies such as Pawn's, Louis Pasteur (1860) and Robert Koch (1882) relied on the germ theory to discover the bacillus that causes TB. Pasteur's ability to show that bad air did not necessarily cause diseases, although microorganisms could be found in the supposed foul air, was later confirmed (Black, 1996). While it is acknowledged that Pasteur was not the first to put forward the germ theory, Pasteur's empirical studies substantiated and popularised the germ theory (Ullman, 2007). Koch's detection of the bacteria that causes TB sealed the acceptance of the germ theory as compelling evidence.

For Koch (1876), for an organism to be deemed to have 'instigated' a disease, four sufficient conditions must be available. That is, (1) the organism must be found in all cases of the disease examined; (2) it must be capable of surviving in a pure culture; (3) capable of producing the original infection, even after several generations in culture and retrievable from an inoculated animal and re-cultured (Koch, 1876 cited in Cochran, Ewald, & Cochran, 2000).

Since the late 19th century, the germ theory has formed the starting point of contemporary medicine and microbiology (Madigan Martinko, & Parker). The generally high levels of confidence in the germ theory, due to its precision in predicting causative agents of disease (cholera, Snow 1854, typhoid Budd, 1855) in some measure, contributed to explaining and providing answers to some of the myriad of health dilemmas (Najman, 1980).

Later evidence, however, deflated some of the claims made by the germ theory. The germ theory had implicitly argued, among other things, that all individuals exposed to disease-causing germs should contract the disease in question and, without timely chemotherapy will die. However, Max von Pettenkofer (1892) publicly consumed the cholera bacilli but survived the fatality of cholera (Morabia, 2007). According to Morabia (2007), Pettenkofer engaged in that unethical research practice as a means of redeeming his reputation, which had been battered as a result of Koch's convincing evidence about the germ theory as well as Koch's ability to show that the cholera epidemic of Hamburg (1892) arose from the germ theory instead of miasma. Nonetheless, the action demonstrated that exposure to disease organisms does not necessarily result in diseases as well as leading to death. Thus, the interaction between exposure, disease, and death was not always direct (Cassel, 1976). Krieger (1994) critically commented on the germ theory as retarding and narrowing progress towards multi-level interventions and research on fundamental public health diseases.

Personalistic view

Essentially, the personalistic paradigm asserts that contravention of moral and spiritual orders can form substantive basis for an individual to be struck with illnesses. Thus, adherents of personalistic theories aver that people who become sick may have dishonoured a religious taboo, thereby, being punished with ailments from their deities (Feezer, 1921). The personalistic stance further submits that diseases could occur in people possessed by evil spirits and who may have offended the spirits, such as breakdown in carrying out proper rituals, for example, respect for a dead ancestor while alive or dead or merely owing to frightening coincidence (Breslow & Cengage, 2002).

Thus, there is a belief that failure to observe culturally acceptable obligations towards a family member whiles alive can invoke a disease (Dodor et al., 2008). Participants in a focus group discussion in urban Takoradi, Ghana, distinguished between ‘ordinary’ and ‘spiritual’ TB. The respondents added that spiritual TB is exacted on a relative of a person who died of TB whose spirit in turn infects their family members who recoiled from them while sick. The local name, *nsaman wa*, literally ‘ghost cough’ (Dodor et al., 2008) demonstrates such personalistic views about causes of diseases. Perceived chances of recuperation of diseases linked to such personalistic beliefs are therefore usually resigned to sorcerers and others of their kind (Breslow & Cengage, 2002).

The major weakness associated with the mono-causal perspectives is that there is much emphasis on single factors as underlying diseases. However, it is not always the case; diseases can have multiple causes. That probably explains why some people exposed to certain disease causing organisms do not become ill. The next section presents the multi-causal view of diseases.

Multi-causal perspectives

Multi-causal theories concerning patterns of diseases are somewhat a response to the limitations inherent in mono-causal logic. Whereas the multi-causal perspective appreciates the relevance of a causal organism trigger, multi-causal views about causes of diseases include analysis of social, economic and cultural factors, which can influence the causes of disease (Krieger, 1994). Leavell and Clark (1965) gave one of the clearest indications of multi-causal perspective as a composite course of divergence from health, arising from chains of causes and effects that are triggered by different factors.

Based on multi-causal perspectives, the concept of environment as pertained to causes of diseases is expanded to include social environment in addition to the physical environment (Krieger, 2001). Such perspectives, as Krieger (2001) points out, re-echoes Cassel's (1976) conceptualisation of host-agent-environment in social epidemiology. Cassel (1976) argued that in the attempt to understand health of populations, the circumstances of the diseased person, where, how and when the disease causative agent thrives and the micro, meso, macro contexts of the host and agent need to be synchronised. Earlier, Jefferys (1970), in a report prepared for British Medical Association illustrated that most diseases brought to primary health care facilities mainly arose from physical, emotional and social factors. The political economy of diseases (Doyal & Pennel, 1979) and psychosocial (Cassel, 1976) theories provide different dimensions to the multi-causal point of view.

Political economy of health

There is the belief that political leadership has persuasive impacts on health outcomes. Doyal and Pennel (1979) proposed an upstream-downstream framework, known as political economy or social production of diseases to account for diseases and health situations, which are associated with political actions and inactions. This theory moves away from individual to state responsibilities in ensuring healthy citizenry.

Political economy of disease production gives responsibility on health to the state on the assumption that individuals are rational beings and will therefore engage in positive healthy behaviours. However, political decisions on health care and supply of personnel, cost of treatment (time and finances) about the health of an individual will depend on prevailing national health policies. Furthermore, the theory argues that other indirect policies on education, environment, access to water and sanitation, industrial or work place safety regulations do affect health outcomes.

For instance, political systems that engage in mass exploitation of labour can directly or indirectly contribute to poor health. Economic exploitation miners are considered to be one of the contributory factors to TB epidemic in South Africa (Randal, 1990; Stuckler, Basu, McKee & Lurie, 2011). Political decisions such as the introduction of as health insurance, political participation of marginalised populations and voting patterns (share of votes in last elections) could be significant issues affecting the distribution of doctors, nurses, auxiliary nurses and health facilities (Mobarak, Rajkumar & Cropper, 2009). In communities where mayors and governors are in the political party as the ruling government are able to attract higher national level funding for health and other social services (Mobarak et al., 2009).

The political economy standpoint assumes that an individual's control over his/her health conditions is limited. Studies on the so-called life-style diseases have demonstrated that personal accountability in preventive measures is equally important. Therefore, leaving the health of individuals to the control of state could be costly, particularly in situations where the state is more aligned to economic orientations such as cost recovery health systems. Nonetheless, the political economy framework provides a paradigm for examining the role of the state in health delivery.

Psychosocial theory

This theory is credited to Cassel (1976), who tried to offer explanations for people's resistance to bacteria and viruses. A key component of the psychosocial theory is that the "feasible and promising interventions to reduce health inequalities will be to improve and strengthen social supports rather than reduce exposure to stressors alone" (Cassel, 1976, p.121).

The fundamental proposition of psychosocial theory relates to social environmental factors that modify host susceptibility to causal agents (usually biological) of diseases. Such psychosocial factors may include domination (men over women), social disintegration (national and communal conflicts and wars), marginalisation and discrimination. For instance, certain social groups may be susceptible to certain diseases due to the conditions within which they operate (Cassel, 1976). In respect of TB and other infectious diseases, residents of poor physical environment (lack of sanitation, water and proper housing) are more vulnerable to infections and to die of TB due to weakened immune system arising from poor nutrition and other infections more likely than people who are better nourished.

Martikainen, Bartleyb and Lahelmac (2002) extended the theory further to include levels at which social and environmental variables converged - micro, meso and macro. They surmised that psychosocial explanations of health in effect do not have to be limited to one level: all may happen concurrently or sequentially. In its original form, the theory fails to isolate the role of demographic, emotional and economic environments, which are broadly part of social environment (Krieger, 2001). Psychosocial theory also downplays biological factors such as individual immunity against diseases.

Perceptions and attitudes towards tuberculosis

The concept of perception deals with how people construct meanings of their world, as well as cause and effect linkages about their behaviours and those of others (Worhel, Cooper, Geothals & Olson, 2000). According to Lewis and Daltory (1990), perceptions towards various health conditions are informed by some overt or covert orientations, namely development of correct attributions (of causes), development of therapeutic relationships between health care professionals and clients, adaptations to attributions, shift in focus of attribution, attributing characteristics to the individual and maintenance of perceived personal effectiveness. These behavioural outlooks may lead to undesirable or desirable outcomes such as ideas about a disease and its outcomes.

Differences in understanding of causes and treatment of diseases could include how it is managed. For instance, In Ghana, TB infection is attributed to punishment, hence the local name *'nsaman wa'* (ghost cough) (Dodor et al., 2008). In Ethiopia, one of the beliefs is that cold air could be responsible for TB transmission (Deribew et al., 2010) and that the recurrent TB results from early resumption of sexual intercourse after initial successful treatment (Sagbakken, Frich & Bjune, 2008a).

In Vietnam, causes of different genres of TB have been identified by sex: "Lao truyen" (hereditary TB), handed down from older generations to latter ones through "family blood" regardless of sexes; `Lao luc' (physical TB), caused by hard work and higher in men; "Lao tam" (mental TB), caused by too much worrying and affects mostly women and "Lao phoi" (lung TB), the most dangerous which is perceived to originate from TB germ and, transmitted through the respiratory system. Men are perceived to be at higher risk than women. All these erroneous perceptions about routes of transmission delay early reporting and as a result derail TB control efforts (Johansson, Long, Diwan & Winkvist, 1999).

These perceptions do not have to be always discounted because selective blend of folk perceptions and biomedical knowledge are important for health education in culturally sensitive areas (Ho, 2004). Ho (2004) therefore cautioned against adopting only biomedical interpretations of diseases as "objective", which assumes that correct knowledge will result in correct behaviour and perceptions.

Kubler-Ross (1969) advanced a framework which attempts to identify stages individuals faced with life-threatening diseases (sometimes terminal).

These stages are secrecy, exploratory, readiness, and disclosure. The secrecy phase involves feeling of shock, loneliness, isolation, identification of trusted adults to disclose status to and professionals may be the only people with whom they can share feelings. The exploratory phase comprises searching for support of relatives and exploring feelings about disclosure to identified relatives. At the readiness stage, the individual begins to plan disclosure and discusses strategies of disclosure with professionals, trusted adults and support groups. Finally, where an individual has pursued this course, the disclosure process culminates into actual disclosure with or without presence of professionals (Qiao, Li & Stanton, 2013).

In spite of the fact that some studies (Blasini et al., 2004) recognised the usefulness of the stages, they are not necessarily ordered in real and sequential order. Individual patient's cultural, economic, and family environment may determine whether, the secrecy phase for instance may be skipped or retained (Qiao et al., 2013).

Lazarus and Folkman (1984) proposed a closely related theory of stress and coping, which postulates perspectives on disclosure. They argued that peoples cognitive appraisal of situations informs whether they consider those events as life threatening or not. The theory suggests that individual's interpretations of the world and their assessment of how they are able to respond to difficult situations is critical for successful coping (Lazarus and Folkman, 1984; Lazarus, 1991). Owing to the stress associated with some diseases, such as those that elicit stigma, infected persons coping capabilities may be impaired, irrespective of the fact that disclosure may assure support from relations. As a result, an individual's desire views on TB status disclosure may be determined by appraisal of positive and negative outcomes of disclosure (Sowell, Seals, Phillips & Julious, 2003).

Chaudoir et al. (2011) have provided a theoretical model on disclosures for diseases which are stigmatised by focusing on why, how and when individuals disclose status about diseases. Known as the disclosure decision-making model (DDMM), it depicts three stages of decision-making, namely, decision-making, disclosure event, and outcomes (Chaudior et al., 2011).

One of the key features of the DDMM is the individual's expectation and calculation for potential benefits and risks of disclosure. The assumption is that individuals will make ultimate decision of disclosure/non-disclosure based on a careful analysis of anticipated outcomes. The decision-making process affects the disclosure event in both the content of the disclosure and reaction of the targets. The event to be disclosed may affect outcomes through three intervening processes: alleviation of embarrassment, social support, and changes in social information (Chaudoir & Fisher, 2010). Being open about a disease status may make disclosers more likely to engage in behaviours that they previously avoided for the purpose of hiding their status (for example, taking anti-TB medications in public). Finally, the outcomes of disclosure may influence future disclosure decision-making through a "feedback loop" (Chaudoir et al., 2011).

Until the discovery of HIV/AIDS, TB was the most stigmatised infectious disease (Daftary, 2012). With increasing awareness about the close synergy between TB and HIV, stigma towards TB has re-emerged (Johansson, Long, Diwan & Winkvist, 2000; Nnoaham, Pool, Bothamley & Grant, 2006; Daftary, Padayatchi & Padilla, 2007; Daftary, 2012). There is evidence that the double stigma attached to TB discourages disclosure, particularly in high HIV endemic areas (Bond & Nyblade, 2006). This makes the inclusion of attitudes towards TB control relevant, as an understanding can be useful for designing behavioural change communication messages as well as targeting potential respondents.

Health policies and disease control

Health policy is part of broad social policy, which can be defined as social relations and regulations essential for human wellbeing and the structures by which wellbeing may be advanced (Dean, 2005). Wellbeing entails health, education, income maintenance, employment, housing, environment and personal social services (Dean, 2005). Health policy is also defined as "courses of action (and inaction) that affect the set of institutions, organisations, services and funding arrangements of health systems" (Buse, Mays, & Walt, 2005, p. 6). Such policies could emanate from governments, non-governmental actors and organisations external to the health system. However, such processes of 'making' policy are not necessarily overt or clearly bounded. The ways in which decisions 'emerge' rather than taking place at a point in time can be particularly difficult to unpack and explain (Exworthy, 2008). Some of those policies discussed in this work are multiple streams (Kingdon, 1984), punctuated equilibrium (Baumgartner & Jones, 1993; Jones & Baumgartner, 2012), street-level bureaucracy (Lipsky, 1980) and rational choice.

Multiple streams theory

Multiple streams theory contends that social policy follows three interrelated bands - problem(s), policies (solutions to problems) and politics streams (Kingdon, 1984). For policies to become acceptable and viable, the three streams need to prevail sequentially and should be preceded by agenda setting. Agenda is defined as the "list of subjects or problems to which government officials, people outside government and other officials are paying serious attention to at some given time" (Kingdon, 1984, p.3).

The first stream of the theory is identification of problem. The problem stream represents various attempts to bring attention to public problems (Kingdon, 1995). Usually, policy makers are confronted with many competing problems for attention. The choice of an issue over another does not come by chance: it involves methodical efforts. For instance, Shiffman (2009) has argued that for issues relating to health, the public would normally have perceived the situation as a problem. Methodologically, cost-benefit analyses of competing issues are undertaken and then choices are made (Robinson & Eller, 2010).

In elaborating further on the theory and how it applies to health policy, Ogden et al. (2003) added a new dimension to the problem stream - "policy windows" which are triggers that shape specific problems (Ogden et al., 2003). Robinson and Eller (2010) noted that there are varied participants who broker attention to public problems by directing the attention of policymakers to a limited set of problems. For instance, TB control was re-introduced towards the end of 1980s and early 1990s because of its upsurge in the US (New York City especially) and as a result of the deadly combination of TB with HIV.

Although TB's fatal effects were commonplace in the developing world before early 1990s, the evolution of MDR-TB and HIV were influential in shaping the re-introduction of TB control discourses, with HIV and MDR-TB serving as policy windows for TB control (Ogden et al., 2003).

The second stream, policy or solutions consists of policy alternatives that are provided by mid-level government officials and administrators, policy advocates and academics (Teodorović, 2008). These policy makers are either tied together (epistemic community) or consist of loosely connected coalition of organisations, which advocate for parallel paths (Walt, Shiffman, Murray, Burgha & Gilson, 2008). Recent scholarship has added the concept of "problem surfing", defined as advocacy groups attaching "their preferred policy solution to whatever problem(s) (is) salient at the time" (2009, p. 421).

The choice of solutions to address health problems such as TB or any other health problem prevails with contributions from various actors: visible actors, who are frontline policy makers, often officials within or outside the mainstream policy-making; invisible actors, who include researchers, academics and consultants with peculiar interest in proposing alternatives to existing policies. For instance, the global acceptance of DOTS for TB control benefited mutually from visible and hidden hands (Ogden et al., 2003). With respect to invisible actors, the various studies Styblo conducted, with the support of IUATLD in Tanzania led to the reduction of the period of DOTS from 18-months to six months (Rouillon, 1991). This was re-enforced by a parallel study conducted in Malawi, Mozambique and Tanzania (Murray et al., 1991).

The political stream comprises two levels of power brokers: local (national) and international. Local/national level stream members may include government officials (e.g. minsters of state), pressure groups, and political parties (Kingdon, 1984) as well as organisational, economic, scientific and political systems (Reich, 1995). In-country political loyalties also play major roles in priority setting in disease control. For instance in 1986, the Centres for Disease Control and Prevention (CDC) practically showed that TB declines that had been achieved between 1956 and 1986 were being derailed. This situation made the CDC request for financial assistance, yet that financial assistance was denied, which negatively affected the Centres' TB research and programming (Advisory Council for Elimination of TB (ACET), 1993).

Key actors at the international level stream may include multilateral (example, WHO, World Bank) and bilateral institutions (example, United Kingdom Department for International Development (DfID) and United States Agency for International Development (USAID)) with support from powerful, pressure groups and international non-governmental organisations (NGOs). Financial and other conditionalities from international organisations could influence disease control. For instance, a critical country-level financial assistance may be tied to the acceptance of a vertical model disease control programmes. The continuous donor funding for TB control in China was tied to the government's commitment to fighting TB among the poor and poorest provinces. In Uganda, commitment to decentralising the management of basic health services and to making local authorities accountable to communities had to be a condition in the Uganda poverty reduction support credit (Lukwago, Nantunja, Ndayimirije, Wamala, Malimbo et al., 2012).

The main limitation of multiple stream theory is its assumption of linearity or hierarchical orientation - agenda moving from problems through policies to politics. The various stages of the theory are treated discretely (Walt, Lush & Ogden, 2004), suggesting that participation in one stream limits participation in another (Robinson & Eller, 2010).

Punctuated equilibrium theory

Evolutionary biologists, Eldredge and Gould (1972), first developed the punctuated equilibrium theory (PET). They posited that organisms that reproduce sexually undergo certain mechanisms which at certain points become stabilised while at other times too they become disorganised by swift but uncommon events (Adler & Carey, 1982). Baumgartner and Jones (1993) drew on these principles and hypothesised that social policies go through series of experiences, some positive while others are negative. It also involves succession of social, political and economic behaviour as well as dynamics across time and space (Tilly, 1984). Jones and Baumgartner (2012) have argued that PET was informed by the fact that earlier theories “emphasised stability, rules, incremental adjustment, and “grid-lock” although policy changes are often disjoint, episodic, and not always predictable” (p. 1). Over time, health policy experts have illustrated how health policies are refined through similar punctuations and equilibria.

Shiffman et al. (2002) have added policy image and policy venue to improve the applicability of the theory to health policy. Policy image refers to conceptualisation of problems and solutions while policy venue refers to different players and institutions that craft and provides solution. The major actors in the policy environment may have monopolistic power over time but with time, new interest groups may offer alternatives to existing ones. If policy leaders have monopoly, policies will be stable and incremental. When new actors and images emerge, rapid bursts of change are possible. For example, in an analysis of the tobacco industry in the US, Givel (2006) noted that regular demonstrations by anti-tobacco coalitions between 1990 and 2003 in all states led to tightened tobacco regulations. These contestations were the responses to the stability the tobacco industry had had before the 1990s. Nevertheless, the tobacco industry countered those oppositions and was able to reduce significant regulatory threats to tobacco sales. The policy process may therefore be stable at one time but change at another. Neither stability nor change is uninterruptable (Shiffman et al., 2002; Walt et al., 2008).

The various TB control policies provide a classic example of punctuated equilibrium; from vertical through specialised, integrated, management integration and back to specialised and dominated by varying interest groups. When TB and HIV emerged to be the number one cause of death among people in their productive ages, the World Bank collaborated with WHO to re-energise interest and funding of TB control programmes (Ogden et al., 2003).

Fundamentally, disease control policies are not unidirectional since patterns of disturbed equilibrium can be identified at one time or another (Shiffman et al., 2002). Specific to policy leaders, for instance, Ogden et al. (2003) indicated that when Halfdan Mahler was the Director-General of WHO between 1970s and 80s, his personal frustrations encountered in the control of TB in India discouraged him to push for TB control and rather focused on family planning and immunisations. Commenting on the health systems in Israel, Feder-Bubis and Chinitz (2010) contended that policy leaders, institutional breakdown and new ideas are among the principal features that precede periods of stability and change.

Street-level bureaucracy

Lipsky (1980) put up a hypothesis that explains how policies are shaped at the implementation stages to eventually become a policy. Lipsky argued that front-line operatives in the public sector are usually confronted with twofold tasks: responding to needs of their clients as well as promoting policy goals. The duality of responsibilities compels them to drop proactiveness, and instead, adopt reactionary measures to manage daily occurrences associated with dualism. By and large, the actions and inactions of public servants indirectly shape public policy (Wong, 2007), which could be the new basis for decision-making.

Although Lipsky (1980) contended that low- to middle-level employee (street-level bureaucrats) may not have participated in problem identification and crafting of policies, their discretions exert huge directions on what is actually implemented. Lipsky (1980) further emphasised that over time, the minor omissions and commissions of front-line bureaucrats become agenda setters for public policy because what they directly and indirectly do impact on public perceptions.

Winter (2002) has argued that policy restructurings will remain at the conception stage without street-level bureaucrats' who take the ideas and convert them into actions. Winter (2003) maintains that discretions exercised by bureaucrats inevitably become the markers for measuring policy results although they may not have identified the problem.

Street-level bureaucracy theory has been used to study community health nurses in South Africa and it was concluded that point-of-health-delivery discretions exercised by health personnel influences policy outcomes (Bergen & While, 2005). The clarification of policy guidance, synchronisation of professional values with policies, local practices and policies and personal vision of the community health workers contribute to the achievement of policy goals (Bergen & While, 2005). In a review of health insurance exemption policy in Ghana, Agyepong and Nagai (2011) noted that some stakeholders, especially health services administrators relied on their experiences (delays in releasing insurance claims) to charge patients hitherto exempted in order to generate contingency funds to sustain health care provision.

An argument against street-level bureaucracy theory is that it assumes weak bureaucratic supervision, which makes it possible for workers down the ladder dictate policy options. That is, where supervision of policies is not strong, bureaucrats can implement policies and programmes at their own discretion with little regard to existing regulations. In Agyepong and Nagai’s (2011) study for instance, monitoring and supervision mechanisms were not strong and therefore it was easy low-level operators to alter a policy targeted at vulnerable populations. In an environment of strong institutional supervision, there is less likelihood of policy changes originating from bureaucrats.

Rational choice theory

Rational choice theory is situated in economic thoughts of scale of preference and opportunity cost (Green, 2002). It is founded on a universal assumption that individuals and institutions, when faced with multiple choices in the presence of limited resources engage in situational analysis and make choices. Rational choice theory suggests that people and organisations attempt to offer their best under existing situations (Green, 2002).

Progressively, health economists have “imported” the concept into health policy analysis, in terms of what diseases should be funded; therefore, measures such as disability-adjusted life-years (DALYs) and active life expectancy have been developed. According to Shiffman et al. (2002), health policy makers are generally circumspect in identifying health problems, offering alternative solutions before proceeding to undertake objective analysis of policy alternatives and subsequent adoption. Specific to health policy, the target has often been rationalising the use of resources, thereby focusing on pressing health challenges.

A major limitation of rational choice approach in setting health priorities is its discriminatory tendencies, especially when summary measures are used. In summary measures, certain diseases are weighted in addition to age discounting, which raises some ethical concerns in valuing life - considering some ages to be more important than others. Nevertheless, rationality can provide avenues for managing shrinking health resources.

Sustainability and integration in health systems

Efficient and enduring communicable disease control programmes can be situated in the theoretical realms of sustainability (Fiksel, 2003; Fiksel, 2006). Systems sustainability has been defined as the ability to adapt to a wide range of external and internal pressures yet retain functioning and performance, and initiate changes through innovations in order to continuously improve performance (Fiskel, 2003; 2006).

The multiplicity of health system functions, which include governance, financing, planning, service delivery, demand generation and evaluation are generally targeted at achieving optimum health for populations (Atun, Menabde, Saluvere, Jesse & Habicht, 2006). Due to the multiplicity of health system functions, Atun et al. (2006) argued that there is a need for adaptive interaction of functions within and outside health to ensure sustainable health care.

Gruen et al. (2008) defined sustainable health care as a system that embraces health concerns of a population, wherein programmes are implemented to address specific health concerns through positive, and sometimes negative experiences or factors. Given that health systems operate in complex, adaptive and constantly changing environment, it makes risks and shocks unpredictable, making integration of health system functions prudent (Shigayeva et al., 2010).

Classical organisational theorists, Lawrence and Lorsch (1967) defined integration as the "quality of the state of collaboration that exists among departments that are required to achieve unity of effort by the demands of the environment" (p. 11). However, in most organisations, there is often differentiation of departments as a result of division of labour, resulting in functional differentiation before structural differentiation (Axelsson & Axelsson, 2006).

Shigayeva et al. (2010) described health system integration as the "structures and functions (the what of integration) associated with establishing and sustaining a health system and its components in order to ensure effective, efficient and equitable use of resources (i.e. the why of integration)" (p.i12). Grepin and Reich (2008) add that integration in health systems could be linked to economies of scale and commonality of elements of parallel programme. They further argued that successful integration set clear guidelines on activity (what), policy (functions), organisational structure (separate or new programmes) and structural level of integration (national, regional, local - district, village, community). At each domain and level, the degree of integration also require specification whether coordination or collaboration.

Grepin and Reich (2008) define programme coordination as "communication and information sharing among distinct programmes for purposes of simplifying the implementation of respective programmes". Shigayeva et al. (2010) provide another perspective of coordination as representing goal-oriented activities enhanced by working together on joint activities whilst retaining a programme's distinctive structures and functions" (p. i14). Collaboration on the other side "connotes increased cooperation and may involve sharing of resources and personnel" (Grepin & Reich, p.2).

The alternative point of view is based on vertical disease control. Verticalised disease control programme is often a specialised management of a disease of substantial public health importance and usually operated differently from the existing health system (Raviglione & Pio, 2002). Often, planning, governance, data management, finances, and demand generation functions of health systems are provided separately from the mainstream service providers.

Gonzalez (1965) cited in Mills (2005) summarised the essence of vertical programme thus: “there are two apparently conflicting approaches to which countries should give careful consideration. ... The first, generally known as the ‘horizontal approach’, seeks to tackle the over-all health problems on a wide front and on a long-term basis through the creation of a system of permanent institutions commonly known as ‘general health services’. The second, or ‘vertical approach’, calls for solution of a given health problem by means of single-purpose machinery. For the latter type of programme the term ‘mass campaign’ has become widely accepted” (p. 9).

The philosophy underpinning vertical disease control programme is intended to be a short- to medium-term measure to manage population health problems. Such measures are also expected to be radical, results-driven and efficient (Mills, 2005). To this extent, once vertical programmes have been effectively used to significantly cut down in prevalence and incidence rates, disease control can be reverted back into the generalised system. For example, in 1989, malaria control in Nepal was integrated into the mainstream system after much success had been achieved (Mills, 1989 cited in Mills, 2005).

Health policy makers, particularly those in developing or resource-limited countries are not enthused with verticalised disease control programmes. The seemingly disinterest in vertical programmes is borne out of resource constraints, sustainability problems, discouragement of comprehensive treatment, responsiveness to diseases rather than the interest of service users (Sen & Koivusalo, 1998; Atun, Bennett & Duran, 2008; Doherty, Chopra, Tomlinson, Oliphant, Nsibande & Mason, 2010; Keugoung, Macq, Buvé, Meli & Criel, 2011).

Beyond the conceptual debates over integration and vertical programmes, Shigayeva et al. (2010) provided a model of integration of TB/HIV programmes. The emerging body of knowledge on TB/HIV programme integration has found some positive evidence (increase case detection and survival of co-infected patients) to encourage functional (at least joint delivery of TB/HIV treatment services) integration of TB and HIV services (Ansah, Walley, Siddiqi & Wei, 2012; Uwimana, Jackson, Hauster & Zarwsky, 2012).

Overall, the thinking underpinning the model by Shigayeva et al.'s (2010) social constructionism exists through the assignment of roles to major stakeholders of programmes. Stakeholders could be funders, policy makers, managers, community leaders, patients and users association, providers of services, professional associations, religious authorities, civil society organisations and other groups which are directly or indirectly affected by a health problem (programme drivers) (see Figure 1) (Gruen et al. 2008; Atun, de Jongh, Secci, Ohiri & Adeyi, 2010). The urgency, scope, socio-economic impact and social narratives of a disease may influence how drivers conceptualise a problem (Tkatchenko-Schmidt, Renton, Gevorgyan, Davydenko & Atun, 2008; Atun et al. 2010).

Social narratives of programme drivers could also have implications for the choices and equilibrium of interventions (curative or preventive) as well as approval and persistence of programmes. Consequently, the perceptions of visible and invisible hands pushing a specific disease control programme shape ideas about exchanges with other health systems or related programmes (Shigayeva et al., 2010). For instance, the current strategies for TB control recognises HIV/AIDS and TB as positive associates and that one could not be effectively tackled without the other. Integration of anyone or more of health system functions may become relevant to health delivery.

Emanating from the drivers are potential setbacks as a result of differences in philosophies and approaches to care and treatment, lack of national and local leadership to dedicate resources, time and attention to those providing integrated services, reluctance from specialists to lose professional autonomy and disagreements in resource distribution (Chaulet 1998; Mayhew, Lush, Cleland & Walt, 2000; Feenstra & Visschedijk, 2002; Heller, McCoy & Cunningham, 2004; Dimitrova, Balabanova & Atun, 2006; Hill & Tan Eang 2007).

The larger political, legislative, economic, social and technological contexts also determine a programme's structures and functions (Atun et al. 2004). For integration to prevail, the existing health system and programme orientations must be favourable or positive (Shigayeva et al. 2010). Gruen et al. (2008) has noted that the perception of programme drivers can positively or negatively influence the flow of resources and interactions among system elements. The power connections between individuals or institutions in specific organisations form the political economy stream of integration (Figure 1).

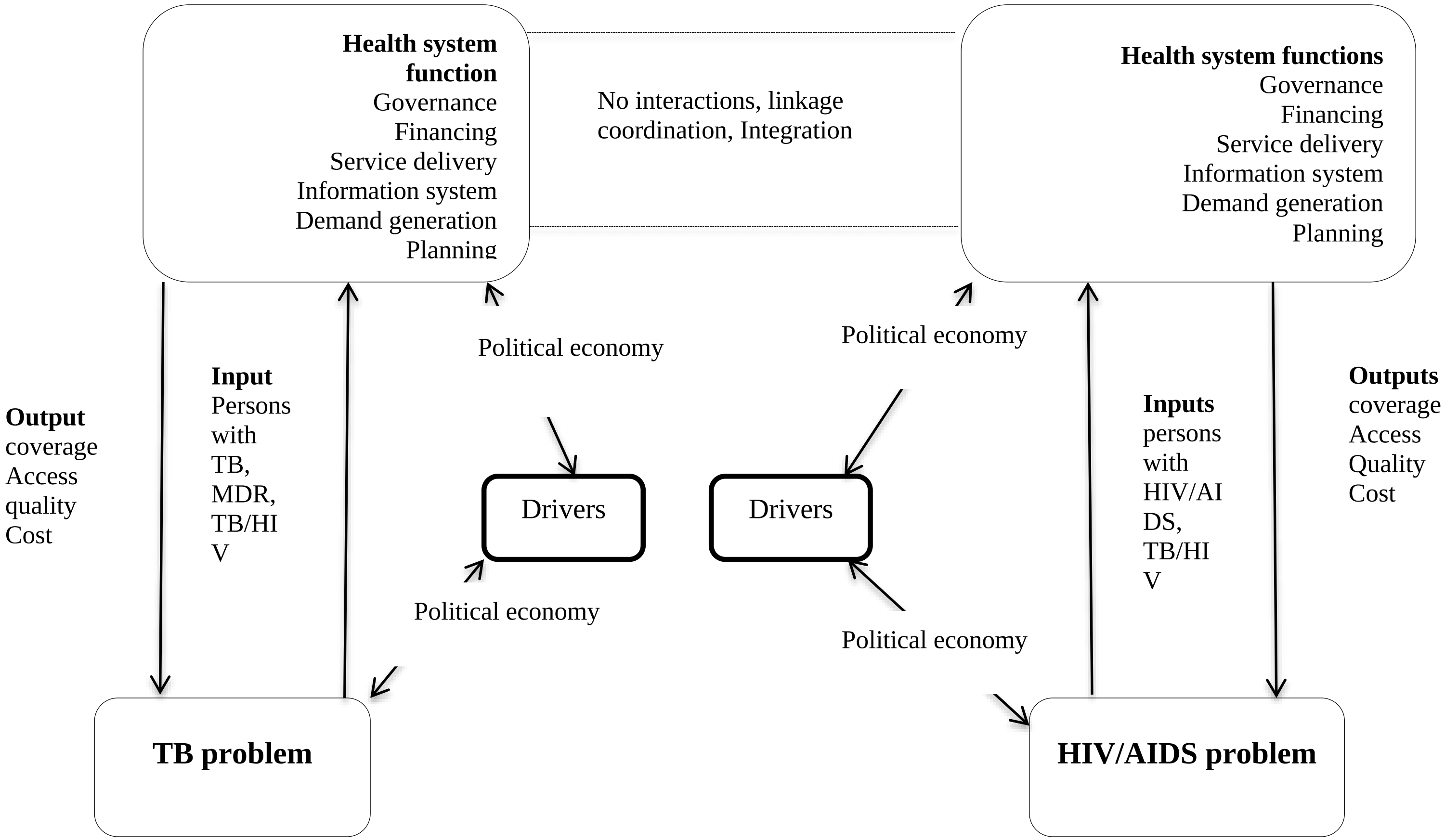

Figure 1: A model of tuberculosis and HIV programme integration
Source: Shigayeva et al., (2010)

Evidence has shown that communicable disease control programmes, which are integrated into the broader health system can guarantee several positive outcomes such as improved coverage, access, equity, efficiency and sustainability (Atun et al. 2008; Mosneaga et al. 2008; Utzinger et al. 2009; Gyapong et al. 2010).

The need for integrating TB and HIV programmes is borne out of the need for economic rationalisation and efficiency (Ansah et al., 2012), more especially in the wake of declining financial resources for communicable disease control. Indeed, funding for the trio of malaria, HIV/AIDS and TB has become a concern in the wake of dwindling funds from the Global Fund. Shigayeva, Atun, McKee and Coker (2010) have developed a framework that allows an intuitive analysis of the level of integration between TB and HIV.

Integrated TB and HIV services can manifest at four levels: full segregation, linkages (referral systems), coordination and full integration (Shigayeva et al., 2010; Ansah et al., 2012). Full segregation exists when there are no recognised connections, with programmes operating with different structures. All health systems functions exist parallel or independent of each other. Linkage is more of an unstructured relation, with interactions done on ad-hoc basis: information is exchanged upon request, such as through a referral system. Coordinated service delivery is based on goal-oriented activities enhanced by working together on joint activities, whilst retaining a programme's distinctive structures and functions. Coordinating structures or regulatory mechanisms exist and are supportive of organised interactions

(Contandriopoulus, Denis, Touati & Rodriguez, 2003). At the coordination level, some health system functions (governance, planning, finance, demand generation, data management) activities may be implemented together. Integration involves changes in both programme structures and/or functions, leading either to establishing common formalised governance structures or uniting governance responsibilities, pooling of funding, merging service delivery or unifying information systems. At the health delivery point, fully integrated programmes provide one-stop-shop services to TB and HIV patients instead of referral and coordinated services (Shigayeva et al., 2010; Ansah et al., 2012).

Framework for tuberculosis control programme analysis

Quite often, questions are asked about whether a programme worked or not (Pawson & Tilley, 1997). In providing a better understanding of effectiveness of a programme. Pawson and Tilley (1997) argued that it is rather important to move beyond whether a programme worked or did not. They further suggested that questions have to be rather framed around the context, the epidemiological problem, interventions needed, and mechanisms to deliver the interventions, the expected outputs and outcomes.

Coker, Atun & McKee (2004) built on these concepts to develop a conceptual framework for examining control strategies for communicable diseases. The framework is built on horizontal and vertical interfaces. Horizontal integration involves integration of organizations or providers working at the same level of the hierarchy (for example, among hospitals), and vertical integration refers to integration across different levels of the service delivery hierarchy (for example, between hospitals and primary care facilities). The vertical domain is also related to mechanisms while the horizontal is related to contexts (Shigayeva et al., 2010).

Based on the extent of synergy between context and mechanism, changing outcomes may be recorded when projects are rolled out in different sites. Without patients, there can be no disease control programme and therefore patients represent the inputs. Patient pathways are the socioeconomic characteristics of individuals and how they respond to treatment regimens. The context could significantly shape regularity of outcomes. Regularity represents the five main domain of first DOTS framework (political commitment, case detection, short course chemotherapy, regular drugs supply and recording and reporting system (Atun et al., 2004). Outputs in this model are the ultimate goal of DOTS - favourable treatment outcomes (high treatment completion and cure rates).

This framework is, however, limited since it is based on an old TB control strategy. Currently, TB control is based on an expanded model: expansion and enhancement high-quality directly observed treatment short-term course, addressing TB/HIV, multi-drug resistance and needs of poor and vulnerable populations, health system and TB, engagement of service providers, empowerment of people and communities living with TB and promotion of operational research. This makes the models based on the framework unsuitable for programmes based on the current six broad strategies.

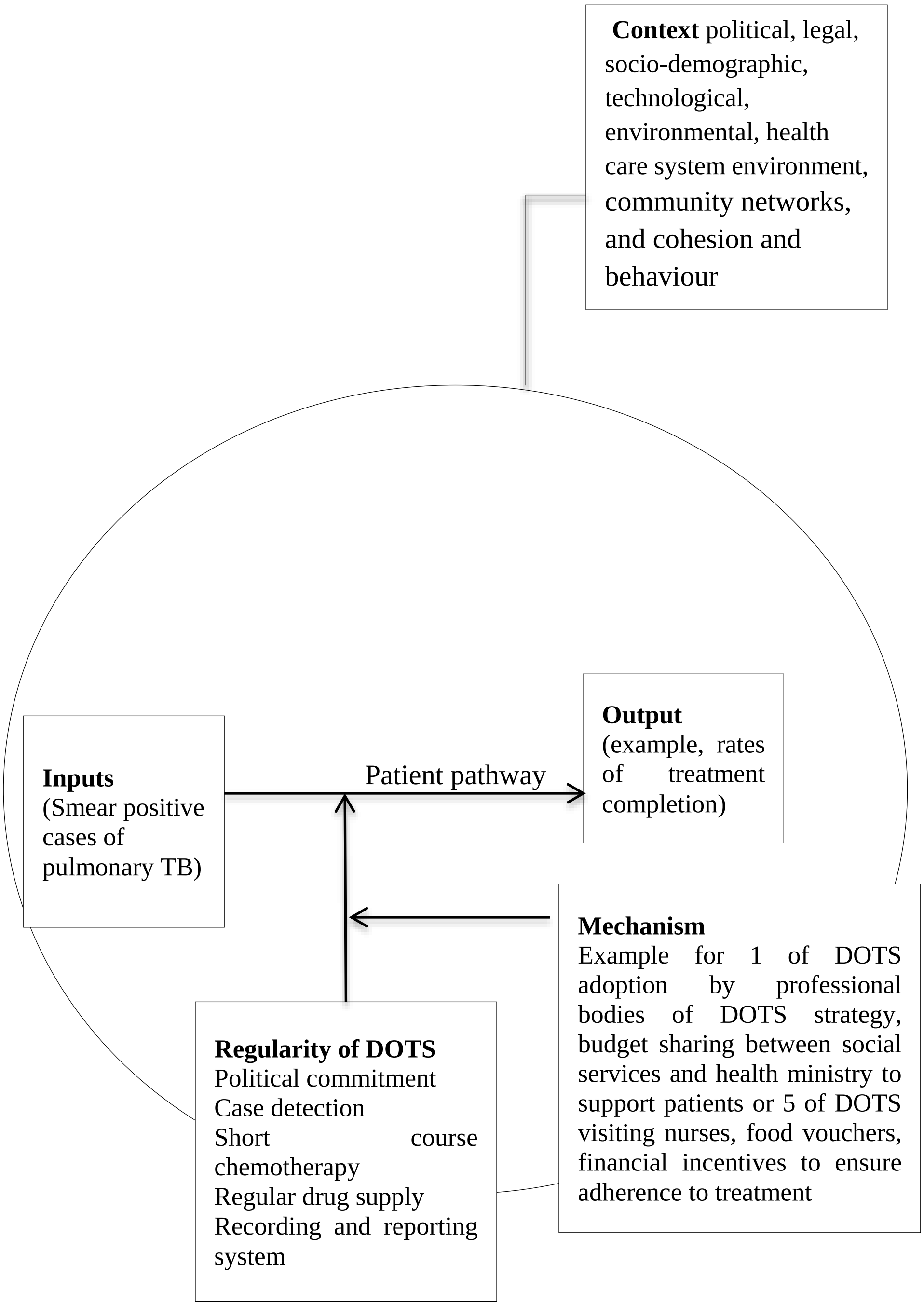

Figure 2: Framework for studying tuberculosis control programme
Source: Coker, Atun and McKee (2004)

In 2010, Coker et al (2010) proposed another model, taking into consideration the extent of epidemiological problem of a specific disease that required an intervention. Traditionally, programme theorists have been interested in what works and does not work when assessing programmes (Coker et al., 2010). The framework Coker and his colleagues advanced go a step further by questioning why a programme works, for whom and in what circumstances. The model has six key elements for effective analysis. The elements are context, epidemiological problem, intervention, mechanism, outputs and outcomes.

The context embraces political, legislative, social, economic and technological environments within which communicable disease control programmes operate. This environment may be global, regional, national or local. These contextual elements may also be drivers, that is, forces that operate to provide the initiative, resources and energy for the control of communicable diseases. Together, these components constitute the enabling or constraining environments, the foundation upon which a programme's success or failure ultimately depends (Coker et al., 2010).

The epidemiological problem refers to infection levels and various disease characteristics. For example, this might relate to upstream risk factors such as the emergence of drug-resistant strains of TB or HIV, or clusters of diseases in settings such as prisons and other institutions.

The third component is the intervention intended to serve public health. For example, in TB control this could be the DOTS strategy and its respective components. For HIV, this might be the use of pain reduction, needle exchange and the use of antiretroviral therapy (ART).

The fourth element is the mechanism by which interventions are delivered. It is the mechanisms within a programme, that are of critical interest compared to others to make interventions operational. Interventions are often the focus of much evidence, through randomized controlled trials. For example, regular supply of quality-assured anti-TB drugs (the intervention) is a prerequisite for an effective control programme.

The fifth element of the conceptual framework relates to outputs, which are expected to be public health concepts that can be measured or determined. These include equity, acceptability, efficiency and effectiveness of the control programmes as a result of interventions. In a successful and sustainable programme, these outputs ideally result in outcomes, such as reduced incidence of disease or decreased mortality. Finally, the level of working link between the five main domains result in outcomes: whether TB rates have declined, stabilised or increased.

Although the model provides much details of how, why and under what circumstances programmes can work, two important dimensions of what makes communicable disease programmes effective are health system functions and integration. Health system functions are broadly categorised into stewardship and governance, financing, planning, service delivery, monitoring and evaluation and demand generation (Atun et al., 2004).

Depending on the kind of programme integration (vertical or horizontal) preferred, one or more of the health system functions could be integrated into an existing health system or another health programme of shared vision.

This framework has been adopted for the study based on its comprehensiveness. Its choice rests on the fact that the model is flexible and allows for manipulation to suit varying contexts. Again, the model draws on globally accepted strategies (expansion and enhancement high-quality directly observed treatment short-term course, addressing TB/HIV, multi-drug resistance and needs of poor and vulnerable populations, health system and TB, engagement of service providers, empowerment of people and communities living with TB and promotion of operational research) for controlling TB in a country, regional and sub-regional context. Consequently, the three broad objectives of this study, which are to conduct a time-space investigations of TB control in Ghana (Gold Coast) from 1900-2010, examine the perceptions of Ghanaians towards TB transmission and treatment and discuss some major strategies for TB control in the country, makes the use of this framework reasonably practicable. It is originally based on the old DOTS framework, which is essentially limited to expanded DOTS. The study is principally limited to three of the six interventions; expanded DOTS, TB/HIV, MDR and needs of vulnerable populations and engagement of all service providers.

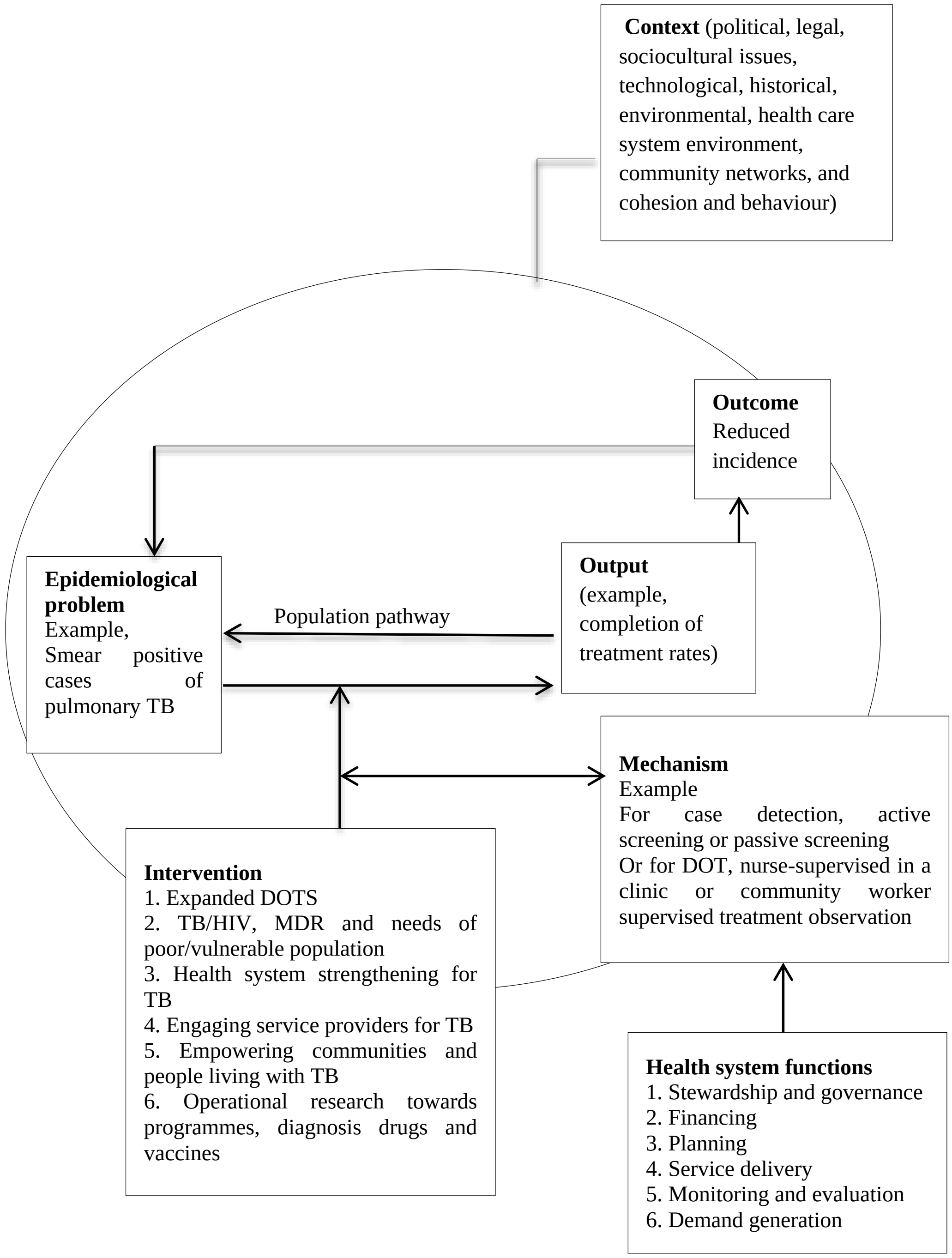

Figure 3: Framework for tuberculosis control programme analysis
Source: Coker et al., 2010

Discussion

This chapter covered three broad areas: the first part dealt with some theories about causes of diseases. The second part concentrated on models/theories of social policies that can be applied to discourses on disease control and the third part focused on concepts of sustainability and integration as well as some frameworks for TB control.

The review of theories of causes of diseases in populations showed that the conceptions about origins of diseases are complex and probably cannot be explained by one particular model. This is because the premise of each school of thought is valid on the basis of prevailing body of knowledge. As Nicolaus Copernicus (1473 - 1543) pointed out, truth is what is considered to be the reality based on prevailing body of knowledge. On such basis, one cannot categorically disclaim specific concepts about diseases as irrelevant. They can only be refuted based on acceptable evidence against them. Similar contestations and acceptance have characterized theories of causes of diseases.

At one point, the scientific community upheld the miasma theory, which argued that diseases arose from bad air and that was considered the sole origin of all causes of diseases. Following continuous research, the germ theory became acceptable towards the end of the 1800s, based on pioneering works of Koch, Pasteur, Snow, Budd among others. It was based on the soundness of the germ theory that the bacteria causing TB, bacillus was discovered. Since that, bacillus has become the accepted cause of TB, although several variants of TB such as bonvine, MDR-TB and XDR-TB are known currently.

Personalistic concepts of causes of disease have prevailed and may continue for sometime owing to how they are embedded in cultural epidemiology of diseases. Personalistic views may be considered metaphysical and such cultural interpretations have been found to be relevant for disease control in some cases. For instance, Gyapong, Gyapong, Adjei, Vlassof and Weiss (1996) observed that cultural or metaphysical interpretation of lymphatic filariasis is as important to preventive efforts as biomedical strategies. For diseases that have high personalistic interpretations, relying solely on biomedical pathways for control efforts may not lead to expected results. Personalistic views, which sometimes push people infected with TB to resort to folk and faith-based medicines account for the inclusion of all available health service providers in the current strategies for TB control. This kind of inclusiveness is particularly important in countries where personalistic interpretations of diseases are common (for example, see Dodor & Kelly, 2009).

Current views about causes of diseases have, however, moved beyond mono-causal interpretations to more pluralistic views. Pluralistic or multi-causal theories accept mono-causal but go further to argue that diseases arise from a complex mix of environmental (social and physical) and individual level factors. By this logic, disease control programmes have to be broad in perspective. That is, while disease control interventions seek to block the agents of diseases, which are the basic principle of clinical epidemiology, it is important that the social contexts (i.e. social epidemiology) within which the agents can thrive are equally held in check. It is based on these propositions that models such as political economy of health/disease and psychosocial become relevant for discourses on disease control programmes. Focusing on mono-causal models such as the germ theory may potentially result in strategies, which are tilted towards the biomedical realm and may end being ineffective for disease control.

The multiple streams theory, both in the original and revised forms, highlight the fact that social policies emerge through problems, solutions and political streams. 'Problem' as defined in the theory provides insights into issues that societies through public opinion or expert advice consider as challenges and would need to be addressed. Either visible or invisible actors who may also be of local or international origin could influence the solutions. In a setting where lack of resources compels local problems to be solved with international actors, sustainability could be a problem. As Shiffman (2009) pointed out, health policies in resource-constraints that rely disproportionately on external actors are not likely to be sustainable.

The punctuated equilibrium theory shows how periods of stability and instability affect disease control programmes. For biomedical and socioeconomic reasons, a particular intervention may hold sway for a period of time, but, depending on the actors involved, series of burst and instability may cause disequilibrium to a particular programme. For example, the various eras and paradigms which TB control programmes have gone through provide evidence to support the punctuated equilibrium theory, and this study examines some periods of stability and instability in TB control in Ghana and factors which might have led to such observations.

The street level bureaucratic model of Lipsky directs our attention to how middle-level employees of institutions can alter public policies from time to time based on prevailing circumstances. The gradual but consistent alteration of policies, over time, becomes substantive or operating regulations for institutions. Although unstated, the theory appears relevant in an atmosphere of weak institutional monitoring such as within the Ghanaian health system (see, Agyepong & Nagai, 2011). A number of interventions currently exist for the control of TB in the country and without proper monitoring of intended policies; middle level bureaucratic tendencies may drive the interventions. Nonetheless, these propositions are not intended to suggest that bureaucratic alterations of policies are always negative: there could be occasions when changes made by the bureaucratic may be based on practical considerations, which policy makers could not have envisaged.

The rational choice model draws on economic rationalisation principles, wherein the argument is made for cost-effectiveness analysis. Cost-effectiveness analysis is made on which aspects of public health where much resource investments would be needed. In resource constraint settings, this kind of approach is useful since it allows resources to be spent on diseases that pose high burdens of disability-adjusted life-years (DALYs) and years of life lost to disability (YLL). For instance, with TB having a disability weight of 0.271 (0.264-0.294), compared to HIV patients who are not on ART (0.505)

(WHO, 2008c), the later would receive more resources on equity principles. Between HIV and TB, the study explores perceptions about funding for both diseases and the considerations that went into such decisions.

Theoretical imperatives underlying TB status disclosure have been discussed in this chapter. The available evidence suggests that attitudes towards disclosure evoke complex psychological processes, which may negatively affect disclosure. Where individuals perceive potential stigma, there is a high likelihood that they would not be motivated to disclose status on diseases that arouse stigma. Despite that the studies reviewed were conceptually based on actual patients, this study highlights on individuals whose status are unknown. In pointing out these divergences, it is argued that such a review on disclosure provides us with a broader understanding of what may inform disclosures generally: whether real or hypothetical. In both cases, some insights can be tapped about the characteristics of individuals who are likely to disclose or otherwise.

Integration and sustainability have become closely related in the communicable disease control literature. Integration allows synchronisation of health system functions of governance, planning, service delivery, monitoring and evaluation and demand generation, all geared towards improving sustainability. Based on evidence on how integration improves sustainability, various forms of integration of particular health service function(s) have been tried. One dimension though is that the orientation and programme leaders perceptions could affect the implementation of an integrated programme.

The adopted framework for the study is based on the fact that it includes a context, epidemiologic problem, intervention, mechanism, health systems functions, output and outcome. The inclusion of context is intuitively important for this work. It helps to highlight the environment for TB control. For instance, there can be a relationship between epidemiological problem and political situation. Austere economic measures such as structural adjustment may lead to cuts in people's incomes, which could affect food consumption and, consequently, result in malnutrition. This can therefore become a risk factor for TB infection to degenerate to the disease stage.

The health system environment, socio-demographics and community cohesion, and the treatment behaviours of patients influence the functioning of a health system. For example, a patient could default in treatment when attitudes of health workers are not encouraging or motivating.

Based on the multi-perspective stance of this study, the theoretical outlook is inclined towards theoretical triangulation (Denzin, 1970). Theoretical triangulation is the application of multiple theories to examine a single phenomenon (Denzin, 1970). Theoretical triangulation allows the study of a phenomenon with multiple lenses. Mitchell (1986) added that the application of different theoretical perspectives or assumptions helps to minimize competing explanations. The perspective allows deeper analysis of issues as well as looking beyond (Banik, 1993; Thurmond, 2001; Hussien, 2009).

Although theoretical triangulation is appealing, it can lead to the generation of large amount of data. The caveat is to be able to sift through the materials for those that are relevant. In the next chapter, the sources of data as well as the analytical techniques used to undertake the study are discussed.

CHAPTER FOUR

CONTEXT, SOURCES AND METHODS OF DATA ANALYSES

Introduction

Irrespective of the paradigm (qualitative or quantitative) a study is aligned to, data and methods are important. Indicating the various sources of data and how they are analysed provides the reader with the basis for "objectively" assessing a study, particularly, whether conclusions and recommendations emerge from the data.

This chapter therefore discusses the type and sources of data including research instrument, data collection, ethical issues, fieldwork and related experiences, data analysis, which include data cleaning and actual analyses. Contextual issues such as demographic and health characteristics of the country are also outlined in the chapter.

Demographic profile of Ghana

The first Ghanaian census was conducted in 1891 with the subsequent ones in 1901, 1911, 1921 and 1931 when the 2nd World War interrupted the 1941 census. Until the 1921 census, which covered what is now considered modern Ghana, the earlier ones were limited in scope (Gaisie, 2005). The census returns since 1891 are shown in Table 3. In 1921, the population of Ghana was around 2 million. By 1960, the population was around 6.7 million, and by 1970 the numbers had risen to 8.6 million.

Table 3: Population returns of Ghana, 1921-2010

Year	Population	Life expectancy		
		Males	Females	Total
1891	764,613*	-	-	-
1901	1,549,661*	-	-	-
1911	1,503,911*	-	-	-
1921	2,486,392	-	-	-
1931	3,457,282	-	-	-
1948	4,501,218	-	-	-
1960	6,726,815	44.4	47.3	45.8
1970	8,559,313	47.8	50.7	53.0
1980	-	51.6	54.5	53.0
1984	12,296,081	-	-	-
1990	-	55.7	58.1	56.9
2000	18,912,079	57.9	59.1	58.5
2010	24,658,823	59.4	61.8	60.6

*Exclude data from the Trust Territories (Togoland)

Sources: Nsowah-Nuamah (undated); Gaisie, 2005; World Life Expectancy (undated)

Currently, the population of the country stands at 24,658,823 with 12,633,978 females and 12,024,845 males, which translates into a sex ratio of 95 males to 100 females. The population density increased from 79 per square kilometre in 2000 to 103 in 2012. Current life expectancy for males is estimated at 59.4 years while that of females is at 61.8 years, with average being 60.6 years.

Public health institutions in Ghana

The Ministry of Health (MOH) is the political institution responsible for delivering to all Ghanaians. The Ministry works in partnership with other agencies and stakeholders with the aim of improving human capital under the theme "creating wealth through health" (MOH, 2007). This is being done through development and implementation of policies that can guarantee improved health and contribute to the socio-economic development of the country. The ministry is tasked to provide and deliver humane, efficient and effective services through well-trained, friendly, motivated, and client-oriented personnel (MOH, 2007).

In 1996, the Government passed Act 525 establishing the Ghana Health Service and Teaching Hospitals. The Act made the Ministry responsible for policy formulation, monitoring and evaluation, resource mobilization and regulation of the health services delivery. There are five delivery agencies under the Act: Ghana Health Service, Korle-Bu Teaching Hospital, Komfo Anokye Teaching Hospital, Christian Association of Ghana and Ghana

Ambulance Service, and four statutory and regulatory bodies, namely Ghana Medical and Dental Council, Pharmacy Council, Ghana Registered Nurses and Midwives Council and Traditional and Alternative Medicine Council (MOH, 2007).

The Ghana Health Service (GHS) was created to assume responsibility for service delivery and implementation of the health policies and programmes designed by the MOH. To make the health sector more responsive to the needs of the people, all publicly owned health institutions and facilities are allowed plan, budget, implement, and monitor and evaluate locally activities of national, regional, district, sub-district and community levels.

As part of initiatives for reducing financial barriers to health care in the country, the Government of Ghana passed the health insurance law (Act 650). Implementation was initially at district and municipal levels but this situation changed in 2008, making it a national system. Apart from annual subscription fees paid by patrons, there is 2.5per cent tax added to Value Added Tax (VAT) system and another 2.5 per cent contribution made by clients of Social Security and National Insurance Trust (SSNIT). Despite some initial constraints the scheme has registered over 60 per cent of Ghana's population. As of June 20110, active membership of the scheme stood at 12,549,708 (National Health Insurance Authority, 2010).

Health profile of Ghana

The ten leading causes of ill health and death are largely in the Group I cause of morbidity within the framework of 2000 Global Burden of Diseases, that is, communicable, maternal, pre-natal and nutritional deficiencies. There are also indications of high numbers of non-communicable diseases accounting for mortality as shown in Table 4 (Group II). Although injuries (Group III) appear in the causes of morbidity, they do not appear in the top 10 causes of mortality.

As part of expanding and speeding-up delivery on some specific diseases, the GHS has created units within the system to facilitate promptness. These are National Malaria Control Programme (NMCP), National TB Control Programme (NTP), National AIDS Control Programme (NACP), and National Buruli Ulcer Control Programme, Expanded Programme on Immunization (EPI) and Nutrition and Malaria Control for Child Survival. The NTP was established in 1994 with a policy framework crafted within the policy of International Union against TB and Lung Diseases, following a long period of inactivity of controlling the disease in Ghana (MOH, 2007).

Table 4: Top 10 causes of morbidity and mortality in Ghana - 2008

Morbidity	Proportional morbidity rate	Mortality	Proportional mortality rate
Malaria	32.9	Malaria	13.4
Pregnancy and related complications	6.2	HIV/AIDS related conditions (including TB)	7.4
Anaemia	5.3	Anaemia	7.3
Diarrhoeal diseases	4.2	Cerebro Vascular accidents	7.3
Hypertension	3.1	Pneumonia	6.4
Hernia	2.5	Septicaemia	5.1
Gynaecological conditions	2.3	Hypertension	4.1
Pneumonia	2.0	Cardiac diseases	4.0
Typhoid fever	1.9	Meningitis	2.3
Road traffic injuries	1.6	Diarrhoeal diseases	2.3
All others	37.9	All others	41.5

Source: Ghana Health Service, 2010

Appendix 1 shows the distribution of health sector professionals by region as of 2009. The distribution shows concentration of health sector workers in Greater Accra Region, accounting for about 22.12 per cent of the 45,330 workers as of the end of 2009. This may be accounted for by the fact that the region hosts the national capital of the country, which places the region at an advantage in terms of attracting quality health infrastructure and facilities.

The distribution of health facilities on regional basis is depicted in Appendix 2. The Eastern Region has the highest number of clinics, and in terms of hospitals; the Ashanti Region has the highest. The Ashanti Region has the highest number of districts in Ghana and is the most populous region, as revealed in current and past censuses (Ghana Statistical Service, 2010). Upper West Region has the least number of health infrastructure and personnel, probably corresponding to its low proportion of national population (3%).

Sources of data

Data for this thesis was collected from four different sources. These sources were interviews with key informants of the staff of the NTP and the National AIDS Control Programme (NACP). The second set of data was collected from archival materials from the Public Records and Archives Administration (PRAAD) of Ghana and the National Archives of the United Kingdom. The third source was the TB surveillance data of the NTP. The fourth source of data was drawn from the 2008 GDHS.

Primary qualitative data

This data were used to explore views of frontline staff of NTP and NACP on some key issues on TB and HIV/AIDS control. The specific areas explored were political commitment for TB, perceptions about patterns of TB treatment outcomes, TB/HIV programme interface and public-private partnership. In-depth interviews were used to obtain information from respondents drawn from personnel engaged in TB and HIV/AIDS control at the national, regional, district and facility levels.

Guided by the principle of saturation for selecting number of cases for qualitative studies, no sample size was assigned a-priori (Charmz, 2003). Saturation is measured at a level when responses emanating from respondents do not differ substantially from earlier responses. However, theoretical limit for determining number of cases for qualitative studies differ. For instance, Creswell (1998) has recommended that 25 participants can lead to saturation point in phenomenological studies. Guest, Bunce and Johnson (2006) have observed that a sample of six interviews "may (be) sufficient to enable development of meaningful themes and useful interpretations" (p.78). A recent review of PhD studies in Britain and Ireland based on qualitative studies using saturation as the benchmark for terminating further interviewing identified between 10 and 40 respondents (Mason, 2010). None of these criteria are, however, sacrosanct as far as saturation is concerned.

At the end of the exercise, 31 persons were selected from four of the ten administrative regions in the country. These regions were Greater Accra, Ashanti, Eastern and Western regions and were selected on the basis of prevalence of TB and other socio-economic factors that influence incidence and control of TB. First, Greater Accra was selected because it houses the national response offices of NACP and NTP and it is one of the two regions that has engaged in private-partnership mix for DOTS (PPP DOTS) since its inception. Ashanti region was selected because it has the highest TB prevalence/incidence rate in the country and also a partner region with Greater Accra Region that started with PPP DOTS. Besides, other interventions such as enablers' package were first introduced in the Ashanti Region.

The Eastern Region was also selected due to its high prevalence of HIV/AIDS. Until 2011, the Eastern Region had consistently remained on the top spot of HIV rates from sentinels survey in the country. Since HIV has shown to have significant relationship with TB (Ahmed et al., 2006), the region was selected. Finally, Western Region was selected due to the high presence of gold mining activities in the region. Historically and presently, concentration of mining activities in an area has been shown to be associated with TB and recently with HIV (Stuckler et al., 2011).

In each region, the district with the highest prevalence was selected (Given, 2008). Where possible, two public and one private (where PPP DOTS existed) health facilities were selected. In addition, three national officers of NTP and two national officers of NACP were interviewed for national perspectives. Data collection and transcription started concurrently on 26th March 2012 and ended on 30th June 2012. This was done to reduce risk of memory lapses. Table 5 provides a summary of the type of officers interviewed.

The author also participated in one regional (Western Region) TB stakeholders meeting on 13th July 2012. Additional discussions were held with some of the participants to clarify some of the issues that emerged after the forum.

Table 5: Summary characteristics of respondents

Category of respondent	Number
Private facility DOTS	6
Public facility DOTS	9
District/Metropolitan coordinator	4
Regional coordinator	4
NTP Secretariat	4
NACP Secretariat	3
NGO	1
Total	31

Interview guide

For the qualitative data collection, an interview guide was developed covering four thematic areas, in addition to some background information. Background information was collected on study site, sex of respondent, respondents' status and designation, level of formal education and other training attended (Appendix 3).

In the first section, information was collected on historical issues on TB control in Ghana. Core issues explored in this section were TB control situation in the country before NTP was formally established, source of initiative and main power brokers, specific landmarks in TB control and concerns at the beginning (opposition or acceptance) and how these concerns were addressed.

The second part covered issues on current space for TB control. Major issues of concern were on mechanisms through which TB is being pursued currently; main drivers for current interventions; political commitment (in funding and advocacy); assessment of current strategic plan against former ones; obstacles to policy implementation; sustainability of existing policy framework and concerns about monitoring, supervision and evaluation.

Issues covered in the third section were on TB and HIV collaboration. Under this section information were collected on current working relationship between TB and HIV (thoughts on concept for operation between the two institutions - collaboration or integration), resource mobilisation, and potential areas of conflict as well as challenges and how these could be addressed.

The final section was on views of respondents on public-private mix (PPP) DOTS for TB control. Issues in this section were level of involvement of private health institutions in TB control, expectations of PPP DOTS now and in future, assessment of current performance of PPP DOTS and how it can be utilised for effective disease control, and, finally, the way forward for the partnership.

Pre-testing of interview guide

The interview guide was pre-tested in the Central Region. The region was selected because it shares boundaries with Greater Accra, Western, Eastern and Ashanti Regions. Through the pre-testing, the instrument was refined. For instance, during the pre-testing, issues about fixed-dose combination therapy were brought to the fore and it served as a probing question during discussions on landmark events in TB control in Ghana. The pre-testing was done on 19th March 2012.

Archival materials

Historical materials were collected from Public Records and Archives Administration (PRAAD) of Ghana. Archival files from which information was collected were CSO and ADM 5-8. All annual reports of Sanitary/Medical and Health activities as well as those of the General Annual records available in the archives from 1890 to 1960 were searched, first for materials on health before narrowing to TB. The time span was terminated at 1960 because beyond that period, no substantial records on health were noted. Discussions with some of the archivists of the National Archives indicated that following Ghana's republican status when all administrative ties with the British were severed, there were dramatic changes in record keeping on general social issues such as health. Attention to record keeping began tilting towards court and commission proceedings and this practice remains to current times.

Another source of information was collected from National Archives of the United Kingdom. Available materials on health and TB are limited to the pre-independence era. In accessing information from the UK archives, an abstract of the study was initially sent to the Record Copying Director. Following his review and approval, all Internet linkages to their database containing information on "phthisis" "consumption", "TB", "Gold Coast", and "Ghana" were forwarded to me and each of the links was tracked to access the title of those documents and their suitability for the study. There were some documents that were excluded since the contents were unrelated to TB. For instance, there were some materials that were related to cocoa consumption but they were in the search results.

Tuberculosis surveillance data

As indicated earlier, another set of data was collected from the NTP head office. The NTP has collected data on reported TB cases in the country since 1994 but because the first two years (1994 to 1996) were used for preparatory test runs, there are concerns about the quality of data for the first two years. Data for 1994 to 1996 have therefore been excluded from the analysis.

The data set had information on treatment outcomes: cure, completed treatment, died, treatment failure, and treatment default. A person is considered cured when he/she completes all prescribed doses and is documented to have recorded two or more consecutive negative cultures after six months of starting treatment. Completed treatment occurs when all prescribed doses are adhered to but there is lack of bacteriological proof of cure due to patient's inability to produce sputum. A patient is considered to have died from TB after receiving at least one week of anti-TB medications, with TB as the major cause of death, or death as a result of toxicity of anti-TB medications. A case is considered to have 'failed' if there is a presence of positive culture for M. TB after four months of treatment. Treatment default occurs when treatment is interrupted for two or more consecutive months after initiation of treatment. All the TB treatment outcomes used in this study existed by year and region.

Ghana Demographic and Health Survey, 2008

The 2008 edition of GDHS is the most recent of five surveys carried out since inception of demographic and health surveys in 1987/88. As a precursor to a planned nation-wide TB prevalence survey, a module on TB was incorporated into the 2008 survey. The main themes incorporated were modes of TB transmission, knowledge of availability of cure and attitudes towards status disclosure. Some other basic socio-demographic characteristics that are usually collected in Demographic and Health Surveys (DHS), and which have been used in this study, were age, marital status, formal education, religion, ethnicity, wealth scores, spatial distributions (urban-rural and region of wealth) and exposure to media (television, radio and newspapers).

The GSS conducted this survey in collaboration with MEASURE DHS. The survey was a household survey based on probability sample of 12,323 households across the country. The survey started from 7th September and ended on 25th November 2008. A multi-staged sampling was used. The first stage of the sampling involved a selection of 412 clusters based on updated enumeration areas of the 2000 Population and Housing Census (Ghana Statistical Service, Ghana Health Service, & ICF Macro, 2009). The second stage ensures representativeness. During the survey, one cluster was dropped due to security concerns. At the end, 4,916 females and 4,546 males responded to the questionnaires (GSS et al., 2009).

Permission to use GDHS was sought from MEASURE DHS, copyright owners of DHS data from various countries. In line with MEASURE's requirements for data access, a concept paper outlining the scope of the research was assessed and approved by MEASURE DHS. The Ghana Health Service ethics committee provided ethical clearance of the 2008 GDHS. The data is publicly available on request.

Fieldwork

In November 2011, discussions were held with the programme managers of NTP and NACP about feasibility of including staff of the programme in the study and I followed-up with a copy of the proposal for the approval of the manager. The work was accordingly given the full support of NTP. This initial support from the head office was transmitted to lower levels of NTP and NACP. The monitoring and evaluation director at NTP was nominated by the manager to assist in releasing existing NTP surveillance data as well as facilitating appointments with regional and district coordinators. Contact information about all regional and district coordinators were provided and these were used to set-up appointments for interviews. At the regional level, another permission was requested for and obtained from regional health directors due to integrated TB control approach being practiced. In cases where respondents were attached to hospitals, permission was sought from district/municipal/metropolitan health directors before proceeding to interact with district coordinators. At the clinic and hospital levels, introductory letters provided by district directorates of health were shown before staff of the service was interviewed. The study protocol was reviewed, and approved by the Institutional Review Board of the University of Cape Coast.

Experiences from the field

Generally, targeted participants accepted to be interviewed. However, there were some challenges and opportunities that require mention. First, some respondents felt uncomfortable and suspicious about motives for this study. Some respondents felt that the study was going to be an assessment of NTP, and this made them uncomfortable, especially at the facility level. Thus, one could guess from the body language in some cases, during the interview and de-briefing after the interview.

Another issue that emerged was cancellations of interview appointment. In one instance, the officer was not available for the interview and the appointment had to be rescheduled. Although it was conducted finally, it affected the schedule of work. One respondent also refused to be tape-recorded.

In general, respondents were cooperative and were found to be confident about their responses. Besides, the cooperation of NTP national officers provides enough opportunities for research on TB.

Data quality concerns

Relevant concerns over data quality in social studies mainly hinge on validity and reliability. Until recent developments in social science research, validity and reliability had remained largely within quantitative research cycles. However, similar concerns have emerged in qualitative data where interests over validity and reliability are usually related to quality or trustworthiness of research findings. The areas of concern are credibility or trustworthiness (accurate description of participants views), transferability (usefulness of findings to theory), auditability (clearly stated research processes to allow critique of other researchers) and confirmability (findings reflect informants ideas and experiences as opposed to preferences and characteristics of interviewer) (Lietz & Zayas, 2010). Practical steps recommended to achieve trustworthiness or quality include member checking, thick descriptions, peer debriefing, reflexivity and negative case analysis, amongst others (Padget, 2008; Shenton, 2004; Lincoln & Guba, 1985). Of these strategies, peer debriefing, thick descriptions and member checking were used to improve credibility of the qualitative section of the study. For instance with reference to member checking, three respondents were arbitrarily selected to read through their transcripts and comment on the write-up. In all cases, respondents made just minor revisions to the transcribed responses.

Data analysis

Existing quantitative data

Three dependent variables were extracted from the 2008 DHS data. These were myths and misconceptions about TB transmission, attitudes towards TB status disclosure and knowledge about availability of cure for TB. With respect to the transmission variable, five related questions on views about transmission were used to generate one dependent variable called myths and misconceptions. Picou et al. (2011) defined myths and misconceptions as ideas held to be true but are, actually untrue. The five questions used were: whether one can be infected with TB through sharing utensils, sexual contact, mosquito bite, sharing food and touching an infected person. Responses to these five items were dummy-coded ("Yes", "No") and used to construct an index to tap respondents' knowledge on circumstances under which TB could be transmitted. A final myths and misconception variable was constructed with "1" representing no misconception and "0" representing misconception. A respondent was considered to not have misconception if he/she answered "no" to all the five questions. A "yes" to at least one of the questions meant misconception. This transformation yielded a dependent variable to measure myths and misconceptions about the transmission of TB. The remaining two dependent variables, attitudes towards status disclosure and knowledge of cure for TB were dummy coded 1=yes and 0=no. In terms of attitudes, respondents who indicated that they would tell other relations if they became infected with were considered as having positive attitudes or otherwise.

With respect to each dependent variable, missing returns were excluded from the analysis, and, in each case, a bivariate model that involved a main independent variable was estimated and a second model, a multivariate, which included other co-variants, was estimated. This was done to assess the level of interaction among the variables. Separate analyses were done for males and females due to difficulties in merging male and female GDHS data. The main independent variable used for all the outcome variables was region of residence. The rational was to contribute to identifying regions that will require more emphasis on TB education. Even though ecological fallacy can arise from such an analysis by treating the respective regions as homogenous, among the various independent variables in the data set, region appears to be an important variable that can be used easily for audience segmentation in policy and programming. Other independent variables that were used for estimating equations for transmission, disclosure and cure were type of settlement (rural-urban residence), religious affiliation, ethnic background, level of formal education, household wealth index, age of respondent and exposure to radio, newspapers/magazines and television.

In order to make the analysis manageable, some of the independent variables were transformed or recoded. This was done to make those variables practically and conceptually sound. For instance, in terms of religion, those who identified themselves as Catholics, Presbyterians, Methodist and Anglicans were coded into “Orthodox Christians”, Pentecostals and Charismatic Christians were also merged into one category given their similarities. The non-religious and traditionalist were merged to generate the “Others” category. With respect to ethnicity, the four dominant ethnic groups in Ghana - Akan, Mole-Dagbani, Ewe, and Ga-Dangme were maintained while smaller groups including Guans, Gruma, Mande, Grussi and other unsolicited groups were put together to form the “Others” category.

Level of formal education obtained was reduced from four categories to three that is, no formal education, primary and secondary or higher. Higher formal education consisted of senior secondary school and tertiary formal education. This was done due to small numbers of those who had attained tertiary formal education.

Household wealth was also recoded into three categories: poor/poorest, average and richer/richest. The regrouping of wealth status into three, thus putting poor and poorest together on one hand and richer and richest on the other was to increase statistical power. This was because preliminary test-run of the data did not yield any differences among those at the two extremes (poorest-poorer and richer-richest). This naturally increased the frequencies (*N*) of the new categories that help to strengthen size effect (Seltman, 2012). Marital status was coded into “never married”, “currently married”, and “formerly married”. Currently married consisted of respondents in informal and socially sanctioned unions while formerly married respondents consisted of those divorced, separated and widows/widowers. Exposure to the three channels of media was coded as “no exposure”, “moderate exposure” (less than once a week or at least once a week) and “high exposure” (almost every day).

Two closely related statistical techniques were used to analyse the GDHS data, namely logistic and complementary log-log regression. Logistic regression was used to analyse the variable on knowledge about transmission of TB. This was based on initial manipulation of the dependent variable, which did not give clear indications of asymmetry.

However, complementary log-log regression was used to analyse knowledge about availability of cure and attitudes about TB status disclosure due to the presence of asymmetric distribution (Long, 1997). Except among females, where respondents with positive attitudes towards status disclosure were about a third (32%), the rest of the outcomes (males positive attitudes towards disclosure: 20.34%) as well as knowledge about transmission of TB (males: 5.28%; females: 8.73%) (Table 6) showed traces of asymmetry.

Using binary logistic regression to model an outcome variable that shows asymmetry overestimates the odds ratio and therefore leads to distortions. But just like probit and logit functions, the two allow estimations on dependent variables with categorical and continuous predictors and has an in-built statistical power, which helps to overcome restrictive assumptions of ordinary least squares (OLS) regression, which often requires an outcome variable measured with either interval or ratio scales (Hosmer & Lemeshow, 2000; Hair et al., 2006). Modelling of variables was done sequentially. The distribution of the various outcome variables for both males and females are shown in Table 6.

Table 6: Dependent variables for tuberculosis perception analysis

Dependent variables	Males		Females	
	N	%	N	%
Misconception				
No misconception	2,977	66.75	3,376	66.13
Misconception	1,591	33.25	1,540	33.87
Attitudes towards disclosure				
I will disclose	3,236	79.66	2,760	67.72
I will not disclose	822	20.34	1,332	32.28
Can tuberculosis be cured?				
Yes	224	5.28	344	8.73
No	3,695	94.72	3,488	91.27

Source: GDHS, 2008

During the analysis, attention was paid to the nested nature of individuals in the DHS sample. For instance, a selected household may have more than one qualified respondent and therefore share similar household characteristics such as wealth. This somewhat creates challenges of independence of samples assumption under regression models. Consequently, survey analysis approach that takes into account clustering of samples was employed to obtain robust standard errors in each of the equations. Survey weights were applied to all the analyses to correct for the effects of over and under sampling associated with large national surveys such as the DHS. In nationally representative surveys, some areas over sampled while others are under sampled coupled the possibility of non-response, In the DHS surveys, this arises from because of unequal probability of selection that is also informed by the need to expand the number of cases available to reduce sample variability for certain areas or subgroups for which statistics are needed. This calls for application of weights to statistical tabulations to produce the proper representation. Individual (women and men) weights used in the GDHS were obtained by multiplying household weight by the inverse of the individual response rate of her individual response rate group (Rutstein & Rojas, 2006).

With respect to the five TB treatment outcomes, Poisson regression was used to assess incident risk ratio. Due to the count nature of the data, Poisson was considered the most appropriate. The other alternative for count data is Negative Binomial regression, which becomes useful when the data set is much dispersed. However, preliminarily testing of the data did not yield any evidence of dispersion. The choice of Poisson is again justified since all the treatment outcomes were not normally distributed, which imposes another constraint on using any other parameter estimators. All the statistical analyses were carried out in STATA (College Station, Texas, 12th Edition, 2011).

Analysis of primary qualitative data

All the qualitative data were tape-recorded. Each tape was transcribed and care was taken to ensure that intended views of respondents were not misreported. After transcription, texts were printed out and edited. Transcription was done immediately after the interviews in order to avoid memory lapses. Data were analysed manually. The transcripts were read several times to generate themes. Inductive coding was used to define codes. That is, instead of relying on predefined codes and categories, an emergent thematic coding was used. Thick descriptions were used to support observations.

Content analysis of historical records

Inductive content analysis, which focused on who was telling the story, where it happened, when it happened, what happened and why it happened, was used to analyse the historical materials collected (Hsieh & Shannon, 2005). In terms of philosophy, this approach to data analysis is aligned to hermeneutic paradigm, where attempts are made to understand text and context of existing published and unpublished materials (von Zweck, Paterson & Pentland, 2008).

The written material was read repetitively, and as many relevant notes as possible were written in the margins to describe all aspects of the content. The headings were then collected from the margins on to coding sheets and themes were freely generated. After this open coding, the lists of categories were grouped under higher order headings (Elo & Kynga¨s, 2008). The aim of grouping data was to reduce the number of categories by collapsing those that are similar or dissimilar into broader higher order categories. But as Dey

(1993) points out, creating categories is not simply bringing together observations that are similar or related. Instead, data are only being classified as ‘belonging’ to a particular group and this implies a comparison between these data and other observations that do not belong to the same category. The purpose of creating categories was to provide a means of describing the phenomenon, to increase understanding and to generate knowledge (Cavanagh, 1997).

Discussion

Two kinds of data, quantitative and qualitative, were considered appropriate to answer the study’s questions. The quantitative data were extracted from the 2008 Ghana Demographic and Health Survey and TB surveillance data from the NTP database.

The DHS data was found useful for the analysis of perceptions TB, knowledge of cure for TB and attitudes towards disclosure when infected among Ghanaians. This source was used due to the high quality of the data it provides as well as its usefulness for national studies. The data is also representative of the Ghanaian population, although it is limited to males and females between the ages of 15 and 59 years and 15 and 49 years respectively.

The second source of quantitative data from the NTP was relevant for the study to the extent that it covered a relatively long period (1997-2010) of data points. This made it possible to isolate periods the NTP performed well by determining the statistical significance of those outcomes. The main weakness of the data is that socioeconomic and demographic details are not attached to the data set, except information on region and year of surveillance. Nevertheless, the regional information was useful for identifying differences in treatment outcomes by region.

Two types of qualitative data, one collected through in-depth interviews and the other based on existing historical materials were used. These sources provided valuable insights into past and present motivations for TB control, with implications for future programmes and interventions.

The study relied on both positivism and interpretivism research paradigms. It was based on the positivist ideology that quantitative data from the GDHS and NTP were used as means of describing knowledge, attitudes towards status disclosure, knowledge of cure for TB and treatment outcomes by year and regional distribution. A blend of two variants of interpretivism, hermeneutics and phenomenology, were also utilised. Heidegger (1962) first conceptualised hermeneutic research, arguing that through interpretation of texts, researchers are able to move beyond simple description to tease out apparent meanings of text. This approach was found useful since it contributed to making sense of historical materials whose meanings were not immediately apparent. The phenomenological interpretivism (Finlay, 2009) was relied on to explore lived experiences of frontline personal of NTP and NACP as far as the control of the two diseases were concerned. The combination of positivism and interpretivism gave the study a pragmatic orientation, which points to the assumption that logic of justification is reasonable than the logic research paradigm (Johnson & Onwuegbuzie, 2004)

Overall, the triangulation of these two research orientations resulted in a mixed method study. Mixed method research allowed a combination of elements of qualitative and quantitative research approaches for the purposes of breadth and depth of understanding (Johnson, Onwuegbuzie & Turner, 2007). These methods were employed concurrently (Creswell, Plano Clark, Gutmann & Hanson, 2003) to allow for simultaneity, inclusiveness, pluralism and complementarity (Biesta & Burbules, 2003; Johnson & Turner, 2003).

CHAPTER FIVE

TUBERCULOSIS IN GOLD COAST/GHANA: TIME AND SPACE PERSPECTIVE

Introduction

Due to the lethal prognosis of TB, wherever it has been recorded, sustained efforts are often made to control its impacts. As has been shown (Daniel, 2006), the discovery of the first chemotherapy around 1944 marked the beginning of a paradigm shift, from mainly social control (for example, segregation) to chemotherapy. Following these successes, the fight against TB almost went into hibernation. However, the epidemic of HIV/AIDS in the late 1980s and peaking to epidemic levels in early 1990s revived attention to TB.

The focus of this chapter is to examine historical dimensions of TB distribution in the Gold Coast/Ghana, juxtaposing that into the patterns noted in the country since the second half of 1990s. It attempts to identify spatial characteristics that could have sustained the patterns observed. It is meant to reconstruct the past in an attempt to understand the present strategies, and to project into the future.

Tuberculosis control in Ghana: 1900-1960

The demography student interested in studying morbidity and mortality history of Ghana is usually faced with the question of quality and quantity of data available in reconstructing the past. This challenge, according Dumett

(1993), is borne out of two constraints. The first is the selective nature of historical records. Those involved in recording events were selective based on their perception (street level bureaucracy, Lipsky, 1980). The second challenge, which arises from the first, is gaps in data and information. These two factors combine to constrain the nature of data available in terms of quality and quantity.

Nonetheless, the available data suggest that TB is believed to have emerged on the public health landscape of the country through two major entry points - contact with Europeans from the south and Arabic and Semitic tribes trading in the north (Dumett, 1993). Macfie (1902) observed: “phthisis (TB) is also very common and very fatal, particularly in those parts of the colony that have been Europeanised. The disease is not new to the country, (sic) although in some localities it appears to be on the increase …” (p. 159).

Public health management then was limited to the Europeans and at best highly segregated along social status - Europeans, African elites and indigenous Africans (Tsey & Short, 1995). Due to the interest of the colonial administration on the mineral wealth or the colony, mining areas were given priority in the reports of TB.

This is reflected in a letter from Dr Jupe, Medical Officer at Tarkwa to the Secretary of Mines in August 1912. In the letter, he noted: “in response to your request, I am laying before you the following facts with regard to pneumoconiosis in this district … At an autopsy held on an European, whose death was subsequently certified as due to another disease, pneumoconiosis was observed to be present … A similar case was with a native. On the 20th of July (1912), I certified the death of a native - after holding an autopsy to be due to miner's phthisis" (Gold Coast Colony, 1941, p. 2).

Similarly, a Medical Officer at Prestea mines indicated phthisis to be a relatively depressing condition among residents. In this instance, the problem of phthisis was seen to be generic rather than specific to miners alone. He observed: "it is certain the phthisis is on the increase … from the autopsies I have been able to carry out, the appearance of the lung indicated to me a simple TB condition of the lungs, rather than TB grated on the "miners lung" (Gold Coast Colony, 1941, p. 3).

Not much was done during the World War I period (1914-1918) concerning TB until the mid 1920, when the colonial office commissioned investigations led by Professor W. J. Simpson, of the London School of Hygiene and Tropical Medicine (LSHTM) into the health and sanitation issues in Gold Coast. Among other things, the report indicted the colonial government for failing to provide broad-based health services for both Africans and Europeans. Prior to the report, health statistics were limited to only Europeans working in the colony, Ashanti and the Northern Territory. Following Simpson's report, the colonial government and mining companies such as Ashanti Gold Company (AGC) and others operating around Tarkwa began including Africans in annual medical reports. Simpson's report was damning of the colonial government's attitudes towards the health of Africans. Five major conclusions were drawn in the report (Simpson, 1924). However, for the purposes of this thesis, aspects of the report relevant to TB are highlighted. Simpson observed: “unscrupulous company agents recruited unfit workers from the Northern territories - many showing sings of TB who then collapsed under the strain of gruelling underground work at the mines” (Gold Coast Medical and Sanitary Department, 1925, p. 21).

TB and other respiratory diseases (example, pneumonia) were the second prevalent causes of mortality along the coast and mining communities in particular. Although there is no recorded evidence of prevalence of TB in the northern territories up till 1920s, one can infer its existence in the north on the basis that some labourers recruited from the northern territories arrived at the mines frail, showing signs of TB.

Research later showed that the long walking journey from the north exposed many of these labourers to the TB bacteria. People from the northern territories working in the mines were found to be more vulnerable to respiratory diseases including TB, than their counterparts from the coast, probably due to the long Harmattan they experienced (Dumett, 1993). In the 1920s, death rates among Africans working in the mines in the Ashanti Protectorate and the Western Province hovered around 12/1000, while deaths in the Northern Territories was around 75.2/1000 and 60.48/1000 in 1923-24 and 1924/1925 respectively (Dumett, 1993).

In 1924, the Guggisberg administration implemented some reforms, which aimed at reducing deaths among various populations and in particular those around the mines. Some of the reforms were: (1) medical screening of prospective miners, (2) rejection of recruits found to be weak, (3) provision of railway links to the mines, (4) registration of all recruits upon arrival and (5) introduction of government permits before one could engage in the recruitment of labourers from the north (Guggisberg, 1924).

Overall, deaths disproportionately affected more men than women. In Selwyn-Clarke's report to the Colonial Office, he observed: "the higher death-rate amongst males noted previously is probably accounted for by the large influx of labourers of relatively poor physique from neighbouring territory which takes place annually, and by the greater hazards run by this section of the community" (Selwyn-Clarke, 1931)

Reported TB cases for four towns for which data are available are shown in Table 7. Reported cases were lower in Accra, the main city, than the smaller urban centres then. It is very likely that the presence of comparatively better-developed housing facilities, concentration of health personnel (foreign and local) as well as better socioeconomic conditions contributed to the lower levels TB mortality in Accra. Chemotherapy had not yet been developed and so medical activities could not have accounted for the differences. Occasionally, sick patients were isolated to prevent further infections (Patterson, 1979).

Between 1931 and 1933, TB was the second highest cause of reported mortality, ranging from 2.4 per cent in Koforidua to 25 per cent in Tarkwa (Patterson, 1979).

Table 7: Tuberculosis mortality from 1920-1938 - per 100,000 populations

Year	Accra	Kumasi	Sekondi	Cape Coast	Total cases
1920	241	110	240	320	-
1921	140	30	420	210	-
1922-23*	179	20	310	190	-
1923-24*	188	-	300	390	411
1924-25*	169	-	320	220	414
1925-26*	186	-	300	360	571
1926	184	-	300	400	698
1927	189	-	350	250	910
1928	135	210	370	170	1151
1929	181	160	290	200	1175
1930/31	135	340	300	290	1149
1931/32	169	-	-	-	1180
1932	157	-	-	-	-
1933	192	-	-	-	-
1934	194	-	-	-	-
1935	179	-	-	-	-
1936	193	-	-	-	-
1937	177	-	-	-	-

Table 7 continued.

1938	182	-	-	-	-
1939	-	-	-	-	-
1940	-	-	-	-	-
1941	-	-	-	-	-
1942	-	-	-	-	-
1943	-	-	-	-	-
1944	-	-	-	-	-
1945	-	-	-	-	-
1946	-	-	-	-	2509(98.8)[¥]
1947	-	-	-	-	2848(107.8)[¥]
1948	-	-	-	-	3156(76.7) [¥]
1949	-	-	-	-	3368(68.8) [¥]
1950	-	-	-	-	3150(64.4) [¥]
1951	-	-	-	-	3068(38.6) [¥]
1952	-	-	-	-	2947(64.1) [¥]
1953	-	-	-	-	3153(41.9) [¥]

Source: Patterson, 1979; Report of the Ministry of Health, 1953
^After 1930, mortality in all urban areas was aggregated except Accra. There is contradictory evidence on the actual point at which data aggregation started as Dumett (1993) and Patterson (1979) give different versions.
*Fiscal year started from April 1.
[¥]In parenthesis is proportional mortality

Factors that were highlighted to have resulted in the high trends of TB in Gold Coast within this period included poor housing, overcrowding, exposure through non-observance of rudimentary health laws and complete lack of immunity against TB bacteria. Of peculiar concern within this period were the harsh micro and macro economic conditions, which could also be traced to the hold-up of several tonnes of cocoa due to pitiable world market system (Selwyn-Clarke, 1931).

As could be noted from Table 7, reported TB increased and remained consistently high after 1925. The observation of increasing reported cases of deaths attributed to TB led to a number of measures. Among them was the expansion of births and deaths registry to include non-African workers of the colonial government and the enforcement of regulations on the disposal of dead bodies under the Births, Deaths and Burials Ordinance of 1925. Apparently, these measures were intended to have a clearer picture of the burden of TB in the country, which would form the basis of any social intervention.

In 1928, a request to the Colonial Government to fund the construction of sanatoria was declined. The total amount requested to be included in the 1928-29 budget was £29,550 and additional £4,336 for hiring of personnel and maintenance for the first year. The reason for rejection was captured in a memorandum Dr W. G. Watt (Deputy Director of Medical and Sanitary Services) wrote to the Colonial Secretary on 7th November 1928 (Gold Coast Colony, 1928) stated in part:

"It is considered that under the conditions presently in this colony, it would be premature to initiate an expensive ad hoc anti-TB campaign. With attention to the housing conditions and general sanitation, it is felt that this disease can be kept within reasonable limits - its eradication is impossible, and money spent on improving the general standard of public health will do more good in the long run than that spent on sanatoria. Even in Britain, only early cases can be expected to recover economic independence, cases in the later stages are cases which practically need periodical assistance both medical and, though perhaps indirectly, financial. Here this disease is generally fatal within a few months, and the only obvious conclusions is that what is wanted is a ward or building attached to Government Hospitals where these unfortunates can be allowed to die under comfortable surroundings for themselves and safety for the general community, since the average native house and mode of life are ideal for spread of this disease" (p. 23).

In 1932/1933, 96,480 infectious diseases, which constituted 39.7 per cent of all in-patient and outpatient cases in the country, were recorded. Of the total infectious diseases, TB constituted 1.3 per cent of treated cases, and 29.1 per cent of the 560 deaths arising from infectious diseases registered in the Gold Coast (Gold Coast Colony, 1933). Following this grim picture, the government decided to take measures to tackle the TB problem, especially in the mining areas (Gold Coast Colony, 1936). It was indicated: "a close watch is being kept on sanitation and health conditions in the mining areas and at present I am considering measures for an investigation into the related disease of silicosis and TB in the mining industry" (Gold Coast Colony, 1936, p. 3).

However, this and many other pronouncements from the colonial government appeared rhetorical given that by 1938, the commitment of the government had not been translated into concrete and actionable interventions. This argument was reflected in the 1938 Medical and Sanitary Department report which noted socio-environmental conditions, which had the potential to fuel the outbreak of TB in the country: “it is depressing to have record that the unsatisfactory conditions in the rural areas and in the areas surrounding the mines (especially with regard to housing and overcrowding in the mining areas) remain practically unchanged … the necessary legislation establishing local sanitary authorities with sufficient power is enacted, conditions cannot be improved” (Gold Coast Colony Medical and Sanitary Report, 1938, p. 4).

That is five years after the promise to deal with the challenge of TB, very little had been done as expressed in the report. In particular, poor housing, which had been identified to be risk factor for TB transmission still prevailed. By 1940 it was reported (Gold Coast Colony, 1940) that TB had resumed its place at the head of the list of killing diseases, displacing pneumonia. It was also reported that there was overcrowding at the only asylum in the then Gold Coast, which might have contributed to the high incidence of TB mortality. Other behavioural tendencies such as indiscriminate spitting and cough etiquette of the general population were cited to have accounted for the depth of TB. It was pronounced: “a campaign against the evil habit of spitting has been inaugurated throughout the schools of the country and thousands of pamphlets in the vernacular have been distributed and a series of hortatory articles addressed to school teachers and published in the Teachers' Journal are expected to be productive of much good" (Gold Coast Colony, 1939, p5).

It was not until 1941 when the wishes of the Medical Department as expressed in its correspondence (Gold Coast Colony, 1941) with the secretary of the colonies on investigations into TB and Silicosis in mining towns became a reality. A study on TB and Silicosis was conducted, with Murray and Crocket, as the lead investigators. The key highlights of the report were that TB affected mostly the native labourers and more especially those from the northern and other overland territories. Three of the seven individuals whose post-mortem reports suggested traces of TB/silicosis reported by Murray and Crocket (Gold Coast Colony, 1941) were:

"Amadu Wangra - died of pulmonary TB at Amalgamated Banket Areas hospital after having worked underground for twenty years, finally as a spanner boy. There were numerous tuberculous cavities in both lungs and definite silicosis with coalescence of the nodules in several areas. The appearances suggested an acute tuberculous process occurring on top of an old standing silicotuberculosis" (p.7).

"Samba Fulani - he had been under the surveillance of the medical officer, Amalgamated Banket Areas, for five months with pulmonary TB. His industrial history amounted to eight years underground as a hammer boy at that time. At autopsy, there was present a semi-chronic tuberculous process with pneumothorax on the right side, and typical silicotic nodules of medium size scattered throughout both lungs. Well-marked silicosis was present in the microscopical sections" (p.7).

"Morga Moshie - admitted to Tarkwa hospital in the last stages of pulmonary TB with an industrial history of six years as a machine boy at Gold Coast Banket Areas. The post-mortem appearances were those of advanced pulmonary TB succeeding a moderately well marked silico-tuberculosis" (p.8).

These three persons had worked at the Tarkwa Gold mines for at least six years. The lack of large-scale post-mortem examination could have even led to under-reporting of deaths arising from TB. The report further indicated that prior to the post-mortem, radiographic diagnosis of Samba Fulani showed a clear case of TB while that of Morga Moshie had shown a case of silicosis with pulmonary TB.

Besides, some mine workers who experienced excessive cough (probably TB) returned to their hometowns. While there was clear instruction from the Medical and Sanitary Department to Medical Officers of the mining companies to quarantine such TB suspects for further investigations, some medical officers flouted this instruction. Further investigations by Murray and Crocket revealed that the clandestine practices of some medical officers were perceived to be 'beneficial' to the mining camps as a natural means of removing the source of infection. This and other conditions (for example transportation development) fuelled the dispersal of TB into hinterlands.

The living conditions, particularly of housing among these categories of mine labourers seemed worse than those of the indigenous populations. The

1937 report of the Medical Department noted: "it is mainly the Krus from the Kru Coast (Liberia) or the labourers from the Ivory Coast, Haute (White) Volta and French Sudan who are in any way disposed to live in groups in sheds or hangers, and they are driven to this to a certain extent on account of relatively high rents charged by local house-owners and because they are compelled to economise … legislation exists to prevent overcrowding but it is difficult to invoke" (Gold Coast Colony, 1937, p. 17).

Murray and Crocket (1941), (authors of the report on silicosis and tuberculosis) therefore made recommendations similar to the earlier ones made by Simpson: "that compulsory registration of all mine labour be introduced, such registration to include complete and reliable particulars of the industrial history … that in order to obtain an approximation of the incidence of pulmonary TB in various parts of the Colony, TB be made notifiable and that it was necessary to complete records of dust counts and underground atmosphere conditions be kept and be available" (Gold Coast Colony, 1941, p.17).

Between 1946 and 1953, the number of reported cases increased modestly with equally modest decline in proportional mortality. Possible explanations are diverse. First of all, the discovery of chemotherapy occurred around 1944/1945 might have contributed to the decline of TB although a high proportional mortality was recorded in 1947 followed by a consistent decline. Other social issues also deserve attention. Second, following the Second World War period, many economies saw improvement, which reflected in standards of living of the Gold Coast. The increase in cocoa prices after the war might have contributed to improving standards of living. This could have played a role in improving nutrition and subsequent resistance to TB and decline in the number of infections and death from TB. The declines in the number of reported cases has also been attributed to the fact that hospital beds were not sufficient and that could have discouraged some people from seeking care and some patients discharged themselves (Gold Coast Government, 1953) and die without being recorded.

From 1951 onwards, efforts were made to collect data on TB from the regions and by sex. Table 8 gives data from 1951 to 1953 by sex. One should interpret the data with caution since there were indications of incomplete hospital returns from the region and that data from the Northern Territories were weighted, as there was no return from Navrongo. Overall, there was an increase in the number of reported cases from 1,946 in 1951 to 2,160 in 1953. That more males than females reported TB are consistent with the present knowledge on TB, which point to about 1.7 male:female ratio (WHO, 2012a).

In 1952, a Commission of Inquiry into health needs of Gold Coast was established. Among other things, the commission highlighted the seriousness of TB in the country (Gold Coast Government, 1952). A recommendation for a TB survey was made. Six years after the report, a nation-wide survey on TB was conducted in 1958.

Dr Todd spearheaded this survey and it lasted for two years, from 1945 to 1947. The study revealed that TB was still a major cause of morbidity and mortality. However, the conception of TB by lay people and their report of specific communities were often exaggerated (Todd, 1947).

Table 8: Sex distribution of pulmonary tuberculosis, 1951-1953

	1951		1952		1953	
	Males	Females	Males	Females	Males	Females
Ashanti	241	139	237	143	56	215
Trans Togo	60	16	75	21	2	17
Accra	70	64	251	98	213	94
Eastern	23	66	179	89	19	110
Western	651	172	559	199	375	141
Northern	227	67	185	64	212	56
Total	1472	524	1486	614	1527	633
Grand Total	1996		2100		2160	

Report of the Ministry of Health, 1953

The seriousness of TB resulted in the Gold Coast Department of Health establishing Ghana TB Services (GTS), with Dr A. B. P. W. Koch as the first director in 1959. Immediately upon formation, the service developed a five-year development plan of TB control from 1960-64. Through the plan, regional TB treatment centres were established in all the regional capitals at the time (Northern - Tamale, Ashanti - Kumasi, Eastern - Accra, Central - Cape Coast and Western - Sekondi-Takoradi provinces), and by 1959, 10 district TB clinics had been established. Materials and resources such as X-rays were provided at the TB clinics in both public and mission hospitals. TB specialists also paid routine technical visits to clinics to review old and new cases (Koch, 1960a).

Three years after establishing the GTS, it undertook a nationwide tuberculin survey to determine the actual prevalence of TB in the country, using a sample of 7,400 individuals in forty-five communities. More than half (55%) of the participants were tuberculin positive and of the positive participants, one per cent had active TB with a range of 0.3 per cent to 3.0 per cent in the communities surveyed. Following the survey, it was estimated that about 40,000 individuals had active TB, which is one per cent of the estimated population of 4,691,000 in 1956 (Koch, 1960a). However, the main weakness of the survey was that it was limited to only health workers and their relations and known TB patients and their contacts (Koch, 1960b). The report indicated that the burden of infection in the coastal towns (Accra, Winneba, Cape Coast and Sekondi), ranged from 24 per cent to 69 per cent of the 2,290 tested individuals. Koch (1960b) therefore speculated that population density and the good roads for travel along these coastal towns facilitated the spread of the disease. Tsey and Short (1995) argued that the expansion in railway transportation resulted in significant spread of infectious diseases among a population that was highly malnourished.

Immunity against TB among the population was minimal at most times and those who became infected emaciated very fast (Koch, 1960a). For Accra in particular, there was evidence to show that the most congested slums such as Ussher Town and the impoverished migrant populations from French West

Africa and the northern territories were the most vulnerable (Patterson, 1979). Infection rates were, however, low in the forest belt: 62 per cent positive reaction to tuberculin test among those aged 35-44 compared to 76 per cent in the Coastal Territory and 74 per cent in the Northern Territory of adults in the same age group as those of the forest. The most probable reason, according to Koch (1960b) could be that the many remote villages in the forest belt reduce contact with outsiders unlike those of the north and coasts.

The study further reported high infection rates among children in the northern territories. Children who reacted positively to the test in the Northern areas were 36 per cent compared to 24 per cent in the Coast and Forest belts respectively. According to Todd (1947) and later Koch (1960b), this could be attributed to the return of migrants, especially those from mining towns such as Tarkwa where the prevalence of TB was high compared to the other territories. Overcrowding in the northern territory was also another possible factor. It was also found that the average number of persons per compound was about 40 in the northern areas, compared to an average number of 20 persons per compound in the forest and coastal areas (Todd, 1947).

As of 1958, estimated proportional respiratory TB mortality was 35/1000 (Koch, 1960a). Data from Korle-Bu chest clinic in 1958 showed that 819 out of 838 cases were pulmonary TB (Koch, 1960a). The contribution of other types of TB such as bovine TB to the burden of morbidity and mortality largely remained unknown but given that there were no restrictions on pasteurisation, it is likely it might have contributed to morbidity and mortality as it did in England and America.

Some policy directives targeted towards TB were that TB was added to the list of notifiable diseases in 1959 (Koch, 1960a), which meant that TB was considered a major public health concern. From around 1959, the Ministry of Health abolished financial costs associated with diagnosis of TB (x-ray and laboratory investigations), consultation, treatment, tuberculin testing of patients' contacts and BCG vaccination (Koch, 1960a). TB patients within the public sector had sick leave for about a year to allow them recuperate. However, some patients working outside the public sector faced difficulties with such a long sick leave and many of such patients were dismissed and those affected by such labour practices were given priority in the employment of the TB Services whenever job opportunities occurred (Koch, 1960a).

The first formal public-private partnership model for TB came into being around 1959/1960 known as the Ghana Association for The Prevention of TB (GAPT). The Association facilitated the receipt of dried-freeze BCG vaccine from the Pasteur Institute in Dakar, Senegal, to the GTS, which was used for BCG vaccine campaigns in Accra. An amount of £200 donation from GAPT was used to support rehabilitation of cured TB patients and re-integration into their societies through a revolving fund for start-up businesses (Koch, 1960a).

Tuberculosis control in Ghana: 1961-1993

From 1957, the drive to control TB was sustained till about 1965 after which interest in TB waned significantly. There was no active surveillance, no case definition and treatment was symptomatic. Activities towards TB control had become passive after the 1960s. The following description of the state of affairs from a national officer encapsulates the scenario:

> *"Before re-establishing in 1993, TB control was managed on ad-hoc basis. For instance, there was no case definition to say that this is TB. There was no systematic way of collecting and analysing data. Drug supplies were erratic; patients were given drugs that were available. So almost everything was done on ad-hoc basis".*
>
> (NTP National Officer A)

As a result, there is little documentary evidence on TB from the 1960s. This is not surprising since the policy driver, WHO itself, had almost folded TB control activities towards the end of the 1960s and the disease was thence treated as any ordinary respiratory disease (Ogden et al., 2003).

Research interest in the disease in Ghana declined considerably until the 1990s (Table 9). Published studies on the disease in Ghana, as shown in Table 9, is based on review of studies, which formed the basis of the problem statement as indicated in Chapter One. Trewartha (1953) made similar observations on the basis of research in population geography and general interests subject. He argued that low academic and research interest in a subject at any point in time might be a reflection of general attitude towards the subject. In Ghana, it was not until the late 1980s when renewed interest in the disease emerged, with the passing of Legislative instrument (LI. 1313) in 1985, which removed financial costs associated with TB treatment.

Table 9: Studies on tuberculosis in Ghana, 1900-2011

Year	Number	Per cent
<1969	8	10.13
1970-1989	2	2.53
1980-1989	3	3.80
1990-1999	18	23.37
2000-	46	59.74
Total	77	100.00

Source: Author's construct, 2013

Tuberculosis in Ghana: 1994-present

The present era for TB control in the country began in 1994. Two factors resulted in programmed interventions for TB control in 1994. The first recounted by senior officers of NTP was a local drive, based on an analysis of data from hospitals on TB throughout the country. As one respondent recounted:

> *"Before NTP in 1994, there was some semblance of a control programme but this was not active. However, in 1992, the then director of medical services after analysing TB data from the country observed that TB cases were going up. He then called a*

meeting involving all regional directors of GHS. Preparatory works were started to have a structured programme. Incidentally, in 1993, the World Health Organisation declared TB a global emergency. Someone was sponsored for further training overseas in TB control. In the process, the director initiated a process to obtain support from donors for the programme. Luckily, DANIDA came on board in 1994. At the same time, the gentleman sponsored for further training returned to start a programme. Documents spelling out details of the programme were also written. So the actual structuring started in 1994". (NTP National Officer A)

There is some evidence to support this view, though fragmented. For instance between 1990 and 1992, TB cases in Eastern Region increased from 1,260 cases through 1,585 in 1991 to 1,817 in 1992. The epidemiology division of MOH in 1991 reported about 7,327 cases in 1991 and this happened to be the highest since 1986. In the 1992 annual report of the epidemiologic division of MOH, 7,044 cases were reported and more than half of the cases were reported from the Ashanti, Eastern and Volta regions. Prior to 1994, the national response was mainly limited to treatment of TB cases under the auspices of the Korle-Bu Chest Clinic.

While this cannot be representative of the entire country, piecing these information together lend to the credibility of rising TB cases in the country. Other regions similarly reported rising patterns of TB in the early 1990s. From

1990 to 1993, TB cases in the Upper West Region rose from 132 in 1990 to 424 in 1993, approximately 69 per cent rise within four years. The same rising trend occurred in the Ashanti Region; between 1991 and 1992, reported TB cases increased by about 273 per cent, that is, from 403 to 1504 cases. It must, however, be noted that the increase may not be real but rather the results of renewed and active case search, which could have result in that sharp increase.

Table 10: Reported tuberculosis cases at Korle-Bu Chest Clinic, 1987-1991

Year	New cases	Deaths
1987	1,608	114
1988	1,493	154
1989	1,739	128
1990	1,964	138
1991	2,292	169
Total	9,096	703

Source: Epidemiology Division, Ministry of Health, 1991

Whatever that could be, the important issues are still valid: TB became a serious public health concern that needed measured interventions. Similar anecdotal evidence was provided in the 1990 annual report of the Western Region, which indicated that the number of TB cases was rising within the Tarkwa area, particularly among students. A screening programme that was conducted in the area showed that about 52.5 per cent of the students screened reacted positively to the test. Further analysis in hospitals confirmed and treated thirteen cases. The cases were all mainly as a result of passive surveillance - active surveillance. At the end of 1994 (when the programme had started in June), 7,149 cases had been reported and placed on short course chemotherapy (WHO, 1994).

The second driver was the international element, typical of most prioritised infectious diseases. A respondent noted:

> *"Globally, TB was becoming an issue and various governments had made commitment to fight the disease. Once it came on the agenda, then expansion of the existing control interventions was deemed necessary. This gave birth to a national TB control programme, a structured programme to manage TB from a multi-dimensional perspective - communication, advocacy, diagnosis and case management and monitoring and evaluation. It is a combination of local and international initiatives - mind you the GHS already had a programme of controlling the disease but as you know, WHO would always want to bring issues onto the agenda and their role was more of an advocacy. The right to accept or reject, however, lies within the determination of every country. I therefore cannot take anything away from policy makers at the time - it is a local initiative supported by WHO".*
>
> (NTP National Officer B)

International bodies such as WHO began to play active roles in TB management from 1993. In that year, WHO recruited advocacy expert and declared TB as “a global emergency”. This became the slogan for the DOTS campaign and was also used to attract funding (Ogden et al., 2003).

In Kingdon (1984) and Walt’s (1994) public health policy propositions frameworks, windows of opportunities emerge and this was utilised. At the international level, HIV became a major opportunity window for TB to be put on the agenda. In Ghana, the windows of opportunity were through analysis of local data.

In spite of the positive enabling environment for establishing a structured TB control programme, this was not done and the situation arose from fear of establishing a vertical programme. As pointed out by one interviewer:

> *“Certain people within the system were opposed to specialised or earmarked funding for TB. Those opposed argued that instead of earmarked funding, all funds coming for the programme should be deposited into a common basket. There were also fears about structuring leading to some vertical programme”.* (NTP National Officer A)

Although the resistances were held back, the programme mainly relied on donor funds. When that was exhausted, the programme depended exclusively on Government of Ghana (GoG) funds. During that period, there were significant cuts in budgetary allocations to NTP activities. One respondent observed that:

"When initial funds from Danish International Development Agency (DANIDA) got exhausted, there were cuts in funding for TB. When one needed funds for TB activities, one had to write to fund managers at the GHS/MOH headquarters for approval, and the request was either denied or unduly delayed". (NTP National Officer A)

As observed from the account, the exhaustion of donor funds for TB control meant that some activities had to be scaled down and this affected the general programme.

Discussion

The emphasis in this chapter was mainly a review of how TB control in Ghana had unfolded through content analysis of archival materials and qualitative accounts of programme stakeholders. Characteristically, the chapter took steps back into the past in respect of TB control. The review showed that TB featured prominently in the disease profile of pre-colonial, colonial and post-colonial Ghana. While there is no evidence of recorded epidemic as reported in some European countries (for example, UK) and American states, the situation in the country could be characterised as an endemic situation.

The disease also existed mostly in the colonies and the northern territories due to contact with Europeans and the northern territories engagement with other foreign traders whose entry was mainly through the Sahara desert. Following the entry of TB into the country, it became established in the major mining communities (Prestea, Tarkwa, Obuasi and other adjoining communities, mostly in the Western province). Probably, environmental pollution and poor living conditions in the mining areas fuelled its spread.

In the absence of effective chemotherapy, quarantine of infected patients would have been a better option to containing the afflictions of TB but no evidence of such intervention existed. Fairchild and Oppenheimer (1998), for instance noted that segregation of TB patients was one of the best solutions to the disease. Although there was no cure in segregation, it helped to reduce further infection, a cardinal principle in epidemiology of communicable diseases.

Poor socioeconomic conditions, especially poverty has always been recognised as contributing to the spread of TB in the country. Improved housing, for instance, was acknowledged to have made important impact on the burden of TB in Obuasi compared to other areas such as Tarkwa where housing was considerably poor. The 1931 report of the Registrar of Births, Deaths and Burials in part stated: “it is noteworthy that taken together with pulmonary TB, diseases of the respiratory system form almost half of the total number of deaths registered at Tarkwa - a town situated at the centre of an important gold-mining district in the Western Province of the Gold Coast … a large proportion of the population of Tarkwa is made of mining labourers or persons who have worked in mines or in close association with mines … the nature of the occupation combined with not altogether satisfactory housing conditions no doubt predisposes to respiratory trouble" (Selwyn-Clarke, 1931, p. 3).

Around 1924/25, TB deaths per 100, 000 was 820/100,000 (Patterson, 1979). In Obuasi, where improvements had been made in housing conditions compared to Tarkwa, the mortality stood around 31.7 per thousand. The caseload of TB in the mining communities with poor social amenities does not appear unique to the Gold Coast alone. Earlier in 1914, Packard (1990) reported of similar conditions in South African mines. He noted: "as a general rule, the quarters (of mine workers, mainly Africans) are bad: on some collieries they are extremely bad. In nearly all cases, rooms have mud floors, and there are no bunks, so that inmates lie on the floor, which in the majority of cases was extremely filthy and littered with dirty kit, old sacking and debris of food…" (Report of the TB Commission, 1914, p.184 cited in Packard, 1990, p.332).

In 1927/28, with an estimated population of 2,671 in Tarkwa, reported TB cases were 56, second to Accra with 92 cases and with a population of 60,000 (Gold Coast Colony, 1928). By 1935, when the first urban mortality statistics were collected in the Colony, Ashanti and the Northern Territories, two out of the four popular mining towns, Tarkwa and Prestea, recorded the highest mortality cases of about 85.6 per thousand and 70.3/1000 respectively.

The case of Obuasi has been partly attributed to public investments in housing of miners and their dependents, regardless of origin (African or European). This is believed to have significantly contributed in reducing infectious diseases' mortality, including TB (Dumett, 1993). Elsewhere, there is empirical evidence about the relationship between housing conditions and TB prevalence. In reviewing evidence on mortality transition in England, Szreter (1988) noted that overcrowding in living, sleeping and working environments contributed much to TB. In the case of the Gold Coast, the evidence on housing to reduce the scourge of TB was politically limited to European workers. Evidence on working conditions in the mines was at best appalling - TB mostly affected underground workers.

Issues about nutrition among many Gold Coasters, which heightened the chances of infection also arises. As Simpson's report of 1924/25 observed, some recruits into mining industries arrived weak and frail and were therefore vulnerable to infections. It is on record that between 1931/1932 when the world economy was impressive, there was general reduction in infectious diseases, in general, and TB, in particular. This observation could be situated in arguments about nutritional status and TB containment (McKeown & Record, 1965; McKeown et al., 1972; McKeown, 1976). In a series of publications, McKeown and his colleague argued that nutritional improvement was the best antidote to historical fights against TB. They argued that the agricultural advancement in Britain in the 1800s through to the 1900s provided several malnourished populations with much to eat and that contributed to strengthen people's immune system, which helped to fight infections. However, this position by McKeown and his colleagues have been criticised by Szreter (1988) as too simplistic a stance. Szreter (1988) contended that causation theory of disease is chronological and that nutrition alone could not have caused the significant decline in TB morbidity and mortality as reported in Britain. Instead, Szreter (1988) supported the role of broad social interventions such as housing, improved legislation (for instance, poor laws) and prevention of overcrowding. With respect to Gold Coast, the evidence available, albeit anecdotal, supports both nutritional and social intervention hypotheses. For instance, between 1931-1933, when there was mass hold-up of cocoa in farms, it affected the socioeconomic situation and this was believed to have contributed to increasing TB mortality for that period. On the other hand, some evidence on housing improvement in Obuasi, especially among miners played a role in reducing TB compared to towns such as Tarkwa where housing continued to be poor.

As happened in most parts of the world, the fight against TB in Ghana declined towards the end of the 1960s, apparently, due to the discovery of chemotherapy, which was used to control the disease medically, until late 1980s when HIV seemed to have provided a window of opportunity for renewed interest in controlling TB. Since early 1990s, interest has been sustained, partly due to high levels of commitment from international organisations such as WHO and The World Bank.

Misconceptions about TB were also common and that somehow worked against some interventions, which were meant to help control the disease. For example, Murray and Crocket (1941) observed that misconceptions about the aetiology of TB served as a hindrance to large-scale post-mortem of people suspected to have died from the disease. The next chapter discusses some issues of importance to current efforts at controlling the disease. The focus is on knowledge of transmission, attitudes on status disclosure and knowledge of cure for TB.

CHAPTER SIX

PERCEPTIONS AND ATTITUDES TOWARDS TUBERCULOSIS

Introduction

TB continues to be one of the infectious diseases confronting developmental efforts in many parts of the world. The cost of treating and controlling the disease in developing countries is more problematic than in developed countries. Myriad of factors contribute to this contrast - poor nutrition and housing at the micro level (Borgdorff et al., 2002) and underdeveloped health systems as well as human, infrastructural and financial restraints at the macro level in the developing countries (Atun, Baezaa, Drobniewski, Levichevac & Coker, 2005). Regardless of efforts to promote prevention, attitudes towards TB status disclosure, knowledge of transmission and of availability of cure are important in achieving objectives.

This chapter discusses one aspect of the strategies for TB control - perceptions towards the disease. Specifically, the focus is on three aspects of empowerment, namely, myths and misconceptions about transmission, knowledge of cure as well as attitudes towards status disclosure. The reason behind this aspect of the study is the need to understand individuals and communities regarding key dimensions of the disease, which can be used to provide campaign messages. Just like in the case of HIV, the argument for TB is that people should not die out of ignorance (Darteh, Amo-Adjei & Awusabo-Asare, *forthcoming*).

Data used for these analyses are drawn from GDHS since it provides a nationally representative sample of Ghanaians. Using such a nationally representative data provides a platform for studying the national views on TB. The rest of the chapter follows this pattern: general background characteristics of respondents, attitudes towards status disclosure, knowledge of transmission of TB and knowledge/awareness of cure for TB.

Background characteristics of respondents

Table 11 gives background characteristics of respondents from the 2008 GDHS. In all, there were 4,567 and 4,915 male and female respondents in the survey respectively. Of the total number, 53.47 per cent of males and 51.52 per cent of females were resident in rural areas. The highest proportion of respondents was drawn from Ashanti Region for both males (18.89%) and females (20.6%) and the lowest were from the Upper West Region, accounting for 2.6 per cent and 2.5 per cent of males and females respectively. The 2008 DHS was based on a sampling frame derived from the 2000 Population and Housing Census and, therefore, the spatial distributions are consistent with the census results.

Almost all respondents identified themselves with a religious denomination. Apart from affiliation to Pentecostal/Charismatic Churches (males: 42.3%; females: 48.2%), where females were relatively dominant, males dominated among the Orthodox Christians (males: 31.1%; females:

29.3), Moslems (males: 16.6%; females: 15%) and “Others” (males: 11.1%; females: 7.5) (Table 11).

Table 11: Background characteristics of respondents

	Males		Females	
Co-variants	**N**	**%**	**N**	**%**
Residence				
Urban	2,125	46.53	2,383	48.48
Rural	2,442	53.47	2,532	51.52
Region				
Western	478	10.48	447	9.10
Central	376	8.24	423	8.62
Greater Accra	734	16.08	852	17.35
Volta	418	9.17	430	8.77
Eastern	470	10.30	482	9.82
Ashanti	857	18.77	1,010	20.56
Brong-Ahafo	384	8.43	425	8.65
Northern	477	10.45	466	9.50
Upper East	249	5.46	253	5.15
Upper West	120	2.64	122	2.49
Religion				
Orthodox Christian	1,419	31.07	1,439	29.28
Pentecostal/Charismatic	1,884	41.25	2,371	48.23

Table 11 continued.

Moslem	757	16.59	738	15.02
Others	50	11.09	367	7.47
Ethnicity				
Akan	2,162	47.34	2,493	50.71
Ga/Dangme	298	6.53	343	6.99
Ewe	672	14.72	633	12.88
Mole-Dagbani	759	16.63	794	16.16
Others	674	14.77	651	13.26
Education				
No Schooling	639	14.03	1,041	21.21
Primary	660	14.51	987	20.10
Secondary plus	3,255	71.46	2,882	58.69
Wealth status				
Poor/poorest	1,624	35.55	1,683	34.24
Middle	783	17.16	979	19.92
Rich/Richest	2,160	47.29	2,253	45.84
Marital status				
Never married	1,942	42.52	1,593	32.41
Currently married	2,404	52.63	2,876	58.51
Formerly married	221	4.84	446	9.08
Age cohort				

Table 11 continued.

15-19	910	19.94	1,024	20.84
20-24	704	15.42	877	17.86
25-29	623	13.66	832	16.93
30-34	532	11.66	644	13.10
35-39	528	11.57	638	12.99
40-44	393	8.62	470	9.56
45-49	363	7.96	428	8.72
50-54	297	6.51	-	-
55-59	212	4.66	-	-
Exposure to print media				
No exposure	2,737	60.05	3,750	76.42
Moderate exposure	1,404	30.82	1,009	20.57
High exposure	416	9.13	147	3.01
Exposure to radio				
No exposure	259	5.68	746	15.20
Moderate exposure	971	21.30	1,611	32.80
High exposure	3,332	73.03	2,554	52.00
Exposure to television				
No exposure	1,162	25.47	1,798	36.62
Moderate exposure	1,620	35.52	1,441	29.35
High exposure	1,779	39.01	1,670	34.03

Source: Computed from GDHS 2008

In terms of ethnicity, the Akan group accounted for half of all the respondents (50.71% of females and 47.34% of males). Formal educational attainment of males and females varied. For instance, the proportion of males with formal secondary and higher education (senior high/secondary school, colleges of education, polytechnics and university qualifications) was approximately 71.5 per cent compared to 58.7 per cent among females. Several factors account for these disproportions. Among them are gender stereotyping about education and early marriage. With respect to wealth, the proportion of males in the richer/richest category was 47.3 per cent and 45.8 per cent among females. The rest are distributed between poor/poorest and average categories as shown in Table 11.

From Table 11, of the male respondents, 52.63 per cent were currently married (including cohabitation) and 59 per cent of females were currently married. A third (32.41%) of the females had never married, compared to about 43 per cent of males. There were about 20 per cent males between ages 15-19 years and almost the same for females (20.8%). At ages 45-49 years (the upper limit of females), the proportion of females was approximately 9 per cent while that of males was 5 per cent.

Since formal TB control programme began in Ghana, print, radio and television have been used to communicate existing and new knowledge about transmission and cure variables. Therefore, exposure to media was explored. From the results, 73 per cent reported listening to radio almost every day, followed by television with 39 per cent, and print material, 40 per cent. Thus, Ghanaians are viewers and not readers, a finding with implications for control.

Myths and misconceptions about tuberculosis transmission

As discussed in Chapter 4, a series of variables were combined to generate a single variable to examine myths and misconceptions about transmission of TB, using the 2008 GDHS data. In the survey, respondents were asked if TB could spread through sharing household utensils, sexual contact, sharing food and through touch. These questions have been used to assess people’s misconceptions about transmission of TB. Earlier studies (see, Jackson, McMenamin, Brewster, Ahmed & Reid, 2008; Weiss, Somma, Karim, Abouihia, Auer, Kemp & Jawahar, 2008; Wieland et al., 2012) have established their relevance in testing misconceptions about TB. Similar means have been developed for HIV.

Of the 3,775 females who responded, 77 per cent reported that it was not possible that TB could be transmitted through sharing of utensils while 80 per cent of males believed same. On whether TB could be spread through touching an infected person, 95 per cent of males and 97 per cent of females said this was not possible. Furthermore, approximately 87 per cent of males and females indicated that TB could not be spread through sharing of food. Almost all respondents (males: 99.4% and females: 99.5%) disagreed that mosquitoes could serve as a medium for the transmission of TB.

In Table 12, descriptive bivariate association between myths and misconceptions and socioeconomic and demographic characteristics are presented. The results show spatial variability in misconceptions. Among males, the proportion not holding misconceptions ranges from 82.9 per cent in Northern Region to 45.9 per cent in the Central Region. For women, the proportions ranged from about 90.3 per cent in the Upper East Region to approximately 48 per cent in the Western Region.

Among males, there was no relationship between type of place of residence and misconceptions about transmission of TB. For females, however, there was a statistically significant association between type of place of residence (χ^2=30.4; $p < 0.05$) and the extent of misconception. Using DHS data from Bangladesh, Khandoker et al. (2011) also observed rural-urban differences in misconceptions about transmission of TB among women.

Moslems, both males (72%) and females (76.7%) reported the highest proportion of correct conceptions about transmission of TB. The least proportion among males was Orthodox Christians (Catholic, Anglican, Presbyterians and Methodists) (63.16%) while Pentecostal/Charismatic Christian females reported the least (64.50%). There were also differences by ethnic affinity. The dissimilarities ranges from 64.6 per cent among Akans to 74.64 per cent (Ga/Dangme) for and among females, Mole-Dagbanis reported the highest proportion without misconceptions (Table 12).

Table 12: Myths and misconceptions about tuberculosis transmission by background characteristics

Factors	Males (n=4,568)		Females (n=4,916)	
	Total respondents	% With correct knowledge	Total respondents	% With correct knowledge
Region	227.64(0.000)*		374(0.000)*	
Western	478	63.98	447	48.07
Central	376	45.94	423	65.62
Greater Accra	734	75.96	825	64.79
Volta	418	57.57	430	61.39
Eastern	470	60.96	483	73.83
Ashanti	857	67.07	1,010	64.36
Brong-Ahafo	384	75.01	425	74.46
Northern	477	82.89	466	85.14
Upper East	249	67.66	254	90.26
Upper West	120	46.70	122	89.12
Residence	0.1742(0.676)		30.39(0.000)*	
Urban	2,125	68.51	2383	66.71
Rural	2,442	56.23	2532	70.24
Religion	19.91(0.000)*		87.85(0.000)*	
Christian	1,419	63.16	1,439	69.03
Pentecostal	1,884	66.41	2,371	64.50
Moslem	757	72.01	738	76.66

Table 12 continued.

Others	506	70.25	367	76.24
Ethnicity	26.92(0.000)*		257.55(0.000)*	
Akan	2,162	64.63	2,493	62.24
Ga/Dangme	298	74.64	343	68.19
Ewe	672	61.92	633	64.04
Mole-Dagbani	759	70.83	794	82.97
Others	674	70.31	651	79.50
Education	28.20(0.000)*		75.52(0.000)*	
Never	639	74.43	1,041	76.56
Primary	660	69.74	987	69.05
Secondary+	3,255	64.57	2,882	65.50
Wealth status	6.53(0.038)*		100.38(0.000)*	
Poorer/richest	1,624	68.54	1,683	75.66
Middle	783	63.42	979	65.20
Richer/richest	1,260	66.62	2,253	64.65
Marital status	59.16(0.000)*		61.16(0.000)*	
Never married	1,942	73.36	1,593	75.61
Married	2,404	62.24	2,876	66.74
Formerly	221	57.77	446	54.77
Age cohort	105.93(0.000)*		135.87(0.000)*	
15-19	910	76.91	1,024	79.40

Table 12 continued.

20-24	704	72.26	877	76.51
25-29	623	69.55	832	67.05
30-34	532	66.83	644	65.54
35-39	528	62.60	638	61.47
40-44	393	56.13	470	57.55
45-49	363	59.26	428	56.08
50-54	297	53.10	-	-
55-59	212	58.53	-	-
Print	12.47(0.002)*		25.29(0.000)*	
Low	2,737	68.62	3,750	69.39
Medium	1,404	63.49	1,009	68.39
High	416	64.95	147	51.44
Radio	27.68(0.000)*		99.03(0.000)*	
Low	259	81.60	746	79.58
Medium	971	67.49	1,611	70.23
High	3,332	65.35	2,554	64.50
Television	1.82(0.402)*		40.71(0.000)*	
Low	1,162	66.94	1,798	71.93
Medium	1,620	67.13	1,441	67.68
High	1,779	66.71	1,670	65.68

*Chi-square significant at 5%. P-values indicated in brackets

Another issue is the relationship between level of formal education and perceptions about transmission of TB. Formal education is expected to improve peoples' perception about disease causation. Contrary to this a-priori, those with higher formal education did not fare better in terms of the proportion with correct knowledge of transmission of TB. For example, while 74.4 per cent of males without formal education knew that TB could not be transmitted through personal touch, sharing food, sexual intercourse, mosquito bite and sharing of utensils, about 65 per cent those with secondary or higher education had correct conceptions. A similar pattern is observed among females as shown in Table 12. To ensure that the emerging results from education are not spurious, a bivariate analysis was done (Data not shown). The analysis showed that higher education did not necessarily lead to low misconceptions among both males and females. Wealth status, age, media exposure had showed relationship with knowledge of transmission of TB as shown in Table 12.

Following the descriptive results, further analyses were carried out to determine how the respective categories of the explanatory factors drive misconceptions. A bivariate logistic regression was first run to test the hypothesis that region of residence was not related to myths and misconceptions about TB transmission. Central Region was chosen as the base category, given that it reported the least proportion of respondents reported the highest myths and misconceptions. The references for the other categories are as follows: type of place of residence (urban); religion (others); ethnicity (others); education (no formal); wealth (poor/poorest); age (15-19); marital status (never married); print media (no exposure); radio (no exposure); and television (no exposure).

Using Central Region as reference, females from the Upper East Region (OR=5.8; $p < 0.001$) and males from the Northern Region (OR=4.95; $p < 0.001$) respectively were more likely to hold positive notions about how TB is transmitted. Among females, those likely to hold misconceptions were in the Western Region and the Upper West Region among males, albeit slight compared with the Central Region (Table 13 Model T1).

In a second model with other socioeconomic and demographic covariates, some dynamics emerge with respect to region of residence for both sexes. Among females for instance, while the likelihood of rejecting misconceptions about transmission of TB declines significantly in the Northern, Upper East and Upper West Regions (Table 13 Model T2), among males, the likelihood of rejecting myths and misconceptions about transmission of TB increases significantly in all the regions except in the Northern, Upper East and Upper West regions.

The expected effect of formal education on myths and misconceptions about transmission of TB could not be identified in the study. This observation occurred for both males and females. For example, females with secondary and higher education were 0.719 ($p < 0.05$) (Model T2) less likely to rebuff misconceptions about TB transmission. For males, those with secondary and higher were 0.596 ($p < 0.001$) less likely to oppose misconceptions about transmission of TB.

Table 13: Multivariate logistic regression results on myths and misconceptions about transmission of tuberculosis

	Females				Males			
	T1	95% CI	T2	95% CI	T3	95% CI	T4	95% CI
Region								
Western	0.557***	(0.416,0.745)	0.563**	(0.382,0.830)	2.070***	(1.362,3.146)	2.234***	(1.452,3.439)
Greater Accra	0.928	(0.708,1.215)	0.963	(0.604,1.537)	3.453***	(2.304,5.174)	3.897***	(2.521,6.024)
Volta	0.804	(0.600,1.078)	0.678	(0.409,1.123)	1.565*	(1.054,2.323)	1.631*	(1.058,2.514)
Eastern	1.383*	(1.029,1.861)	1.487	(0.967,2.288)	1.970**	(1.270,3.054)	2.008**	(1.288,3.130)
Ashanti	0.902	(0.693,1.173)	0.917	(0.605,1.391)	2.238**	(1.356,3.694)	2.292**	(1.369,3.836)
Brong-Ahafo	1.460*	(1.071,1.991)	1.328	(0.856,2.060)	3.545***	(2.357,5.334)	3.465***	(2.285,5.253)
Northern	3.131***	(2.255,4.349)	1.779*	(1.077,2.939)	4.950***	(3.035,8.071)	4.310***	(2.563,7.247)

Table 13 continued.

Upper East	5.812***	(3.831,8.818)	3.249***	(1.800,5.863)	2.750***	(1.657,4.565)	2.416**	(1.394,4.188)
Upper West	4.208***	(2.938,6.026)	2.452***	(1.445,4.162)	1.028	(0.649,1.628)	0.868	(0.506,1.488)
Residence								
Rural			0.891	(0.682,1.164)			1.017	(0.782,1.323)
Religion								
Orthodox			0.969	(0.717,1.310)			0.819	(0.645,1.040)
Pentecostal			0.833	(0.621,1.117)			0.838	(0.660,1.066)
Moslem			0.761	(0.539,1.074)			1.003	(0.723,1.390)
Ethnicity								
Akan			0.651**	(0.484,0.875)			1.308*	(1.003,1.707)

Table 13 continued.

Ga-Dangme	0.650*	(0.436,0.970)	1.837**	(1.232,2.739)
Ewe	0.770	(0.519,1.141)	1.191	(0.873,1.625)
Mole-Dagbani	0.947	(0.686,1.309)	1.081	(0.786,1.487)
Education				
Primary	0.826	(0.663,1.028)	0.711**	(0.559,0.904)
Secondary+	0.719**	(0.570,0.907)	0.596***	(0.476,0.746)
Wealth quintile				
Average	0.826	(0.653,1.045)	0.956	(0.744,1.230)
Least poor	0.887	(0.674,1.167)	0.977	(0.737,1.295)
Marital status				

Table 13 continued.

Married	1.042	(0.836,1.300)	1.006	(0.798,1.267)
Never married	0.850	(0.629,1.147)	0.911	(0.635,1.308)
Age cohort				
20-24	0.867	(0.680,1.106)	0.763*	(0.607,0.960)
25-29	0.553***	(0.417,0.733)	0.607***	(0.470,0.784)
30-34	0.448***	(0.331,0.605)	0.534***	(0.392,0.728)
35-39	0.397***	(0.298,0.530)	0.411***	(0.301,0.562)
40-44	0.346***	(0.248,0.481)	0.335***	(0.243,0.462)
45-49	0.339***	(0.240,0.479)	0.366***	(0.262,0.513)
50-54	-	-	0.315***	(0.220,0.452)

Table 13 continued.

55-59			-	-			0.415***	(0.276,0.625)
Print media								
Moderate			0.996	(0.823,1.205)			0.874	(0.733,1.042)
High exposure			0.543**	(0.354,0.832)			0.838	(0.635,1.105)
Radio								
Moderate			0.643***	(0.503,0.821)			0.610**	(0.434,0.856)
High exposure			0.584***	(0.457,0.745)			0.677*	(0.478,0.960)
Television								
Moderate			0.918	(0.763,1.103)			1.090	(0.873,1.361)
High			0.950	(0.772,1.170)			0.999	(0.784,1.273)
_Cons	1.715***	(1.373,2.143)	12.38***	(6.728,22.79)	0.846	(0.604,1.185)	3.326***	(1.780,6.218)
Log likelihood	-2854.6		-2724.9		-2838.3		-2724.9	
Chi-squared	403.2		436.8		108.5		306.9	
N	4916		4895		4568		4537	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Although this finding is not consistent with existing studies, particularly in the light of allocative efficiency hypothesis (Grossman, 2008), one cannot also discount their validity. Allocative efficiency hypothesis is based on assumption that increasing higher formal education improves health knowledge due to increase in stock of knowledge that is added to an individual's reservoir of information (Grossman, 2008). Altindag, Cannonier and Mocan (2011) have recently provided contrary evidence to the allocative efficiency hypothesis. They found that higher formal education does not necessarily improve people's views on many health outcomes. This is because, as Grossman (2008) argued, there is a possibility of a "third variable" such as the home environment. Such factors can confound educational influence. In the light of the forgoing, there is a need for caution regarding assumption about education and health outcomes.

Aging is expected to increase experiences and reservoir of knowledge on health issues. Results of this study (Table 13) show consistent decline in likelihood of rebuffing misconceptions among males and females. For instance, among males, those between 20-24 years were OR=0.763 ($p < 0.05$) less likely to reject misconceptions. Females in this same age category were about OR=0.867 less likely to reject misconceptions. The pattern of decline in odds continues consistently among females up to 45-49 years. Among males, there are inconsistencies but the bottom line issue of negative relationship between aging and misconceptions still prevail (Table 13).

Awareness of cure for tuberculosis

Awareness about cure for TB is one-step away from seeking cure. Some studies (Orrett & Shurland, 2001; Vukovic & Nagorni-Obradovic, 2011) have documented that while awareness of TB is high among most populations, the dynamics such as transmission, curability and status disclosure and other faces of the disease are poorly understood in certain populations. In this section, results of awareness of respondents about cure are discussed, using both descriptive and inferential analysis against media exposure.

The results indicate that 94.5 per cent of males and 91.2 per cent of females were aware of cure for TB. There were, however, variations by residence, region, religion, ethnicity, education, wealth status, marital status and age. Specifically, region of residence was positively related to awareness of TB between males (χ^2=54.42; $p < 0.05$) and females (χ^2=69.96; $p < 0.05$). The lowest proportion of males who knew that TB was curable was in the Upper West Region (88%) and for females in the Volta region (82%), while the region with the highest proportion of males who were aware of cure for TB was Upper East Region (98%) (Table 14).

Ninety-three per cent of males and seventy-eight per cent of females affiliated to the "Others" group reported the lowest level of awareness of cure for TB. But while the religious differences were not noteworthy for males (χ^2=3.14; n.s.), the reverse was noted among females (χ^2=45.70; $p < 0.05$).

Table 14: Awareness of cure for tuberculosis by background characteristics

Factors	Males (n=4,568)		Females (n=4,915)	
	Total respondents	% Aware of cure	Total respondents	% Aware of cure
Region	54.42(0.000)*		63.96(0.000)*	
Western	472	93.70	353	93.79
Central	342	96.39	333	95.34
Greater Accra	627	95.84	755	94.87
Volta	381	93.63	372	82.05
Eastern	388	90.60	393	88.46
Ashanti	807	96.65	911	89.99
Brong-Ahafo	328	95.88	338	93.55
Northern	319	93.51	264	89.22
Upper East	215	97.63	171	94.67
Upper West	100	87.89	79	90.16
Residence	20.12(0.000)*		28.88(0.000)*	
Urban	1,950	96.03	2,111	93.82
Rural	2,033	93.45	1,861	88.38
Religion	3.144(0.370)		45.70(0.000)*	
Christian	1,291	94.10	1,195	92.29

Table 14 continued.

Pentecostal	1,686	95.39	2,035	91.77
Moslem	592	95.30	523	92.51
Others	412	93.05	218	78.16
Ethnicity	8.82(0.066)*		37.55(0.000)*	
Akan	1,982	95.40	2,186	92.93
Ga/Dangme	259	92.28	295	90.02
Ewe	604	94.41	522	84.48
Mole-Dagbani	604	94.54	540	89.98
Others	532	93.90	428	93.57
Education	25.85(0.000)*		39.34(0.000)*	
Never	455	92.90	638	88.14
Primary	493	90.71	719	85.88
Secondary+	3,023	95.63	2,612	93.51
Wealth status	33.687(0.000)*		42.72(0.000)*	
Poorer/poorest	1,269	92.65	1,129	86.12
Average	677	93.08	817	93.08
Richer/richest	2,036	96.72	2,026	93.41
Marital status	1.05(0.591)		2.83(0.243)	
Never	1,643	94.69	1,307	92.52

Table 14 continued.

Married	2,151	94.63	2,291	90.33
Formerly	188	95.93	375	92.66
Age cohort	13.42(0.098)*		7.22(0.300)	
15-19	725	92.78	768	90.14
20-24	608	97.09	694	93.00
25-29	545	94.11	705	91.64
30-34	474	95.17	523	90.54
35-39	472	94.92	536	89.84
40-44	355	96.64	394	92.70
45-49	327	93.63	351	91.24
50-54	271	93.63	-	-
55-59	200	93.87	-	-
Print	20.03 (0.000)*		29.62(0.000)	
Low	2,227	93.53	2,872	95.28
Medium	1,341	95.93	949	96.43
High	405	97.23	142	91.25
Radio	13.2838 (0.001)*		13.88 (0.001)	
Low	185	91.34	443	87.16
Medium	781	94.45	1,326	89.81

Table 14 continued.

High	3012	95.01	2,199	93.02
Television	23.7089		53.69 (0.000)	
Low	912	92.64	1,244	87.0
Medium	1,412	94.56	1,226	90.84
High	1,653	95.98	1,498	95.26

*Chi-square significant at 5%. P-values indicated in brackets

Marital status of males and females showed no association with awareness of cure for TB. Age of males showed relatively weak relationship with knowledge of cure for TB (χ^2=13.42; $p < 0.05$) while that of females was insignificant (χ^2=7.22; n.s). Expectedly, formal education showed significant association with awareness of cure for TB for both sexes.

Available evidence suggests positive relationship between knowledge of availability of cure for illness and intention and actual health seeking behaviours (for example, Dodor & Afenyadu, 2005). When people affected with certain diseases are sure that they can obtain cure, they are motivated to seek care, barring socioeconomic and physical constraints to accessing health. However, in some countries, such as Ghana, treatment for TB is without cost and so economic reasons are not expected to influence care-seeking behaviour. This section assesses specific individual attributes that determines awareness or otherwise of cure for TB.

Table 15: Complimentary log-log regression results on awareness of cure for tuberculosis

	Females				Male			
	C1	95% CI	C2	95% CI	C3	95%	C4	95% CI
Region								
Western	0.901	(0.716,1.134)	0.917	(0.717,1.171)	0.868	(0.676,1.114)	0.882	(0.682,1.141)
Greater Accra	0.981	(0.796,1.209)	0.910	(0.707,1.171)	0.951	(0.749,1.208)	0.793	(0.612,1.028)
Volta	0.577***	(0.465,0.717)	0.704*	(0.498,0.996)	0.769*	(0.599,0.987)	0.769	(0.580,1.020)
Eastern	0.713**	(0.574,0.886)	0.745*	(0.581,0.954)	0.720**	(0.562,0.922)	0.725*	(0.564,0.931)
Ashanti	0.757**	(0.620,0.923)	0.720**	(0.574,0.903)	0.983	(0.770,1.255)	0.977	(0.766,1.247)
Brong-Ahafo	0.858	(0.681,1.083)	0.896	(0.678,1.184)	0.933	(0.717,1.214)	0.961	(0.726,1.272)
Northern	0.759*	(0.601,0.959)	0.880	(0.655,1.181)	0.814	(0.624,1.061)	0.879	(0.649,1.191)

Table 15 continued.

Upper East	1.011	(0.786,1.301)	1.391*	(1.014,1.907)	1.046	(0.757,1.447)	1.158	(0.797,1.683)
Upper West	0.754*	(0.598,0.950)	0.946	(0.706,1.266)	0.621***	(0.482,0.801)	0.629**	(0.466,0.848)
Residence								
Rural			0.958	(0.840,1.092)			0.977	(0.855,1.117)
Religion								
Orthodox			1.309**	(1.096,1.563)			0.975	(0.828,1.148)
Pentecostal			1.324**	(1.120,1.566)			1.021	(0.866,1.203)
Moslem			1.399**	(1.142,1.715)			1.046	(0.866,1.263)
Ethnicity								
Akan			0.905	(0.748,1.094)			1.028	(0.852,1.241)

Table 15 continued.

Ga-Dangme	0.757*	(0.583,0.983)	0.986	(0.757,1.284)
Ewe	0.763*	(0.587,0.991)	1.107	(0.890,1.378)
Mole-Dagbani	0.779*	(0.641,0.948)	1.166	(0.966,1.408)
Education				
Primary	0.941	(0.813,1.089)	0.884	(0.748,1.044)
Secondary+	1.133	(0.975,1.317)	1.093	(0.925,1.292)
Wealth quintile				
Average	1.202*	(1.036,1.395)	0.922	(0.794,1.072)
Least poor	1.000	(0.844,1.184)	1.124	(0.950,1.330)
Marital status				

Table 15 continued.

Married	0.968	(0.831,1.128)	1.015	(0.857,1.202)
Never married	1.014	(0.815,1.261)	1.154	(0.898,1.483)
Age cohort				
20-24	1.226*	(1.049,1.434)	1.247*	(1.041,1.493)
25-29	1.228*	(1.032,1.461)	1.101	(0.921,1.315)
30-34	1.188	(0.982,1.437)	1.060	(0.847,1.327)
35-39	1.194	(0.974,1.462)	1.079	(0.857,1.357)
40-44	1.362**	(1.095,1.695)	1.253	(0.967,1.623)
45-49	1.375**	(1.106,1.710)	0.992	(0.780,1.263)
50-59			1.050	(0.807,1.365)

Table 15 continued.

55-59			1.095	(0.827,1.450)
Print media				
Moderate	1.167*	(1.020,1.335)	1.070	(0.952,1.203)
High exposure	1.213	(0.856,1.718)	1.199	(0.979,1.469)
Radio				
Moderate	0.981	(0.848,1.134)	1.146	(0.944,1.392)
High exposure	1.050	(0.901,1.224)	1.182	(0.974,1.434)
Television				
Moderate	1.080	(0.951,1.228)	1.089	(0.946,1.254)
High	1.315***	(1.132,1.527)	1.070	(0.910,1.258)

Table 15 continued.

_Cons	3.019***	(2.532,3.598)	1.750**	(1.220,2.508)	3.383***	(2.760,4.145)	2.161***	(1.448,3.224)
Log likelihood	-1126.7		-1054.4		-833.9		-795.3	
Chi-squared	61.20		142.0		37.66		115.7	
N	3832		3814		3919		3891	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Just like the model on misconceptions about transmission, the models in Table 15 are based on the same independent factors but different outcome variable - awareness of cure. However, the base categories were retained for awareness to ensure consistency. These bases are region (Central Region); type of place of residence (urban); religion (others); ethnicity (others); education (no formal); wealth (poor/poorest); age (15-19); marital status (never married); print media (no exposure); radio (no exposure); and television (no exposure).

As shown in the descriptive section under this variable, knowledge on cure appeared to be at the theoretical diffusion level: almost all the specific predictive variables and associated categories range between 78.16 per cent and 97.23 per cent.

The results were then tested to identify which category of the various factors were more or less likely to be aware of cure. With the Central Region as the reference category, females in the Volta, Eastern, Ashanti, Northern and Upper West (Table 15, Model C1) regions were less likely to be aware of cure for TB. Among males, it was only those from the Volta, Eastern and Upper West regions (Table 15, Model C3) who were less likely to have knowledge about cure for TB.

Controlling for other socioeconomic factors, females from the Upper East Region were about 40 per cent ($p < 0.05$) more likely to know about cure for TB: similar higher likelihood of knowledge of cure could be observed among males from the Upper East Region except that the probability was not substantial (Table 15, Model C4).

Other covariates, which showed relationships, include religion, wealth, ethnicity, age, exposure to print and television media. However, these relationships are mainly observed among females. With respect to religion for instance, females who identified with Moslems were approximately 40 per cent (Table 15) more likely to be aware of cure for TB than those who belonged to the “Others” category. Again, older females (45-49 years) were about 40 per cent higher to have knowledge about the curability of TB compared to those 15-19 years. Females with higher exposure to television were roughly 30 per cent likely to know of cure for TB. The only difference observed among females are those between 20-24 years (OR=1.25; $p < 0.05$) being more likely to indicate awareness about cure for TB using those 15-19 years as the base category.

Attitudes towards disclosure of tuberculosis status

Historically, TB patients were demonised and isolated due to fear of its infectivity (Courtwright & Turner, 2010). The development of therapeutic and inexpensive chemotherapy in the 1940s lessened indignity associated with TB (Sontag, 1991). However, present relationship between HIV and TB has revived the stigma associated with TB (Johansson, Long, Diwan & Winkvist, 2000; Nnoaham, Pool, Bothamley & Grant, 2006; Daftary, 2012).

Table 16 presents descriptive results on attitudes towards positive TB status disclosure. Among males, 76.7 per cent reported positive attitude towards status disclosure compared to females (67.7%). Religious affiliation generally showed relationship with attitudes towards disclosure of TB status:

around eight out of every ten (81%) males and about seven out of ten females (68%) with Orthodox Christians; 78 per cent of males and 66 per cent for Pentecostal/Charismatic Christians. The proportion of Moslems who expressed positive attitudes towards status disclosure was 75.6 per cent among males and 72.5 per cent among females. “Others” males (87.4%) and females (75.5%) reported the highest proportion of positive attitudes towards status disclosure. Overall, Chi-square tests produced statistically significant relationships (males: χ^2=27.23; p=0.000; females: χ^2=239.65; p=0.000).

Attitudes towards TB status disclosure were highest among rural dwellers than urban dwellers for males and females: 82 per cent of rural and 77 per cent of urban males; 68.9 per cent of rural and 66.7 per cent urban females. The results seem to suggest weak associations between type of place of residence and respondents’ attitudes towards TB status disclosure. One would have envisaged that urban residents (both males and females) showed more positive attitudes towards status disclosure than rural residents. This was premised on secularisation and individualism associated with urban lifestyle in contrast to the more egalitarian and communal interconnectedness associated with rural residence. However, this a-priori assumption was not confirmed by the results obtained.

Table 16: Attitudes towards tuberculosis status disclosure by background characteristics

Factors	Males (n=4,568)		Females (n=4,916)	
	Total respondents	% With positive attitude	Total respondents	% With positive attitude
Region	175.78(0.000)*		239.65(0.000)*	
Western	446	72.18	379	57.18
Central	375	76.72	362	58.29
Greater Accra	668	85.57	772	76.54
Volta	391	93.04	394	88.59
Eastern	408	77.42	439	65.43
Ashanti	818	71.58	931	67.43
Brong-Ahafo	347	78.76	368	45.91
Northern	335	82.78	293	78.06
Upper East	228	93.88	186	70.57
Upper West	106	68.66	88	51.06
Residence	2.8372(0.092)*		0.7717(0.380)	
Urban	1,981	77.21	2,187	66.67

Table continued.

Rural	2121	81.96	2,028	68.85
Religion	27.45(0.000)*		239.65(0.000)*	
Christian	1,333	80.72	1,269	67.58
Pentecostal	1,723	78.38	2,131	65.71
Moslem	617	75.58	566	72.19
Others	428	87.41	249	75.45
Ethnicity	43.23(0.000)*		74.81(0.000)*	
Akan	2,044	76.58	2,297	63.02
Ga/Dangme	261	76.34	303	71.74
Ewe	614	89.13	554	82.80
Mole-Dagbani	620	82.13	585	70.18
Others	560	78.97	474	67.27
Education	14.04(0.001)*		11.40(0.003)*	
Never	483	86.88	709	73.81
Primary	534	77.12	790	67.12
Secondary+	3,074	78.98	2,712	66.26

Table 16 continued.

Wealth status	0.7714(0.680)		0.9019(0.637)	
Poorer/poorest	1,332	81.73	1,249	70.14
Average	719	78.33	874	66.84
Richer/richest	2,049	78.79	2,091	66.64
Marital status	43.33(0.000)*		50.80(0.000)*	
Never	1,694	74.79	1,371	60.08
Married	2,211	83.65	2,440	71.09
Formerly	196	76.84	403	73.30
Age cohort	68.66(0.000)*		72.48(0.000)*	
15-19	752	72.53	817	56.74
20-24	627	75.64	749	64.23
25-29	567	78.75	730	70.58
30-34	489	78.00	557	69.57
35-39	488	84.64	563	71.59
40-44	360	86.18	422	73.22
45-49	338	82.04	375	78.26

Table 16 continued.

50-54	278	89.05	-	-
55-59	200	84.88	-	-
Print	3.25(0.197)		6.37(0.041)*	
Low	2,340	79.41	3,100	68.48
Medium	1,351	78.84	965	63.96
High	401	83.47	141	76.38
Radio	1.56(0.458)		2.361(0.3070	
Low	196	78.45	496	71.44
Medium	816	80.73	1,424	66.61
High	3,085	79.64	2,291	67.60
Television	0.493(0.781)		11.91(0.003)*	
Low	957	78.45	1,363	72.41
Medium	1,473	80.73	1,304	64.06
High	1,666	79.43	1,545	66.69

*Chi-square significant at 5%. P-values indicated in brackets

Marriage affords partners with some leverage in terms of intimacy that makes it possible for partners to share information that will normally remain undisclosed. Research evidence points to a positive relationship between marriage and better health outcomes (Pandey, 2008). From Table 16, both males (75%) and females (60%) never married accounted for the least proportion of respondents prepared to divulge their status to someone else when infected. The highest proportion of males with positive attitudes towards TB disclosure was the currently married (84%). The relationship between martial status and disclosure was significant for both sexes - males (χ^2=43.33; $p < 0.001$) and females (χ^2=50.80; $p < 0.001$).

Both men and women who had attained formal secondary or higher education as compared to their counterparts without formal education were less likely to express positive attitudes towards disclosure. For example, the proportion of males and females without formal education reported more favourable attitudes towards status disclosure - 86.9 per cent and 73.8 per cent respectively. In contrast, males and females who had obtained formal primary education and were prepared to disclose positive TB status were 77 per cent and 67 per cent respectively. Those who had received secondary and higher formal education were approximately 79 per cent males and 66 per cent females. In all, the relationship between formal education and attitudes towards disclosure was significant - males (χ^2=14.04; $p < 0.05$) and females (χ^2=11.40; $p < 0.05$), suggesting that the differences between various forms of formal educational attainment could also be significant (Table 16).

Unlike knowledge of TB transmission, age depicts significant relationship with attitudes towards disclosure. Thus, as one increases in age, motivations towards status disclosure also increased, though the results are not linear. What is common between males and females was that disclosure intents begin to increase at age 35-39 years. Another commonality for males (72.53%) and females (56.74%) was that older adolescents (15-19 years) were less open to disclosure. For females, the highest was reported by those between 45-49 years (78.26%) while 89 per cent was recorded among males between 50-54 years.

Table 17 presents complementary log-log regression results of analysis on respondents' attitudes towards TB status disclosure. Similar to earlier models, the unadjusted models (for males and females) consider only region of residence. A full model, which incorporates ethnicity, region, type of place of residence, formal education, wealth, age cohort, marital status, print, radio, and television media are presented in the second model with the following base categories: Central Region, urban others ethnicity, others, no formal poor/poorest, 15-19 years, never married, no exposure for (print, radio and television) respectively.

The likelihood (Table 17) of attitudes about disclosure shows differences prior to and after controlling for other determinants. Among females (Model D1; Table 17), respondents from the Brong-Ahafo Region were more likely to indicate positive attitude (OR=1.385; $p < 0.01$) to disclose TB status than those in the Central Region. The lowest was among females from the Volta Region (OR=0.238; $p < 0.001$). In respect of males, those from the Upper West were more likely to indicate positive attitudes (OR=1.572; $p < 0.05$) while the least (OR=0.245; $p < 0.001$) was reported from the Volta and Upper East regions (Table 17, D3).

After adjusting the models, the impact of region of residence on status disclosure increases in some cases and decreases in others: the likelihood of disclosure increases in almost all the regions except among females in the Ashanti Region (Table 17, D2). Among males, on the other hand, the likelihood of disclosure declines in all regions apart from the Western, although not statistically significantly (Table 17, D 4).

The odds expressing favourable attitudes towards disclosure in the Volta Region for both males and females less likely than the reference (Central Region) and this may be due to social norms associated with TB among the Ewes, who are predominant in the region. The local description of TB, *yomekpe*, in the Ewe language connotes an equivalence of death or tomb. The physical deterioration of untreated TB principally accounts for this local description.

Other covariates that provide indications of significant relationships on the females' side include marital status, ethnicity, formal education, age and exposure to television (Table 17). For example, married females were significantly less likely (OR=0.827; p 0.05) respond positively to status disclosure. Males who had obtained secondary and higher formal education were more likely to express positive views about status disclosure (OR=1.366; $p < 0.01$) compared to those without any formal education.

Table 17: Complimentary log-log regression results on attitudes towards tuberculosis status disclosure

	Females				Males			
	D1	95% CI	D2	95% CI	D3	95% CI	D4	95% CI
Region								
Western	1.021	(0.801,1.301)	1.088	(0.837,1.415)	1.160	(0.789,1.706)	1.183	(0.789,1.774)
Greater Accra	0.477***	(0.373,0.610)	0.447***	(0.324,0.617)	0.578**	(0.391,0.856)	0.517**	(0.337,0.792)
Volta	0.238***	(0.170,0.335)	0.312***	(0.204,0.478)	0.245***	(0.147,0.410)	0.254***	(0.142,0.453)
Eastern	0.770*	(0.603,0.983)	0.770	(0.559,1.060)	0.969	(0.650,1.444)	0.900	(0.596,1.360)
Ashanti	0.719**	(0.576,0.898)	0.704**	(0.562,0.882)	1.229	(0.863,1.751)	1.099	(0.762,1.586)
Brong-Ahafo	1.385**	(1.094,1.755)	1.580**	(1.183,2.111)	0.875	(0.590,1.297)	0.761	(0.510,1.134)
Northern	0.509***	(0.380,0.682)	0.579**	(0.402,0.834)	0.791	(0.532,1.178)	0.685	(0.438,1.072)
Upper East	0.653**	(0.492,0.867)	0.724	(0.471,1.112)	0.245***	(0.132,0.455)	0.227***	(0.111,0.466)

Table 17 continued.

Upper West	1.248	(0.979,1.591)	1.445*	(1.036,2.017)	1.572*	(1.047,2.359)	1.301	(0.804,2.106)
Residence								
Rural			0.917	(0.769,1.093)			0.817	(0.657,1.017)
Religion								
Orthodox			1.106	(0.817,1.497)			1.309	(0.942,1.820)
Pentecostal/Charismatic			1.251	(0.929,1.683)			1.336	(0.962,1.855)
Moslem			0.966	(0.691,1.351)			1.372	(0.954,1.973)
Ethnicity								
Akan			0.863	(0.679,1.096)			0.746*	(0.576,0.968)
Ga-Dangme			0.878	(0.611,1.261)			1.069	(0.739,1.546)
Ewe			0.661*	(0.477,0.917)			0.592**	(0.400,0.877)

Table 17 continued.

Mole-Dagbani	0.837	(0.632,1.109)	0.829	(0.627,1.096)
Education				
Primary	1.100	(0.901,1.343)	1.379*	(1.023,1.857)
Secondary+	1.014	(0.824,1.249)	1.366*	(1.043,1.788)
Wealth quintile				
Average	1.004	(0.814,1.240)	0.941	(0.738,1.199)
Least poor	1.028	(0.824,1.283)	0.943	(0.729,1.220)
Marital status				
Married	0.827*	(0.691,0.990)	0.928	(0.740,1.164)
Never married	0.786	(0.598,1.033)	1.266	(0.889,1.803)
Age cohort				

Table 17 continued.

20-24	0.885	(0.739,1.060)	0.802	(0.642,1.002)
25-29	0.719^{**}	(0.576,0.897)	0.721^{*}	(0.553,0.938)
30-34	0.762^{*}	(0.599,0.968)	0.759	(0.566,1.017)
35-39	0.765^{*}	(0.602,0.973)	0.543^{***}	(0.388,0.761)
40-44	0.693^{**}	(0.527,0.913)	0.485^{***}	(0.336,0.702)
45-49	0.596^{***}	(0.439,0.809)	0.714^{*}	(0.515,0.989)
50-59			0.422^{***}	(0.275,0.646)
55-59			0.540^{**}	(0.351,0.830)
Print media				
Moderate	1.025	(0.878,1.197)	0.975	(0.815,1.168)
High exposure	0.757	(0.517,1.110)	0.958	(0.721,1.273)

Table 17 continued.

Radio								
Moderate			1.046	(0.856,1.278)			0.859	(0.593,1.244)
High exposure			0.947	(0.774,1.159)			0.832	(0.571,1.212)
Television								
Moderate			0.820*	(0.692,0.972)			0.851	(0.690,1.048)
High			0.992	(0.847,1.161)			0.775*	(0.619,0.970)
_Cons	0.536***	(0.446,0.642)	0.814	(0.503,1.316)	0.261***	(0.191,0.357)	0.489*	(0.253,0.945)
Log likelihood	-2457.4		-2388.7		-1947.6		-1886.2	
Chi-squared	249.0		234.0		112.3		257.4	
N	4092		4075		4058		4030	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Females generally showed aversive attitudes towards TB status disclosure than males. Some qualitative evidence exists to explain females' averseness towards TB status disclosure compared to males. Disclosing TB status can affect the marriage of women compared to men, and if they are not married, it can affect later chances of being married due to stigma associated with TB. Dodor and Kelly (2009) found out in Sekondi-Takoradi that male respondents felt marrying and being with a woman infected with TB posed both economic and social burdens. For instance, one male respondent argued: "if your wife develops the disease, she has no strength to do anything to help you; she cannot cook for the family, somebody else must be there to take care of the children, so it is a problem to us" (p.173).

Karim, Johannson, Diwan and Kulane (2011) also noted that male patriarchy hinders females infected with TB from disclosing to others. In one of their interviews, a female respondent observed: "in the case of a wife suffering from TB, the husband will remarry … The husband does not give proper attention to a wife's treatment, as he can marry another girl if she dies and receive more dowries. He may think that treatment is a waste of his money" (p.87).

In a context where HIV is predominant but largely affects more women than men, the general discrimination against women will militate against early disclosure. The increasing burden of TB heightened by HIV is reviving TB-related stigma, although less than stigma associated with HIV (Johansson et al., 2000; Nnoaham et al., 2006; Daftary, 2012). In Ghana, TB prevalence is higher among females than males but attitudes towards disclosure are reserved. It could be that the social cost to women will explain their negative attitudes towards TB status disclosure.

Discussion

The main objectives of this chapter were three-fold: assess knowledge about transmission and cure for TB as well as assess attitudes towards TB status disclosure. For each of the outcome variables, the main explanatory factor was region of residence. The use of one main explanatory variable in studying the three outcome variables provided an opportunity to determine whether the three outcomes follow similar trends.

Generally, the evidence points to a rejection of the entire three null hypotheses. Indeed, there were significant relationships between vis-à-vis spatial (region of residence) and myths and misconceptions/knowledge about transmission, cure, and attitudes towards status disclosure. The spatial effects persisted in each case even after controlling for other socioeconomic factors. Khandoker et al (2011) observed spatial differences in perceptions about TB transmission, awareness of cure and attitudes towards disclosure. These differences may be accounted for by disparities in socioeconomic characteristics as well as cultural conceptions about specific diseases in a particular area (Ahorlu, Koram, Ahorlu, de Savigny & Weiss, 2005).

There was an expectation that higher knowledge about transmission of TB will correspond to improved knowledge of cure and somehow attitudes towards TB status disclosure. However, the evidence from the data did not follow this expectation. For instance, whereas respondents from the Northern, Upper East and West Regions had high probabilities of knowing the routes of transmission, knowledge of cure was low. The three regions have been found to have negative health outcomes on a number of issues of public health importance (see Gyimah, 2006; 2007). The findings on cure appear to follow this pattern some of the earlier observations on specific health issues in the three northern regions. However, the findings on myths and misconceptions and attitudes towards disclosure depart from the “existing” norm. This finding underscores the importance of disaggregated spatial analysis of issues with implications for policy. These findings provide opportunities for scaling-up of mass behavioural change communication messages on TB. This is in spite of many years advocacy on TB transmission in various communities across the country.

Contrary to expectation, higher formal education did not correlate with better low myths and misconceptions about the transmission of TB. A cursory look at the findings can lead one to question the validity of such a finding given the plethora of evidence that support education and better knowledge about health. Emerging literature on this hitherto generic assumption is challenging such propositions. For example, on a ten-point scale measurement of health outcomes, Altindag et al. (2011) study in the US reported that higher formal education did not correlate with better knowledge on health. Similarly, those whose terminal formal education ended at high school showed very weak association with desirable health knowledge. As earlier argued, the allocative efficiency hypothesis is therefore not always tenable in knowledge about health. There could be a “third variable”, which needs to be explored (Grossman, 2008).

In the next chapter, the existing policy/strategic context for TB control in the country is explored with specific attention to patterns of treatment outcomes and their perceived determinants, issues about sustainability, political commitment and challenges facing TB control in the country.

CHAPTER SEVEN

VIEWS OF STAKEHOLDERS ON CURRENT TUBERCULOSIS CONTROL

Introduction

TB is a disease that requires multifaceted interventions in its control. Over the years, countries have taken several measures to combat the disease, ranging from patient segregation, purging, sleeping to an era of chemotherapy of eighteen months and subsequently to a standard of six months treatment duration (WHO, 1998).

In Ghana, TB control has gone through both periods of activism and dormancy or inactivity. This chapter analyses passive surveillance data from the NTP. The data covered the period from 1997 to 2010. In addition, the views of stakeholders based on in-depth interviews (IDIs) are presented as possible factors accounting for TB treatment outcomes. Stakeholders were defined as people with interest and directly in-charge of day-to-day management of TB control activities in the country.

Tuberculosis treatment outcomes - 1997-2010

Improved treatment outcomes (cure, completed treatment, failure, default and death) are the key clinical indicators of assessing the performance of countries in TB control (WHO, 2006). Currently, the WHO benchmark for country and global level assessment indicator for cure rates is 85 per cent. The proportion of TB patients cure in Ghana between 1997 and 2010 are shown in Figure 4. As can be observed from the figure, cure rates for the first decade of

TB surveillance (1997-2007) were below the WHO threshold of 85 per cent but improvements are noted from 2008 onwards. In the section that follows, efforts are made to show the performance of the NTP in terms of treatment outcomes by region and over time.

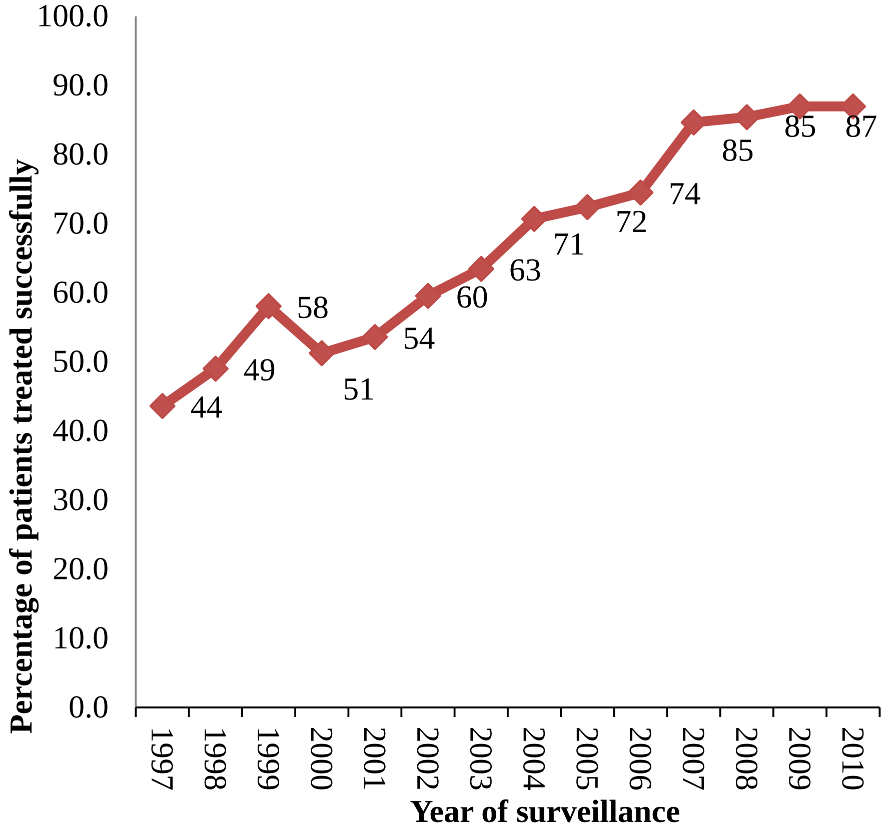

Figure 4: Tuberculosis cure rates between 1997-2010

The Western Region and 1997 have been used as the reference categories. In terms of the proportion cured, the likelihood was significantly higher in the Greater Accra Region (IRR=1.359; $p < 0.001$) compared to the Western Region. The least incident risk ratio of cure was reported at the Komfo Anokye Teaching Hospital (KATH) (IRR=0.00991; $p < 0.001$) as compared to the Western Region. On treatment completion, the chances of completion were significantly lower in all regions compared to the Western

Region. In terms of TB death, the rate was higher in the Eastern Region (IRR=1.55; $p < 0.001$) compared to the reference region (Western). It is possible that co-infection of TB and HIV may be contributing to this pattern given the high prevalence of HIV/AIDS in the Eastern region. Treatment failure was significantly lower in the Upper West Region (IRR=0.0929; $p < 0.001$) in reference to the Western Region.

Over the 13-year period, 2009 appeared the most successful year for TB cure rate ratio as against the records of 1997. In terms of treatment completion, 2010 reported better results (IRR=1.29; $p < 0.001$). The probability of TB death was slightly higher in 1998, 2003, 2005 and 2006, but the differences with 1997 were statistically not significant. Treatment failure was significantly lower in 2009 (IRR=0.281; $p < 0.001$) and treatment default was low in 2008 (IRR=0.123; $p < 0.001$) (Table 18).

In an interview with a senior officer of the NTP, it emerged that the better treatment outcomes achieved between 2009 and 2010 could partly be explained by the high participation of TB-related non-governmental organisations (NGOs) in public advocacy. This might have created much awareness about the availability of cure as well as the need for early treatment seeking and compliance to treatment.

The analysis of region across year showed a high likelihood of cure in the Northern Region in 2009 (IRR=8.033; $p < 0.001$) as against 1997 (Appendices 4-15). The lowest cure rates are reported at the Korle-Bu Teaching Hospital (KBTH) and for the period 2006, 2008-2009 (IRR=0.105; $p < 0.01$) respectively.

Table 18: Tuberculosis treatment outcomes by region and surveillance year in Ghana, 1997-2010

	Cure		Completed		Died		Failure		Default	
	IRR	95% CI	IRR	95% CI	IRR	95% CI	IRR	95% CI	IRR	95% CI
Central[1]	0.990	(0.960,1.020)	0.438***	(0.399,0.480)	1.376***	(1.256,1.50)	0.842*	(0.723,0.979)	1.714***	(1.618,1.816)
Greater Accra	1.359***	(1.321,1.399)	0.393***	(0.357,0.432)	1.061	(0.962,1.16)	0.689***	(0.586,0.808)	0.819***	(0.765,0.877)
Volta	0.828***	(0.802,0.855)	0.494***	(0.452,0.540)	0.903*	(0.816,0.99)	0.350***	(0.286,0.428)	0.417***	(0.383,0.454)
Eastern	0.970*	(0.940,1.000)	0.631***	(0.581,0.685)	1.545***	(1.413,1.68)	0.702***	(0.599,0.824)	1.002	(0.939,1.069)
Ashanti	1.215***	(1.180,1.251)	0.939	(0.873,1.011)	1.315***	(1.199,1.44)	0.391***	(0.322,0.474)	0.526***	(0.486,0.569)
Brong-Ahafo	0.470***	(0.452,0.488)	0.416***	(0.378,0.457)	1.011	(0.917,1.11)	0.571***	(0.482,0.677)	0.351***	(0.321,0.384)
Northern	0.230***	(0.219,0.242)	0.247***	(0.219,0.278)	0.334***	(0.290,0.38)	0.165***	(0.124,0.220)	0.162***	(0.142,0.184)
Upper East	0.243***	(0.232,0.256)	0.0946***	(0.0795,0.113)	0.579***	(0.516,0.64)	0.139***	(0.104,0.187)	0.114***	(0.0985,0.13)
Upper West	0.0973***	(0.0905,0.105)	0.168***	(0.147,0.192)	0.267***	(0.230,0.31)	0.092***	(0.0654,0.13)	0.080***	(0.0677,0.09)

Table 18 continued.

KATH	0.00991***	(0.0079,0.0123)	0.296***	(0.266,0.330)	0.127***	(0.104,0.15)	1.049	(0.909,1.211)	0.068***	(0.0568,0.08)
KBTH	0.0145***	(0.0121,0.0174)	0.287***	(0.257,0.319)	0.209***	(0.177,0.24)	0.926	(0.799,1.074)	0.120***	(0.104,0.138)
1998[2]	1.287***	(1.222,1.356)	0.861*	(0.765,0.969)	1.046	(0.933,1.17)	0.798**	(0.675,0.945)	0.886**	(0.822,0.955)
1999	1.234***	(1.171,1.301)	0.728***	(0.644,0.824)	0.872*	(0.773,0.983)	0.921	(0.783,1.083)	0.818***	(0.758,0.883)
2000	1.181***	(1.120,1.245)	0.679***	(0.599,0.770)	0.788***	(0.697,0.891)	0.743***	(0.626,0.883)	0.671***	(0.619,0.728)
2001	1.327***	(1.260,1.397)	1.113	(0.996,1.243)	0.803***	(0.711,0.908)	0.766**	(0.646,0.90)	0.867***	(0.804,0.934)
2002	1.525***	(1.450,1.604)	0.786***	(0.696,0.887)	0.937	(0.833,1.053)	0.663***	(0.555,0.79)	0.731***	(0.676,0.791)
2003	1.695***	(1.613,1.781)	0.866*	(0.770,0.974)	1.024	(0.913,1.149)	0.498***	(0.410,0.60)	0.711***	(0.657,0.770)
2004	1.724***	(1.641,1.811)	0.971	(0.866,1.088)	0.942	(0.837,1.059)	0.495***	(0.407,0.60)	0.647***	(0.596,0.702)
2005	1.921***	(1.830,2.016)	0.751***	(0.665,0.849)	1.092	(0.975,1.223)	0.478***	(0.393,0.58)	0.579***	(0.532,0.630)
2006	2.052***	(1.956,2.152)	0.822**	(0.729,0.926)	1.092	(0.975,1.223)	0.501***	(0.413,0.60)	0.326***	(0.294,0.361)
2007	2.145***	(2.046,2.250)	0.930	(0.828,1.044)	0.981	(0.873,1.102)	0.352***	(0.283,0.43)	0.153***	(0.133,0.176)

Table 18 continued.

2008	2.324***	(2.218,2.436)	1.062	(0.950,1.188)	0.885*	(0.786,0.997)	0.346***	(0.277,0.43)	0.123***	(0.106,0.144)
2009	2.496***	(2.382,2.615)	1.139*	(1.020,1.272)	0.846**	(0.750,0.955)	0.281***	(0.222,0.35)	0.152***	(0.132,0.175)
2010	2.206***	(2.104,2.313)	1.285***	(1.154,1.430)	0.877*	(0.778,0.988)	0.339***	(0.272,0.42)	0.163***	(0.142,0.186)
Constant	343.2***	(328.3,358.7)	113.1***	(103.0,124.1)	60.15***	(54.13,66.84)	44.73***	(38.61,51.8)	232.7***	(217.7,248.7)
Log likelihood	-2172.6		-1052.5		-910.9		-735.6		-1435.3	
Chi-squared	47983.4		2994.5		3028.6		1306.1		13179.8	
N	167		167		167		167		167	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The poor outcomes at the KBTH could be explained by certain contextual difficulties that may be charactering TB management. Community treatment care and regular follow-ups on patients have been critical to treatment outcomes. However, KBTH is a referral facility and also located in a cosmopolitan area, follow-up on patients may not be effective and efficient as it possibly happens at the lower levels of health delivery. Nevertheless, because it is not the case with KATH, which shares similar features with KBTH, further studies which compare the quality of care at the tertiary on the one hand and primary and secondary health facilities, on the other hand, can illuminate these nuances better. Health workers' views on possible strategies, which might have contributed to the overall improving treatment outcomes, are presented in the following section.

Views on factors determining tuberculosis treatment outcomes

Perception studies are useful for policy changes (Abiiro & McIntyre, 2013) and within the health policy literature; the perception of the stakeholders has been used to assess the impact of a policy or an intervention (Thomas & Gilson 2004; Roberts et al. 2008). In the following section, perceptions of stakeholders about specific strategies in TB control in the country are examined. These areas include case management, community treatment and care, advances diagnosis, incentives, political commitment, challenges etc.

Case management

One of the main measures of TB treatment outcome is measured by the reduction in defaulter rates. Reducing defaulter rates is important because high default rates are one of the causes of MDR-TB. Reduction in defaulter rates is, therefore, one of the major progress indicators in TB controls. As a result, some respondents considered reduction in defaulter rates as one of the major milestone events in Ghana's TB control. One respondent remarked:

> *"What I consider landmark is the reduction in defaulter rates. I learnt that defaulter rates in the region were very high; around 20 per cent in the past but, presently, it has reduced to around 4-5per cent".* (Coordinator, Region 1)

Varied perceptions were expressed about possible reasons for the reduction in the rates. One reason given was the reduction in the duration of treatment regimen from about 18 months to the standard of six months (except among patients reporting for retreatment who may be placed on treatment for eight or nine months).

Some respondents also attribute this achievement to the introduction of fixed-dose combination (FDC), which is a condensation of some first line drugs such as ethanbutol, isonizid, rifampicin and the others into one dosage. Fixed-dose combinations have been advocated as a way of preventing the emergence of drug resistance attributable to inappropriate drug intake (Blomberg et al., 2001). In addition, FDC can reduce the risk of incorrect dosage, simplify drug procurement and aid in ensuring adherence (Lienhardt et al., 2011). The quote below illustrates the perceived contributions of FDC:

> *"… When the FDC was introduced, it resulted in cutting down treatment period from eight to six months without injections and this intervention has improved case management and this has improved our cure rate. Previously, the long duration for*

treatment led to relatively high numbers of default but that has reduced significantly". (Region 2 Coordinator)

The use of FDC, which made it possible to reduce treatment period contributed to decline in default rate in the following way: it reduces the number of different drugs (isoniazid, rifampicin, enthambutol and pyrazinamide) patients should have taken, thereby reducing the burden of swallowing different tablets which could sometimes lead to discouragement (Braga, Araújo da Conceição & Anete Trajman, 2013).

Advances in diagnosis

Another factor that was identified is in the area of accuracy in diagnosis. From the responses, it emerged that the diagnosis of patients has improved. Given that even one TB patient can infect several others per annum, the identification of a single case is an important step towards cutting down infectivity rates. One respondent observed that:

"We have ensured that the quality of sputum produced for diagnosis is improved since confirmation of cases is difficult or impossible without laboratory confirmation. In line with this, every patient is given two containers for sputum specimen - one for early morning specimen and other for on-the-spot specimen. We observed from this initiative that the quality of sputum provided improved ... after implementing coaching of suspects, there were slight changes, about 2 per cent in quality of sputum and we expect this to continue improving ... quality sputum

allows us to have proper bacilli formation through culturing".

(Region I Laboratory Focal Person)

It has been reported that poor diagnosis is a major hindrance to TB control because imprecise diagnosis can result in many false negative results. For instance, Sakundarno, Nurjazuli, Jati, Sariningdyah, Purwadi, Alisjahbana and van der Werf (2009) observed that indefinite sputum diagnosis often resulted in disappointing laboratory outcomes. Secondly, by providing information to patients on reasons for health personnel collecting sputum, how to produce sputum, and informing patients about characteristics of quality sputum, the probability of produce quality sputum increases and that in turn leads to better sputum through microscopy analysis.

Community tuberculosis treatment care

In 2005/2006, the community treatment and care approach was initiated and piloted in the Ashanti Region. The aim was to motivate TB patients to comply with therapeutic regimens. Through this strategy, treatment supporters were attached to patients to encourage and remind them of the schedule of drug administration. It forms part of direct supervision of patients and implemented after patients have been on treatment after two months, the period known as intensive phase. The selection of treatment supporters is done in collaboration between treatment nurses and or district coordinators and clients. The views that emerged were that the approach has contributed positively to TB control. A respondent observed:

"This intervention helped to reduce defaulter rates because some selected individuals within patients' immediate surroundings help

to supervise treatment without necessarily travelling long distances for treatment. Coordinators (District and facility) in collaboration with clients select community TB treatment supporters. These are individuals who the patient can trust - mainly relations and trusted opinion leaders". (Region 2 Coordinator)

The opportunities associated with community treatment strategy is reducing the burden of patients in commuting daily to hospitals and clinics for supervised treatment. Sinanovic, Floyd, Dudley, Azevedo, Grant and Maher (2003) and Zvavamwe and Ehlers (2009) have found evidence to the cost-effectiveness of the community approach. Community treatment care also offers opportunities for offsetting the negative effects of self-supervision (Zhou et al., 2012).

Attitude of health workers towards tuberculosis management

The attitude of health professionals towards a particular disease can shape how they deal with it and manage patients who suffer from the disease (Daniel, Oladapo & Alausa, 2006). Due to the high infectivity of TB, health workers, just like community members have been found to stigmatise TB patients (Dodor & Kelly, 2010). The accounts of a number of respondents indicated that the negative attitudes of some health workers towards TB are gradually changing and that could be contributing towards better management outcomes. A respondent noted:

"Now even the cadres of health worker coming in are people who have opted to work with the TB control programme. Previously, it

was considered a punishment to be posted to chest clinic. Personnel who were considered stubborn, indiscipline or rebels in the system were sent to DOTS centres - it was like Siberia. But that is changing. There is increasing commitment from health workers". (National Officer, A)

One of the challenges to internationally funded disease control programmes, especially in developing countries is the tendency for health workers to hop from one programme to the other just to be have access to funds, either genuinely or not (Windisch et al., 2011).

Based on the comments about the changing attitudes of health workers, further probing were done to understand the reasons behind these perceived changing attitudes towards TB control. Two issues generally related to intrinsic motivation emerged. The first one had to with the perception that the improvement in TB treatment outcomes was serving as a motivation to health workers. A senior programmes officer surmised:

"People see a clear vision for TB control; knowledge has improved, there is greater understanding, the disease has been demystified, logistics needed for control are available - workers don't have to shout and shout for resources … health workers are beginning to see results, which translate into job satisfaction. If you treat somebody and notice the patient is getting healed, you become content". (National Officer A)

The second issue that emerged was about the need for health workers to comply with professional ethics and duty. The respondents who held this view noted that it was part of the professional ethics to accept postings to wherever their competencies would be required. As a result, they accepted and have shown interest in TB control activities because the patient mattered. Respondents at the facility levels mainly expressed these views:

> *"Programmed diseases have problems with funding; normally when sources of funds for such diseases cease, its control becomes something. Often times, certain health workers move towards programmed diseases but in my case, I am doing it because I have been trained to provide health care to those who need care. Note that it is not everybody who wants to work in TB unit even though it is a funded programme. Generally, however, Ghanaians like funded or programmed disease controls and as funds dwindle, some workers retreat".* (DOTS Centre Nurse, Region 2, District S, Public Hospital)

Although the respondents indicated that it was possible for some other personnel to be influenced by the funds available to specific programmes, it was not so in their case. This observation among the participants of this study seems to follow the literature on sources of motivation for health professionals. In a number of studies, non-financial motivators influence health workers much more than assumed (Dolea & Adams; 2005Reid, 2004; Vujicic, Zurn, Diallo, Adams & Dal, 2004; Lagarde, Blaauw, & Cairns, 2012). For example, Reid's (2004) study of village allowances strategy in South Africa could not increase motivation of health workers as envisaged. In fact, Mathauer and Imhoff (2006) argued that health workers give off their best when they feel and know that patients have very high likelihood of healing and survival. This is conceptually related to “I will do” aspect of internal motivations (Kanfer, 1999).

The enablers’ support

The enablers’ support is an intervention, which was introduced to motivate patients and, occasionally, health workers; especially DOTS centre nurses and laboratory technicians. Enablers’ package could include a wide range of services such as travel vouchers, reimbursement; cash payments, toiletries, clothing, cell phone minutes; food during DOT visits, vouchers, periodic food packages; social welfare payments during treatment; income generation project; salary payments or disability payments; legal services; housing or housing subsidies; personalised incentives - e.g., “bait for fishermen” (providing other payments to community or patients who bring suspects for treatment (Weil, 2012). The food supplements are, for example, intended to improve nutritional status of patients because of the strong correlation between under nutrition as well as the energy demands of anti-TB medicines. The overriding aim of the support system is to reduce non-compliance to treatment because food poverty, transportation etc. are some of the determinants (Sagbakken et al., 2008b).

Presently, the enablers’ support in Ghana caters for some of the following activities: cash payments, travel vouchers (both staff and clients), food supplements/packages and social welfare payments. Travel vouchers for health workers were used for home verification and visits and cell phone minutes and social welfare payments targeted at paying health fees for other diseases apart from TB. The following excerpt demonstrates how respondents perceived the contributions of the enablers'.

> *"When the enablers' package begun ... each patient on treatment was receiving about six cups of rice beans, oil as well as stipends for transportation and this was helpful, especially among the poor".* (Coordinator Region 2)

Despite the usefulness of the policy as recounted by the respondents, there were complaints about the inconsistencies in the distribution of funds. Because of the inconsistencies in the flow of resources, there seems to be an application of street-level bureaucracy (Lipsky, 1980) in a number of facilities. Conceptually, the support is targeted at all patients. However, respondents indicated that they were selective in distributing the package. Patients who were judged wealthy based on physical appearance were excluded. This is done to ensure that the very poor (who are also determined based on physical appearance) received appropriate support during treatment. Agyepong and Nagai (2011) have observed similar issues regarding the implementation of the exemption policy under the health insurance of Ghana. They found that instead of full exemption, some facility administrators charged certain patients who are within the exemption category due to uncertainties associated with processing of insurance claims.

It must be noted that changes that might occur during policy implementation as a result of contingencies may sometimes lead to positive outcomes to a system. In another breadth, it points to the need for bottom-up approach in policy design, given that policies could change during implementation.

Perceptions about political commitment to tuberculosis control

Every disease control enterprise requires some level of commitment from political authority. TB and HIV are known to be two diseases that need much attention from political authority. Political commitment transcends different spectrums. Respondents were therefore asked about their perceptions about political commitment towards TB control in Ghana and three major themes were identified. They are: resource allocation (financial, infrastructure and human resource development and management), public policy legislation and advocacy. On each of the three themes, perceptions varied from satisfactory to unsatisfactory.

Resource development and allocation

Several developmental concerns compete for attention of political leaders due to scarcity of resources, and this is not peculiar to only developing countries. Due to this overarching resource concerns, issues that are able to get unto the agenda are usually underpinned by choices. As argued in rational choice theory, concerns about resources often force policy drivers to make choices between diseases that should be founded or given much priority. In the realm of health economics, competitive choices have resulted in measures such as disability-adjusted life-years (DALYs). Through such measures, decision-makers are able to make informed choices about diseases that cause significant disabilities and years of life lost to premature mortality. These issues informed my interest to explore the extent to which TB control has received political attention. A respondent contended:

"I can emphatically say no as far as … political commitment is concerned. But for the Global Fund (GFATM), I don't know how TB control programme could have survived up till now. Whenever GFATM funds are not coming, there is no money that comes in for TB activities". (DOTS Centre Nurse, Region 2, District S, Public Hospital)

A different aspect of political commitment related to human resource development. Human capital development is crucial for providing technical, supervisory and point of care services for TB patients. On human resource development, respondents appeared satisfied with existing management.

These representations from the respondents feed into the widespread perceptions about the capacity of developing countries to sustain initiatives, regardless of the source of intervention. There are several other programmes that have depended so much on donor funding and when the donors have folded up, such programmes messed-up. For instance, HIV/AIDS programme is currently undergoing funding gaps because GFATM has terminated funding some aspects of NACP funding programmes. One respondent from an NGO involved in Ghana's TB control was emphatically pessimistic about the country's ability to maintain current achievements in TB control. The global health aid literature recognises the turbulences associated with setting international health funding agenda (Shiffman, 2008), suggesting that depending extensively on donor funds does not ensure viable healthcare. Apart from issues of sustainability, there is also a danger of loss of local ownership (Shiffman, 2006; 2008). As Shiffman contends, issues that are able to penetrate through array of problems to become an agendum are not always based on “objective” assessment but rather social constructionism, which in itself is dynamic and sometimes subjective (Shiffman, 2009).

Legislation and policy formulation

The broad framework of political commitment recognises the relevance of substantive policy space that can effectively regulate TB control. The first post-independence legal backing to free TB treatment in Ghana is captured in Legislative Instrument (LI) 1313. This LI follows Hospital Fees Act of 1971 (Act 387), which was consummated on 19th July 1985. It is stated in article 2(2) that: patients suffering from Leprosy or TB are exempted from payment of all fees. Nevertheless, one respondent who indicated his awareness of this policy directive appeared not satisfied with providing only a regulatory framework. He indicated:

> *“Although Legislative Instrument (LI) 1313 clearly stipulates that TB should be treated at no cost to patients. But if there are no drugs and logistics, how do we treat people suffering from a disease? It is not about making statements or promulgation of laws that are very essential but instrumental backing of laws and regulations are critical”.* (Coordinator, Region 2)

It was also deduced from some respondents’ opinion that the favourable atmosphere being provided for TB patients is solely restricted to patients - there is no provision for health professionals. For example, while the LI guaranteed free treatment to patients, there was no such policy covering health worker against health hazards, especially working on a highly infectious disease. This, according to certain respondents meant weak political commitment.

> *"No, because there is no policy or law that protect us in this high-risk working environment. Right now, if I become infected in the course of carrying out my responsibilities, there is no protection for me. For instance, there are occasions when you have educated a patient to ensure cough etiquette and yet right after and in your presence, a patient will cough on you - there is no protection for us against occupational hazard".* (DOTS Centre Nurse, Region 3, District A, Public Hospital)

Another area that some respondents considered an indication of political commitment was the state's support through the MOH in providing political insurance that allowed NTP to source funds from the GFATM. Again, it was also mentioned that the political space allowed for establishing a national TB control programme was also mentioned. Harries (1996) posited that one of the major steps towards political commitment in TB control is the political space for TB control programmes.

Advocacy

Community gatekeepers such as politicians (example, Members of Parliament, Ministers of State, Metropolitan, Municipal and District Chief Executives), chiefs, and religious leaders, among others command respect in their respective communities and therefore, their involvement in advocacy for both resources and behavioural changes are critical to successful programmes. Social marketing researchers believe that the number of statements made by credible political leaders carry substantial weight. Advocacy programmes that have influential politicians on board can contribute immensely to disease control. At the lower levels of governance, particularly in the districts, one gets the impression that political involvement in advocacy is satisfactory. The following observations demonstrates this point:

> *"In some districts, District Chief Executives support TB coordinators to educate their populace"*. (Coordinator, Region 3)

> *"When it comes to advocacy, we bring the political heads in the districts on board and their participation there is quite good".* (Coordinator, Region 4)

However, at the national level, the observation is different. Some respondents felt that if national level political authority were committed to TB, they would honour invitation to programmes.

> *"Over the last years, NTP has made many efforts to get top politicians speak at TB programmes. I am looking forward to a time when politicians will accept to speak at TB days. Occasionally, it is advertised that the Vice President of the Republic is attending TB related programmes, only to get there and find someone lower is representing. At other times to, a minister might be advertised to be presenting only to get there and find a deputy minister. May be none of them has or has been closely affected by TB - whether themselves or a close family relation that is why their commitment levels are not encouraging"*. (Coordinator, Region 2)

Between TB and HIV, respondents generally agreed that HIV/AIDS receives more attention than TB. The reason, according to certain respondents was that HIV has a strong advocacy groups, such as Persons Living with HIV/AIDS (PLWA). On the other hand, because TB is curable, forming coalitions of people living with it is practically impossible.

All over the world, issues compete for attention of political leaders. This suggests that soliciting the attention of politicians could be positive for sustainability. As Shiffman and Smith (2007) proposed, persuasive communication is a major requirement for issues to sail through to become an agenda. It is therefore possible that the perceived lack of commitment of those with political power is emanating from inefficient policy and problem-based communication with political actors. One regional respondent acknowledged that that could be the case: "it seems that we have not done enough to bring them on board by inviting them to our programmes" (Coordinator, Region 3).

On the balance, it appears that political commitment towards TB in Ghana does not seem satisfactory. Though respondents did not directly mention poverty reduction and housing improvement as an element of political commitment, in three of the four study regions, some respondents suspected that poor housing could be one of the major risk factors for the high prevalence in the areas they worked. For instance, in Greater Accra, Ayawaso East was found to be the district with highest TB prevalence. During interviews with two health personnel, their suspicion pointed to overcrowding in the neighbourhoods. In Kumasi metropolis, Manhyia polyclinic was reported to be recording the highest cases of TB and participants there also suspected overcrowding and poverty as contributing to TB.

This requires political commitment towards poverty reduction and better housing. Evidence abounds about how improved socioeconomic conditions (housing and nutrition) have contributed to TB reduction. A study in Oman among health workers provoked similar concerns about poor housing in various hospitals' neighbourhood as accounting for high TB incidences (Al-Maniri, Fochsen, Al-Rawas & De Costa, 2010). Crunch macroeconomic conditions in Eastern Europe are believed to have resulted in resurgent of TB epidemic in those parts of Europe (WHO, 2009c). Sterling (2006) further adds that the danger associated with weak political commitment towards TB has primary effect on MDR and XDR, apart from behavioural issues, which in them are underpinned by the political context. Farmer's (1997) observation from Haiti collaborates this assertion. While patients were willing to attend clinic, poor public health infrastructure and transport problems hindered many TB patients in rural areas from accessing care. Álvarez et al (2011) recently confirmed TB mortality inequalities in sixteen European populations. Hargreaves, Boccia, Evans, Adato, Petticrew et al. (2011) have argued that improving social protection and urban planning have the potential of improving TB control.

Concerns about sustainability of current tuberculosis control programme

Since Bruntland's (1987) report on sustainable development, the concept of sustainability has attracted a lot of attention in the development literature. It has emerged to be an integral question policy implementers often ask about impending or existing projects and programmes. Within the sustainable healthcare literature, it is the opinion of some researchers that quality care is the basis of sustainability. Availability and timeliness of logistics and drugs for treatment, adequate compensation of health staff, and quality health infrastructure among others further enhance sustainability. WHO (2011) has noted that the greatest obstacle to TB control sustainability in several African countries (apart from South Africa where programmes are self-sustaining) is financial contribution of local governments. At the moment, donors support more than 50 per cent of budgets in developing countries. In other parts of the world too where control programmes are self-financed, the challenge is related to MDR and XDR (Raviglione, Zumla, Marais, Horton & Motsoaledi, 2012).

The perceived low political commitment among several interviewees resulted in candid concerns about sustainability, especially from a financial perspective. As would be shown, various interviewees were of the opinion that the bedrock of successful TB programme is regular and consistent funding. Activities such as in-service training, procurement of logistics and drugs, personnel and demand generation (example voucher system for patients) are sustainable based on funding. Views of respondents were less unanimous - there were both pessimists and optimists in respect of sustainability of the current programme. Pessimism was mainly based on current and past experiences about funding. Respondents compared periods the programme had been highly funded by donors and eras when the government of Ghana had solely provided funds for NTP.

> *"I have fears about funding. If Global Fund folds-up, the future of TB control in Ghana will be uncertain. For instance, throughout last year, there were funds for only one quarter. This adversely*

affected our programmes so I have deep concerns about sustainability. This year too, we have received funding for only World TB Day and imagining that the first quarter has ended…" (Coordinator, Region 1)

"It seems that when there is no money, there is no TB. My fear is that if current economic recession keeps on, Global Fund will suffer a hefty blow and TB will suffer as well. Recently those funds have not been regular, people meet you and the first question they ask is when are monies coming and all that. So it looks like when there are no funds, the programme will suffer". (Coordinator, Region 3)

The optimists' arguments were situated in the perceived benefits associated with integrated disease control programmes. One interviewee proffered:

"Luckily, integration reduces burdens that would have been associated with personnel salaries and benefits apart from those of us at the national office being paid by GFATM. Currently, most of our things - drugs, reagents, and laboratories materials are supplied with funds from GFATM but these items were being provided by the government before GFATM came. Therefore, we have some level of certainty that when GFATM winds-up, we can fall on government for assistance". (National Officer 2)

Available data seem to support both pessimism and optimism respondents expressed about funding. Currently, donors provide a greater proportion of funding for TB. Even with the presence of donors, available funds since 2006 have consistently been lower than budgeted for effective programme implementation. For instance, in 2011, of the $44 million funds that were needed for the programme in the country, only $27 million was secured, representing 60 per cent budget funded. Out of the $27 million funded, Global Fund provided 64 per cent while GoG provided a paltry of 32 per cent. Available funding for 2012 is estimated at $24 million dollars, indicating a shortfall of 11 per cent. Out of the $24 million available, the GFATM is providing about 54 per cent ($12,960,000) while GoG is providing the remaining 46 per cent (11,040,000).

Juxtaposing this into the framework of GFATM intentions calls into question the country's ability to self-sustain the programme when GFATM folds-up completely. The GFATM, which has proclaimed to finding solutions to malaria, HIV/AIDS and TB is intended to help countries strengthen what they have already been doing better. As it appears now, however, the country seems to have sat back and depending mainly on GFATM benevolence.

Perceived barriers to tuberculosis control

Clinical issues

The development of FDC for treatment for most part has been instrumental in reducing defaulter rates among patients. However, there were specific apprehensions about the size of FDC tablet. A number of DOTS centre nurses have observed that certain patients complain about the size of the dose, which she feared could be counter productive and result in defaulting. She observed:

> *"Some patients often complain about the size of the doses they take, that the drugs are too big and a host of others. Others too when after six months they are not cured and are required to take injections for about two more months, it becomes a big blow to them. Apparently, this is due to cost of commuting to facilities on regular basis for injection".* (DOTS Centre Nurse, Region 3, Private Facility)

Added to this concern was how some physicians perceive TB control. Some participants claimed that a section of clinical staff are not interested in TB. This disinterest, respondents suspect, is emerging from the new approach to TB case management - a shift from a purely clinical orientation to a mix of social and clinical therapy as opposed to previous sole clinical management of the disease.

> *"… There is low clinician involvement due the structured nature of the programme. Usually, immediately they notice a TB case, they quickly refer patients to a coordinator. The problem I see with this attitude is that it is possible the condition might not be only TB; there could be other conditions, which will require the clinicians' attention. Assuming a patient has malaria or is malnourished as well as other conditions that can affect TB management, services of a clinician will be needed because TB caregivers are mandated to provide only TB treatment".* (Coordinator, Region 2)

The low involvement of clinicians in TB control has become a hindrance to the depth of suspicion among clinicians. Responses were triangulated to ascertain the validity of TB coordinators who are all non-clinicians. The low involvement of clinicians seem to be borne out of the perceived narrowed ownership of TB, which has been restricted to disease control people. One clinician narrated his experience when he assumed duty as a district director of health services.

> *"During my first interactive meeting with staff in the directorate, I indicated to them that I was going to assume responsibilities as district coordinator, the staff members looked at me with awe. They could not accept how a clinician would want to be a TB coordinator".* (Clinician and District A Director of GHS, Region 4)

The seemingly poor relationship between disease control staff and physicians, a respondent indicated is arising from the financial packages involved in TB control. He noted: "the enablers' package is bringing the confusion" (Director of Clinical Services, Region 4). These perceived contestations between clinicians and public health staff lends more to the 'medicalised' model of health delivery - a scenario where clinicians perceive health delivery as their preserve and that any attempt at including others is treated with opposition. As one respondent revealed, the integrated primary health care approach adopted from the beginning of NTP was not fully accepted by some clinicians and still prevail. It is possible that efforts have not been made towards inclusiveness. Ayee (2000) has argued that in public policy change, there are "demons" that can oppose policies through overt and covert strategies and these demons may be at play in this scenario. This perception was further confirmed in one of the discussions. A respondent was of the opinion that while clinicians are actively involved in HIV, public health and disease control practitioners more often manage TB. This is a limitation because when there is a complication accompanying treatment, public health and disease control practitioners are professionally not mandated to manage complications thereof. Specific to health delivery, the fundamental issue arise from relinquishing professional autonomy (Shortell, Gillies & Devers, 1995; Dimitrova et al., 2006).

Bottlenecks in funds administration

Research participants expressed varied perspectives on how they are able to access funds. Generally, these expressions were more of frustrations rather than commendation and they varied among respondents. Issues mentioned mostly dealt with delays in accessing funds for various activities. Whereas the national programme receives funds directly from the donors and GoG at the regional, district, and facility levels, the integrated system does not make sub-national coordinators capable of receiving funds directly. Consequently, experiences varied from place to place and some respondents rightly conceded to internal issues that may be peculiar. A respondent noted:

> *"We go through hell before funds are given to us. There are some of the senior health officers who seem not to appreciate the work we are doing. I suspect our hospital administration of intentionally delaying the release of funds for our use. … Certain people in this facility complain that we do not have any significant amount of work at DOTS centre. The accounting processes are also not practicable. For instance, those who are supposed to release funds demand receipts for even sachet water*

bought for patients. While I acknowledge proper financial records be kept, there should be allocations for miscellaneous items so that the difficulties can be lowered … I wish funds for TB programmes were sent directly to the programme office at the various hospitals to reduce the bottlenecks involved in making funds available for the programme". (DOTS Centre Nurse, Region 3, District A, Public Hospital)

As part of triangulation where I participated in one regional TB review, sub-national personnel in TB programme were implicated as "good spenders" of financial resources but fared poorly in retiring funds dispensed. As a result, some regional directors of health are hesitant in releasing funds to district coordinators due to their poor reporting systems and that is also borne out of strict financial accountability of GFATM. Some regional and district directors felt that it would be in their personal and institutional interest to keep funds and rather retire to GFATM (through NTP) than to be implicated in financial mismanagement.

Infrastructure

By the mid of 2012, there were 1057 DOTS and two hundred and fifty-four (254) diagnostic centres distributed across one hundred and seventy (170) districts of Ghana. From respondents' perspective, the number of these physical infrastructures to population ratio is acceptable. Quantitatively, NTP performance so far is acceptable. A regional coordinator felt that:

> *"We don't have many problems with infrastructures such as labs. It's been speculated that we don't even need more labs presently".* (Coordinator, Region 4)

The most recurrent concern among frontline personnel had to do with quality. My personal observations about the centres are consistent with participants' expressions.

> *"Infrastructure is very poor. Now that TB and HIV are collaborating, we are just managing to share this small place and have further created a counselling room out of this same small place. The place is hot; both TB and HIV shares one desk for our work".* (DOTS Centre Nurse, Region 3, District K, Public Hospital)

> *"Infrastructure is bad; ventilation in this centre is bad; we share this place with injection and dressing room. Our drug storage facility as you can see is very poor. There is no restroom in this centre".* (DOTS Centre, Region 3, District A, Public Hospital)

There were also disquiets about location of DOTS centres in certain hospitals - both public and private facilities spoke to the issue. Two issues in respect of location were understood from the data. The first was that some centres were too close to maternal and child health (MCH) centres, a situation that could subject mothers and their children to avoidable infections. In some facilities, I noted that the DOTS centres were next to MCH and health workers re-echoed that observation:

> *"Our major problem is that this room for DOTS centre as well as HIV treatment room is very bad. It is in the same room that HIV counselling sessions are held. Ventilation is poor and we are daily exposed to TB bacteria. There is no drug storage facility in this room - they are in the injection room due to lack of space. At my age (54), I get scared sometimes due to my constant exposure. This room is not good at all. Some patients hide their treatment card just because they don't want people to know they have TB. It is understandable because we share this space with MCH and pharmacy. This is the same office used by the whole disease control unit as well".* (DOTS Centre Nurse, Region 2, District M, Public Hospital)

The other locational issue related to privacy. Selected participants at DOTS centres noted that the locations do not promote privacy of respondents.

> *"There is also no privacy in this facility - we share this place with injury dressing room and this does not augur well for privacy of the patients. For instance, when some patients are getting closer and they notice their acquaintances around the dressing room, they retreat and hide till those they know have left".* (DOTS Centre Nurse, Region 3, District A, Public Hospital)

There were certain hospitals, however, which had properly ventilated and furnished DOTS centres.

In a larger context, location of DOTS centres sometimes evokes ethical issues that feed into stigmatisation. A historical analysis of TB stigmatisation has revealed that persistence of stigma associated with the disease can partly be attributed to segregation of patients prior to development of chemotherapy (see, Tang & Squire, 2004). In order for the health system not to stigmatise TB patients, there is an unstated policy that as much as practicable, DOTS centres do not have to be isolated. Nevertheless, the key problem as respondents indicated related to quality rather than quantity. Birx, de Souza, and Nkengasong (2009) opined that the triad of TB, HIV and malaria controls are often challenged with infrastructural difficulties in terms of quality and quantity.

Monitoring and evaluation

One of the key foundations of successful TB control is quality of monitoring and evaluation (M&E). Within current GFATM funding conditions precedent, strong M&E is tied to about 15 per cent of funding that would be made available to countries in the Round 10. The study therefore sought to investigate the current status of M&E. The data suggest dissatisfaction of respondents about current status of M&E.

> *"I think we can do better for it to become vibrant and rigorous. It is through monitoring and supervision that we can collect the correct data needed for a smooth programme. Occasionally, you review data from sub-national level and you realise that the data is a bit different from the level below or above. However, through comprehensive monitoring and supervision, such inconsistencies in data can be corrected".* (National Respondent 3)

Currently, Ghana is unlikely to access the 15 per cent of additional funding that would have been made available to the NTP were M&E efficient.

Discussion

This chapter sought to explore the current environment for TB control from the perspective of policy makers and implementers. Specifically, issues addressed here were in relation to patterns of TB treatment outcome between 1997 and 2010, subjective determinants of these outcomes generally, integrated programme, political commitment, sustainability issues as well as obstacles to TB control.

Analysis of individual responses showed that TB control in Ghana came to the radar after a long period of neglect. Evidently, the long fallow that occasioned TB control resulted in sudden increases in cases in early part of the 1990s, resulting in a national response to counteract TB. Most TB researchers are convinced that the desertion of TB activities arose from ineptitude towards cost-effective means of resolving the scare of TB. Other triggers of upsurge in TB cases emanated from health reforms in many countries that led to significant cuts in national budgets for health systems as some respondents revealed. Landesman (1993) made similar observations about TB control, suggesting that reforms accompanied by limited funding resulted in TB epidemic in New York City. It took the support of donors for TB control efforts to stand, although initial interventions were piecemeal. Nonetheless, TB control initiative was locally driven but took advantage of the WHO's 1993 declaration of the disease as a public health emergency to garner support from policy makers - consistent with policy windows (Ogden et al., 2003; Teodorović, 2008; Walt et al., 2008).

More pronounced landmark events in the fight against TB control in the country, as respondents revealed, were reduction in default cases, improvement in diagnosis, community participation in TB control, introduction of a voucher scheme for patients and health workers as well as improvement in cultural accessibility to TB treatment. Prior to these interventions, respondents reckoned that TB control occasionally faced challenges. However, with the introduction of these activities, TB control has improved.

Again, the involvement of CHPS compound in some regions such as the Eastern Region where there are a number of compounds, could be making significant impacts. This has arisen from its effects on reducing transport cost and other economic burdens hitherto associated with supervised treatment from only approved clinics.

Similarly, respondents also applauded the direct involvement of community members in TB treatment serving as treatment supporters by increasing levels of compliance to treatment. Maher's (2003) assessment of eight district-based projects in six countries (Botswana, Kenya, Malawi, South Africa, Uganda, Zambia) revealed that the concept was capable of increasing treatment outcomes. It must be emphasised that there are differences between the two studies; while the study is unable to present a controlled trial data as the former, several years of experience of respondents in TB control provides some credibility to these findings. This is more the case in the light of efforts that were made to increase "truthfulness" of the qualitative data.

The quantitative data on surveillance of treatment outcomes generally point to significant improvements since 1997 to 2010 when data becomes available. Whereas the evidence on determinants of improvements in TB control in the country are highly perceptual, descriptions of other studies (Sakundarno et al., 2009; Zvaamwe & Ehlers, 2009; Lienhardt et al., 2011;

Weil, 2012) on specific impact of the various interventions provides some indications about the "truthfulness" of the views expressed by the respondents

Donor funding of programmes has dominated a greater part of TB control activities in the country. Between 1994 and 1999 and 2002 - present control activities have largely being supported with donor inflows. Not surprisingly, for the period's donor inflows failed, TB activities became stagnated. In keeping with these observations, several respondents opined there was weak political commitment for TB control. As a result, most of the study participants were pessimistic about sustainability of TB funding, particularly in light of cuts in major funds from GFATM that is also responding to global economic meltdown. There were however few of the respondents who were optimistic about potential funding from GoG. This was also being informed by gradual acceptance of TB as threat to human development through effective policy communication with the parliamentary committee for health. These steps are expected to result in budgetary allocations different from the composite budget of MOH.

Different shades of constraints were revealed in the data. Principal themes assembled from the data were in the areas of clinical staff indifference towards TB treatment, quality of infrastructure and bureaucracy. In respect of bureaucracies, for instance, one gets the impression that while activities at the national office of NTP is treated with dispatch, the same cannot be said of lower levels of disease control governance.

Tuberculosis control in Ghana has improved from the situation in the late 1980s and early 1990s. To a greater extent, international interest in controlling the disease appears greater than local interest, on the basis of funding, which determines reliability in drug supplies, laboratory equipment and routine reagents for diagnosis, monitoring and supervision (though inadequate) and repetitive training of personnel. Locally, personnel engaged in TB looked committed and willing, even under poor infrastructure that exposes them to infections. Of course, this could be motivated by timeliness and availability of resources to work with, which raises staff morale more than financial incentives (Mathauer & Imhoff, 2006; Al-Maniri, et al., 2010).

Both the narratives of respondents and surveillance data confirm that TB control in Ghana has largely been successful. The next chapter is devoted to in-depth exploration of the connection between HIV/AIDS and TB control based on the understanding that TB and HIV share a relationship clinically and socially. Again, the chapter examines the current status of public-private partnership for TB control.

CHAPTER EIGHT

PARTNERSHIPS FOR TUBERCULOSIS CONTROL

Introduction

This chapter discusses two major partnerships for TB control in Ghana: the interface between TB and HIV programmes and public-private partnerships for TB control. The first part is informed by the fact that there are evidence of clinical and socio-cultural linkages between HIV and TB (WHO, 2012). At the clinical level, TB compromises immune system, which makes it one of the major opportunistic infection among people living with HIV (Dlodlo et al., 2005). Socio-economically, TB has been found to be prevalent in marginal populations and among the chronically poor (WHO, 2009a). Besides, both diseases provoke stigmatisation and in areas where co-morbidity of TB and HIV are prevalent, being infected with either without the other can even draw stigmatisation (Bond & Nyblade, 2006). In a qualitative study of subjective experiences of TB patients in three clinics in the Kwa-Zulu Natal province of South Africa, the finding was that the prevalence of HIV presents basis for linking TB with HIV among community members and subsequent stigmatisation. The various aspects of the co-morbidity of TB and HIV have been taken a step further by some NTPs and NACPs to provide mutually inclusive services (screening, diagnosis and treatment) to HIV and TB clients concurrently (Atun et al., 2010). However, there is the need to examine the possibility and the likely outcomes of TB and HIV partnerships in control.

On the other hand, there is advocacy for integration of private health providers into various NTP interventions - particularly in diagnosis and treatment of TB. The high burden of TB in some developing countries coupled with poorly developed public health systems make restricting TB control to public health facilities. This fact is recognised in the current WHO broad policy framework for TB control, and, in line with this, the involvement of private facilities in TB control has been advocated, especially in areas of case detection and treatment (Khan et al., 2012). In countries such as South Africa, where public-private mix for TB has been fully understood, unorthodox health providers such as traditional and faith-based healers have been incorporated into TB diagnosis and treatment. In the last eight years, PPP DOTS has been fused into TB control in Ghana. In this chapter, the interfaces between HIV and TB as well as PPP DOTS are explored through experiences of frontline TB control activists and officials.

The interface between tuberculosis and HIV control programmes

The details involved in the existing working relations between TB and HIV are captured in Technical Policy and Guidelines for TB/HIV Collaboration in Ghana (Ghana Health Service, 2006). Among other things, the policy recognises that there is a need for collaboration between the two control programmes, the NACP and NTP. This policy is consistent with current WHO recommendations on the need for collaboration in addressing TB/HIV.

In 2005, a framework to guide the collaborative TB/HIV activities was initiated at the national level and this resulted in an establishment of a national TB/HIV coordinating body. This body defined the roles and responsibilities for TB/HIV collaborative activities by NACP and NTP. Responsibilities were assigned to each programme, bearing in mind the need to avoid duplication of effort and to coordinate budgets. The main goal was to take advantage of the natural synergies and complementariness of the two programmes. A focal person for joint TB/HIV collaboration was appointed and resident within NTP and served as deputy programme manager for the NTP. Generally, the two programmes run in parallel with informal collaboration at health facilities where the two exist.

There is also a guideline for clinical management of TB and HIV. The guideline addressed several important issues ranging from diagnosis skills required for detecting pulmonary and extra pulmonary TB in HIV patients (both children and adults) to treatment regimens needed for successful treatment outcome. Specific to co-morbidity management, the policy recognised the need for patient-focused approach. It is stated: “the management of the patient co-infected with TB and HIV should be patient-centred recognising that there are “two diseases, one patient and one health care system”. As much as possible, care of TB and HIV patients should be seamlessly integrated to ensure this. If, however, there are separate TB and HIV care programmes at a facility, close collaboration with well-established referral and close linkage systems should be in place to ensure the best care of TB/HIV co-infected patients” (Ghana Health Service, 2007, p.34).

In respect of treating co-morbidity, three interrelated issues were identified: first is to provide treatment; ensure compliance with drug regimens and timing of concurrent treatment. Among patients with HIV-related TB, the priority was to treat TB, especially smear-positive. The drug regimens used to treat TB in an HIV-infected patient are the same as those for the HIV-negative patient. Currently, FDC tablets are used to treat TB routinely. However, thiacetazone is longer in use because of its contraindication to HIV drugs leading to severe toxicity. Streptomycin is also no longer included in the treatment of new TB patients because of the risk of exposure to HIV from needle-stick injury. The timing of combining ART and anti-TB drugs is not fixed. It is determined by severity of HIV and the quantity of CD4 as well as the prognosis of HIV and thereby demanding clinical evaluation of laboratory report (Ghana Health Service, 2007).

Patients who are diagnosed with smear-positive TB as the first manifestation of HIV infection, and do not appear to be at high risk of dying with a CD4 count greater than 350 are not put on ART until after TB treatment. On the other hand, patients who show CD4 magnitude of between 250 and 350 are considered safe for concurrent treatment to be initiated after the first two of months of anti-TB treatment (Ghana Health Service, 2007).

The clinical guidelines for TB and HIV state that, where feasible, measures towards integrated TB-HIV care should be fashioned out. As Howard and El-Sadr’ (2010) have observed, in resource constrained countries where HIV and TB are of concern, integrated system provides insurance for the two diseases and also enhances case finding, isoniazid preventive treatment (IPT) and infection prevention. In view of evidence to support integrated TB-HIV management in the extant body of knowledge (see Howard & El-Sadr’, 2010), efforts were made to find out the views of operators in HIV and TB control.

Two broad views emerged from the specific question on integration of TB and HIV programmes. As expected, there were those who supported and there were others who opposed integration of TB and HIV programmes or services. Respondents who argued for each stance offered various reasons for this position. In the sections that follow, we present the views of those who supported integration, which is followed by those who did not support integration.

Support for integration of tuberculosis and HIV programmes

Of respondents who favoured integration, the primary reasons offered were the clinical relationship between TB and HIV and the need to optimise resources by avoiding duplications of activities.

Clinical linkages between tuberculosis and HIV

The argument in favour of facilitating the clinical interface between the two was that the two programmes needed to collaborate because persons living with the HIV virus had a high probability of being infected with TB. Although there has been no systematic nation-wide study on the burden of TB/HIV co-infection in the country, it has been estimated that approximately 59 per cent of persons living with HIV also have TB (Ghana Health Service, 2007). For some respondents, this reason was enough for the two programmes to work seriously towards partial integration (collaboration) or full integration.

Optimisation of efforts and resources

Among some respondents, support for integration emanated from the need to avoid and/or to eliminate the duplication of activities, efforts and resources. Given that TB and HIV converge at some points clinically and socially, it was felt that it would be essential for the two programmes to pool their resources. This could include various aspects, including facilities, personnel and expertise. For example, it emerged from the interviews that on a number of occasions, the officers of the respective programmes planned and executed advocacy and community outreaches separately. This was observed to be a misuse of resources and therefore unacceptable. A respondent surmised:

> *"Integration can ensure that duplications of functions are eliminated or reduced to the barest minimum ... Each programme appears to be caught-up in individual programmes and this has created some gaps in our operations. There seems to be too much focus on individual activities - AIDS is interested in AIDS and TB interested in TB".* (NACP National Officer A)

The need to work towards integrated service delivery is particularly important given that resources for TB and HIV control activities are currently quite limited, both at national and international levels. Evidence from Cambodia suggests that a sector-wide approach to HIV, TB and nutrition programmes could lead to an increase in resource allocation (Atun et al., 2010).

Opposition to integration of tuberculosis and HIV programmes

Respondents across all levels of TB and HIV programmes offered varying reasons for opposing integration of TB and HIV. These reasons included a potential increase in workload, the clinical complications associated with the management of TB and HIV, leadership biases and the lack of ownership and the potential for increased stigmatisation of TB patients as a result of joint TB and HIV service delivery.

Increase in workload of health workers

Some respondents, especially those at health care delivery facilities expressed concerns about the potential increase in workload under an integrated TB and HIV programme. They felt that patients with the respective conditions needed adequate attention and emotional support from specialists. That is, if the primary problem is TB, a specialist in TB should be responsible for the person, and if need be, he/she should be referred to the other specialist (linkage/referral services). In this case, one person takes primary responsibility for a particular condition at a time, thus facilitating patient follow-up. Creating a situation in which "one or few" people provide for the needs of people infected with TB and HIV would overstrain staff:

> *"Integration, yes but it will increase the workload of the front liners. For instance, for both diseases, there is need for counselling of patients and I am wondering how one person can do this alone. The important concern is for coordinators of the two diseases to be competent in managing either of the two".* (NTP National Officer A)

One dimension of the workload argument was the view that the two programmes have different processes for capturing data. Each agency tries to compile data to enable it plan on their activities. The argument was that:

> *"… These are two major diseases … different algorithms for capturing data are needed. Depending on where clients report first, screening for the other disease is undertaken and this should be enough".* (NACP Regional Coordinator)

There were also concerns about the levels at which integration could occur. Integration could be full or partial. Such views were commonly expressed by top management informants, who are perhaps more knowledgeable about joint TB and HIV management. For these respondents, full integration would be difficult to achieve due to the demands of each programme. A respondent narrated:

> *"Full integration could be possible but I am yet to see anywhere that it has been practicable. If you look at the dimensions of the two programmes, the work involved is huge. Each requires some specialised skills to manage it, though related skills are required. However, the bottom line is the volume of work at stake. I can imagine one programme manager with assistants responsible for each disease. This should not be misconstrued to mean that people are protecting their turfs but once again it is about the amount of work involved. Each requires a different strategy, innovation, planning and some programmatic concerns".* (NTP National Officer B)

Clinical complications of tuberculosis and HIV

It also emerged from the interviews that there could be certain clinical difficulties in the integration of TB and HIV services. One disagreement with full integration of TB and HIV services related to the time span within which TB could be cured and the need to manage HIV over the course of a lifetime.

According to this view, concurrent treatment services for tuberculosis and HIV could be provided up to a point. As noted:

> *"Integration is not possible at the moment because TB and HIV have different mechanisms at the clinical level: whereas TB can be cured within six to eight months after diagnosis and initiation of treatment, HIV is not like that. It is a lifetime condition with intermittent opportunistic infections that can be treated and the patient continues with the ART".* (NACP National Officer A)

To them, at the overlapping stage, the two could be integrated. However, when TB is cured, the patient with HIV will continue to live with HIV. Given these different trajectories, the two can only collaborate up to a point. In that case, there was no need to integrate the two.

In addition, for some respondents the high risk of nosocomial infection among HIV patients in one-stop-shop TB and HIV clinics made it unreasonable to congregate TB and HIV patients in the same facilities. One respondent said the following:

> *"You see, the issue of integration even at the facility level has to be approached cautiously. There is a danger of exposing HIV patients to tuberculosis when we operate under one-stop-shop system".* (NTP National B)

Leadership biases

In addition, most of the respondents who opposed the full integration of TB and HIV argued that biases could arise if a specific leader is more interested in one disease than the other. They contended that it is possible to have a programme manager who is more passionate about tuberculosis control than HIV or vice-versa. When that occurs, the person could give more attention to one than the other. Those in HIV control in particular contended that given the high public good will surrounding HIV control (albeit stigmatised), its programme could over shadow that of TB and that the reverse was also likely. There was also the fear that HIV has a higher profile in the public eye and could overshadow TB when integrated at the programmatic level.

> *"The danger is that if you have a programme manager who is biased towards either HIV or TB, the other disease will suffer because of his/her passion towards that disease".* (NTP National Officer B)

On the balance, if we integrate, there is the danger that AIDS activities will swallow-up TB control (NACP respondent). Others also described lateral programmes as a conduit for improving efficiency. This view was premised on the fact that when the scope of work is limited it offers an increased ability for in-depth concentration on a particular disease. For such respondents, the provision of quality service was akin to having minimal duties and responsibilities. Again, some respondents frequently indicated how the current arrangements could improve resource mobilisation:

> *"The existing structures of the two programmes also ensure efficiency* - *the smaller the better. Moreover, in terms of resource mobilisation, it will be difficult for one organisation to provide resources for one huge programme: separation allows for easy*

access to funds. Those who provide funding are normally scared of big projects". (NACP National Officer A)

"Generally, some organisations are interested in specific diseases and they would want to allocate resources to those specific projects. There are bilateral organisations and NGOs, which are inclined towards tuberculosis while others support HIV and other infectious diseases. There are also strong advocacy groups for HIV - PLWHA, which do not often exist for TB. Such groups bring in resources and give HIV programme higher visibility". (NTP National Officer B)

Another concern some opponents raised was that integration would not be able to ensure ownership. Furthermore, some respondents claimed that the system might not pay attention to specialisation in an integrated system. The following demonstrates typical views by respondents who opposed integration:

"I will not support full integration. If you give work to 'Mr everybody, Mr nobody does it'. At the national level, we need specialists who can keep standards. Running a disease programme is not the same as administration (planning) where you can put one person in charge. People specialise in the management of specific diseases such as HIV, tuberculosis and malaria. What is needed is coordination that can cut down on duplication of activities. The speciality component should always be there … all that is needed is information sharing

(coordination) … At the managerial level, different expertise are required". (NTP National Officer A)

Stigmatisation of tuberculosis patients

As earlier studies have noted (Dodor & Kelly, 2009), stigmatisation poses one of the greatest challenges to efforts at tuberculosis and HIV control. Stigmatisation discourages infected people from disclosing their status. According to some of the study participants, the co-morbidity of TB and HIV with its attendant double stigma would discourage people who suspect that they suffer from one or both diseases and they may not seek help. Amidst such possibilities, some respondents intimated that the integration of services could heighten stigma. The following excerpts demonstrate the importance that some staff placed on the need to avoid creating stigma:

> *"Another issue that comes up has to do with stigma and discrimination. Although TB used to be more stigmatised than HIV, now the tables have turned … Stigma is now high towards HIV because people are becoming aware of cure for TB. For the sake of emphasis, the two programmes are better off remaining parallel since HIV is plagued more by stigma than TB". (NACP National Officer B)*

Thus, it was the opinion of some respondents that patients who suffer TB may not be as willing as co-infected patients to access care from a facility or room where both TB and HIV care services are provided for fear of being tagged as HIV patients.

Challenges confronting existing tuberculosis and HIV interface

Given the laxity of the two programmes towards guidelines they have set for themselves to achieve, the current management of TB/HIV has numerous barriers. Some of the major bottlenecks that emerged from the study were weak data and information sharing opportunities, as well as the inconsistent screening for and administration of co-trimoxazole.

Data and information sharing

Poor coordination is at the core of the difficulties that are faced by existing TB/HIV working relationships. The concerns appeared intense and fervent among NTP respondents. Some respondents from the NTP perceived a lack of commitment to data sharing by some of the NACP staff:

> *"We (NTP) requested data from their (NACP) side and the response was that they don't have any appropriate format for capturing tuberculosis data. We felt this could be a reasonable excuse so we helped them develop a data-capturing format. We were then expecting returns from them (NACP) at the end of this quarter. Unfortunately, when I did a follow-up, they had misplaced the form and I had to give them another…"* (NTP, Coordinator, Region 3)

None of the participants from the NACP disagreed with the assertions from certain NTP respondents, although they did raise issues about their workload, which led to significant time constraints.

Screening and administration of co-trimoxazole

Opinions were divided on the screening of patients for each condition as well as the provision of co-trimoxazole. Many TB programme staff expressed concerns about HIV clinic staff inconsistencies in screening all HIV patients for TB. NTP staff members were also concerned about the irregular administration of co-trimoxazole to co-infected patients. The excerpt below reveals some form of disappointments expressed by a section of NTP staff:

> *"Screening of HIV patients for TB is not fully implemented. Ideally, persons diagnosed to be HIV positive should be screened on the first day of diagnosis of tuberculosis and continuously for every six months because tuberculosis is one of the major opportunistic infections among people living with HIV … but this is not routinely done! … When tuberculosis is detected quite early, such persons can be treated, and then (the patients) can continue with HIV treatment. Unfortunately, they (NACP) are not doing that and this increases mortality rate among co-infected clients. If they were doing what is expected as we are doing, most deaths in TB/HIV co-morbidity cases would be prevented".* (NTP Coordinator, Region 4)

On the other hand, some participants in the NACP indicated that the screening of all HIV persons for TB was not cost effective, especially with respect to time. According to one:

> *"In 2009, of the 810 HIV cases, only 47 had tuberculosis. In 2010 too, out of 530 HIV cases, only 22 (10 females and 12 males) went to DOTS. Based on this, it is not practically possible to refer*

every HIV patient for tuberculosis screening". (NACP Coordinator, Region 2)

Views from both programmes' officers suggest poor working relationships. There was the suspicion that one group was not really committed to providing adequate care to people doubly infected with TB and HIV, especially with respect to the administration of co-trimoxazole.

"We have some difficulties. The most pressing one here is about timing that the HIV clinicians put co-infected (TB & HIV) patients on co-trimoxazole prophylaxis; it is often delayed. We have advocated for some of the drugs to be kept at DOTS centres for easy access but this has not been done yet". (NTP Coordinator, Region 4)

Based on current arrangements, co-trimoxazole dispensation is expected to occur at ART clinics. Currently, there are 1,057 TB treatment centres compared with only 141 ART clinics in the country, thus co-infected persons may not have the opportunity to be treated without incurring inconveniences, including the cost of travel and time. However, other informants from the NACP gave contrasting views on these claims. They noted that health facilities are required to report on their use and needs for co-trimoxazole, and as a result, those health facilities that promptly reported on the number of co-infected persons were often supplied with co-trimoxazole:

"… Drug supplies for TB/HIV (co-trimoxazole) is always available. It is those facilities that do not report on co-trimoxazole who face difficulties in accessing drugs. Patients who are allergic to co-trimoxazole as well as pregnant women in the

first trimester are also not allowed to take this drug." (NACP respondent)

Public-private partnership for tuberculosis control in Ghana

Public-private partnership has been proposed as supplementary mechanism for improving case detection. Scaling up of PPP DOTS is one of the essential mechanisms for achieving targets in TB control (Dewan et al., 2006; Ahmed et al., 2009; Pantoja et al., 2009; Khan et al., 2012). Three broad areas have been identified to justify a scale up of PPP in Ghana. The first is improving TB case detection and access to TB care services for the general population by engaging all healthcare providers, irrespective of ownership. Second is to increase the involvement of private practitioners in DOTS implementation and the third is the inclusion of private providers to assist in achieving the targets for TB control (National TB Control programme, 2009).

PPP DOTS was implemented in the Greater Accra and Ashanti regions on pilot basis. The experiences gathered from the pilots formed the basis of scale-up in the country. As of 2009, there were sixty-nine (69) private hospitals and clinics and twenty-eight private laboratories reporting and diagnosing cases in Accra, Tema and Kumasi. All the other regions were included sometime in 2009 (National TB Control Programme). In this section, I report on the perceived benefits, status of implementation and challenges of the PPP approach.

Views on benefits of the public-private partnership

The PPP approach to TB control provides benefits to both the patient and the health system. To the patient, it has the potential of reducing travel time, especially in settings where public facilities are limited and invariably result in low cost of treatment. To the health system, it has the potential of reducing workload. Although at the moment treatment outcomes are not disaggregated by type of facility (whether private or public), a number of the respondents, both from public and private facilities rated PPP highly as far as TB control was concerned. Some respondents indicated that PPP has improved accessibility to TB drugs. The following narration illustrates typical views of the respondents:

> *"I think it worked well in this region particularly ... providers helped us especially to manage many patients who could have been lost to follow because there were only five hospitals where DOTS services were provided. At one point, we were recording zero default rates because even maternity homes were serving as DOTS centres".* (NTP Coordinator, Region 2)

The successes of PPP DOTS in areas of operation are attributed to issues of accessibility and the inclusiveness approach it adopted. In certain areas, popular drug stores and pharmacies were included. This line of operation is rational in the light of health seeking behaviours of many Ghanaians. Drug stores and pharmacies and other private facilities are usually the first point of call for many healthcare seekers. The inclusion of private health providers is therefore an important step in improving access (economic and geographic) to TB treatment. Dewan et al. (2006) have argued that effective collaboration between NTPs and private health providers is promising for efficient TB control. Unfortunately, there was no disaggregated data on TB treatment outcomes by type of facility ownership (public or private) to allow for further validation or otherwise of claims of respondents.

Status of implementation and challenges in public-private partnership

Despite the positive remarks expressed by respondents on PPP, some were not satisfied with the current status of implementation. The following extract is an indication:

> *"The involvement of private facilities in TB control has gone down due to decline in funding. The initiative was started with GFATM support and with the decline in funding; PPP DOTS has gone down drastically".* (NTP Coordinator, Region 2)

Following this disclosure, attempts were made to identify some of the reasons accounting for the discouraging status of implementation. Among the popular views pinpointed were the piecemeal implementation of the strategy, lack of explicit policy guidelines and gaps in data capture.

Whereas adequate funding is important for effective PPP, it is not an end. Some respondents perceived that the introduction of the package was poorly presented to the private facilities. Some participants felt that the NTP, advertently or inadvertently raised the expectations of private care providers as to what tangible benefits they stood to gain from participating in TB control. One respondent noted:

> *"I feel that we could not manage expectations of private facilities very well. Expectations of private facilities were raised high,*

> *thinking their involvement in TB control was going to result in massive infrastructural changes as well as other benefits to their facilities. When those expectations were not met, most of them left.* (NTP Coordinator, Region 2)

It also came out during the interviews that the operational difficulty facing the PPP approach was ad-hoc manner in which it was implemented. The introduction of PPP in Ghana followed an approved funding by the GFATM. In the opinion of a respondent:

> *"The PPP was implemented on ad-hoc basis without any clearly defined policy framework. Once the Global Fund approved PPP DOTS for funding, it was rolled-out for accountability purposes".* (NGO respondent)

From the perspective of some private facility respondents, there were gaps in the training of personnel. Some of these respondents alleged that they were occasionally left out during in-service training.

Another challenge found was that in some private facilities, the management of some facilities occasionally withheld the component of the enablers' package intended for health workers. A respondent indicated:

> *"Often, the share of the enablers meant for TB coordinators are not given to them because some of the managers feel that the coordinators are their employees who have been paid to do specific jobs. As such, they claim to have prerogative over use of funds inflow regardless of what workers have done since they pay their salaries, it therefore lies within their power to determine how such resources are put to use. In the end, some private*

hospitals and clinics deny health workers their share of the enablers' package". (TB Coordinator, Sub-Metro O, Region 3)

This concern was, however, not universal in all the private facilities. Some respondents confirmed that they were frequently given the proportion meant for health workers

Another problem associated with PPP DOTS in the views of some of the participants was the weak monitoring of private DOTS centres. There was also an indication that private facilities are not much concerned about documentation of their activities as compared to public health institutions. Ostensibly, TB treatment has been fully integrated into the services they consider as 'very' important. The quote below throws more light on this perception:

> *"The only challenge has to do with documentation because they are actually private-for-profit and therefore do not devote much attention to data for monitoring our progress".* (NTP National Officer A)

On how best to revolve the challenges associated with PPP, the most frequent suggestion was on the need to highlight public service or beneficence. The need for emphasising public service and national responsibility is crucial in making PPP DOTS workable. As is known, private health facilities are established with profit motives also in mind. That means, rather than using financial and other instrumental baits to draw their support for public health interventions, emotive appeals seem workable. Already TB diagnosis and treatment is free. It is therefore possible to orient private hospitals and clinics to understand the epidemic nature of the disease in soliciting their support in TB diagnosis and treatment. A respondent from the private sector agreed:

> *"Generally, I think the private facilities are doing quite well in TB control because you have a portion of the population accessing health from private facilities so it is quite necessary that such facilities were also brought on board to support the fight against TB. TB care is more of a national service rather than profit-making care because TB treatment is actually free. We do that to save ourselves because TB is an airborne disease so if we contribute to cutting down on the prevalence level, we save ourselves from high exposure; it will be limited".* (TB Coordinator, Private Facility, Region 3)

In this scenario, the respondent conceded to several challenges pertaining to their involvement in TB control but the hospital management still considers giving care to TB patients as more of a national duty than to receive any substantial benefit from NTP.

Discussion

A major principle in public health, especially in disease control, is to reduce infection through the elimination of the likelihood of reproduction. For TB and HIV epidemics, the regulations include prevention of initial infection, elimination of risks of infectivity and the use of prophylaxis (Maher, 2010). Among the strategies for achieving these objectives are the integration of TB and HIV services as well as public private mix for TB control. These two specific strategies were the focus of this chapter.

Policies and guidelines already exist to facilitate integration of TB and HIV services, particularly at the point of service delivery, popularly known as co-location or one-stop-shop clinic. However, constraints could be observed at the national, regional, district and facility levels, which hinder the smooth implementation of joint programmes. The constraints exist in spite of the awareness among respondents of the potential benefits associated with full integration at the service delivery points. From the responses, it would appear that the low collaboration at the national level has affected collaboration at the lower levels. This observation was articulated by one of the respondents outside the two institutions (NACP and NTP) thus: "in spite of the creation of a Working Group for TB/HIV, the team barely meets, with busyness and lack of time as the commonest refrain from personnel of NACP and NTP". Similar observations have been made in Vietnam where national officers of the bodies responsible for TB and HIV favoured vertical programmes than the integrated approach (Conseil, Mounier-Jack & Coker, 2010). Frequently cited reasons were that vertical TB and HIV controls improved governance and stewardship, quality assurance and human resource development, which were similarly expressed in this study.

As a result, there is poor information flow between HIV and TB. For instance, TB reports were collated at the district levels due to high decentralisation, while HIV reports were forwarded to regional focal persons. This situation affected district level planning for TB and HIV. One would also have expected the two bodies will collaborate to take advantage of the large number of TB centres compared to HIV. Almost every district has a TB treatment centre to the extent that, CHPS compounds are now actively involved in TB treatment while HIV treatment is carried out by healthcare practitioners and some trained nurses but who are disproportionately distributed across the country. Although HIV/AIDS treatment can sometimes result in complications, it seems that it has been mystified, creating a scenario of maintaining professional autonomy. This is in spite of the existence of evidence that point to better outcomes in full integration as well as concurrent treatment of the two diseases (e.g. Karim et al., 2009; Ansah et al., 2012). Integrated TB and HIV services delivery have been found to reduce deaths associated with TB and HIV, reduce cost of service utilisation to patients, and also reduces complexities in managing the two diseases (Gandhi et al., 2009; Legido-Quigley et al., 2013).

Almost all the respondents expressed preference for the integration of TB control into the mainstream health system but did not show interest in full integration of TB and HIV programmes. Rather, they appeared to favour vertical approach for the respective programmes. Staff of the NTP at the national level is expected to devote all their time and attention towards TB, unlike those at the sub-national level. Programmes that are considered “national” by the GHS over-ride all activities within the system, and this is the case with TB.

While integration is usually intended to be cost-effective and efficient, much emphasis is often placed on cost-effectiveness, overlooking efficiency. Integrated health delivery thrives when there is adequate manpower. WHO (2008b) has argued that integration is not about incessantly adding workload to health workers without expanding the human resource base, a situation that could result in serious deficiencies in service delivery. Respondents repeatedly indicated that there was an urgent need for workers on TB to be allowed to devote at least 60 to 70 per cent of their time on TB, as well as engaging more staff to assist diagnosis and treatment delivery and community level mass education.

Furthermore, some aspects of the NTP's operations are managed within the body without going through the convoluted bureaucracy of the generalised health system. For instance, the NTP manages logistics and drug procurement internally. Similarly, financial administration is retained with NTP. These arrangements could be some of the factors accounting for the successes of TB control in Ghana. However, the TB control programme relies fully on the general health system for personnel and infrastructure. The apparent improvements in TB control in Ghana re-enforce the arguments that disease control programmes in developing countries that are expected to yield the needed benefits must retain some elements of verticalisation (Kabatereine, Malecela, Lado, Zarambam, Amiel & Kolaczinski, 2010).

PPP sprouted from the need to improve case detection and treatment outcomes. The interview data suggested that PPP had made positive contribution to TB control in the country. However, the NTP did not have disaggregated data by type of facility - whether private or public for their respective contributions to be assessed.

In spite of their perceived contribution, some respondents felt that the full potential of PPP has not been achieved. This was partly because the package was implemented hastily without proper situational analysis and orientation of private facilities on the public health interest and nature of their involvement. For instance, there were arrangements for support in the form of equipment to some private facilities. Some of the private hospitals and clinics were disappointed when the equipment and other physical infrastructure they were promised were not delivered as they expected. Nevertheless, there was confirmation from some private facilities that reagents and other routine laboratory materials were supplied from time to time.

Tuberculosis control in Ghana appears to have been successful due to its adoption of a hybrid approach, that is, a combination of some elements of vertical and integrated programing as well as the involvement of the private sector. Yet efforts towards integration of TB and HIV services appear weak.

CHAPTER NINE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

TB remains one of the threats to public health in spite of the fact that it is curable within six to eight months after starting treatment. Due to social, economic and health related factors, more deadly traits of TB are emerging, making continuous fight against the disease more relevant. This study was undertaken to, (1) explore TB control in Ghana (Gold Coast) from the early part of the 20th century up to 2010, (2) examine views of Ghanaians about transmission, awareness of cure and attitudes towards TB status disclosure, (3) discuss some of the key strategies that have been adopted and the perception of stakeholders on these interventions and (4) finally, partnerships (TB/HIV and PPP) for TB control.

Multiple theoretical perspectives were synthesised to broaden the outlook of the study and this resulted in the use of pragmatist philosophy (practical reasonability over dogmatic adherence to a particular paradigm, Johnson et al., 2007), where quantitative and qualitative (in-depth interviews, observations and content analysis) techniques were legitimately combined in this single study. This culminated into multi-method analysis, which helped to enhance the breadth and depth of the study. In this chapter, highlights of key findings, conclusions, contribution to knowledge and recommendations are presented.

Summary of main findings

Results from the study showed along history of TB infection and reporting in Ghana (Gold Coast), particularly, from the early part of the 20th century. The pre-independence government appeared not have put in much efforts to control TB in the early part, especially, among the indigenous population until around 1941 when some form of interest in controlling the disease led to the first state sanctioned investigations into the disease in areas where it was predominant. The report from the investigation led to institution of compulsory registration of populations at risk of infection and some amount of improvement in housing as a means of reducing infections.

In 1957 when the Gold Coast became Ghana, the momentum that had started in the late 1940s and early 1950s continued, leading to another investigations into TB in 1959. The major findings of this survey were that TB was common among health workers who worked on patients directly and their relations as well as returned migrants from the mining areas to the northern region. It was also common among the children of the return miners.

From the later part of the 1960s until about the late 1980s and early 1990s, the pieces of evidence available from studies on TB suggests decline interest in TB control activities. The effect was abrupt rise in TB cases in the early 1990s, which led to the establishment of the NTP in 1994, which began surveillance in 1996.

With the re-establishment of a national institution to fight TB in the mid-1990s, consistent surveillance data became available beginning 1997. The analysis of these data sets reveals that cure rates, treatment completion, treatment failure, treatment default and deaths from TB have improved significantly between 1997 and 2010, although some significant spatial differences existed. The improvements in the respective treatment outcomes were also not linear.

Using data from the GDHS, evidence was found to suggest socioeconomic gradients in the views of Ghanaians about transmission of TB, its curability or susceptibility to anti-TB drugs, and attitudes towards status disclosure. The knowledge of the survey respondents on TB transmission was low compared to awareness of cure. In the inferential analysis where region was used to explore spatial differences, the spatial disparities remained even after adjusting the estimation models. However, the strength and direction of spatial disparities were not always unidirectional on the three different dependent variables (myths and misconceptions about transmission, attitudes towards disclosure and knowledge o cure).

Using in-depth interviews with the staff of NTP and NACP, perceptions about landmark developments in TB control in the country, political commitment to TB control, public-private partnership, and TB and HIV partnerships were explored.

From the interview data, respondents perceived improvement in TB case management through the application of fixed-dose combination, advances in diagnosis, community participation in TB treatment and care, public-private partnership changing attitude of health workers towards TB as well as the introduction of the enablers' support as some of the possible factors which have accounted for the improvement in treatment outcomes.

In spite of the successes achieved in TB control, some challenges still prevail. Particular among these are deficits in quality infrastructure, long bureaucracies and delays in the administration of funds to hospitals and clinics for routine operations, perceived weak/low country-level political commitment to TB control, and weak monitoring and evaluation of interventions.

The current preferred paradigm in TB and HIV controls is active collaboration or integration of services, especially at the point of health delivery. However, the study found weak integration of TB and HIV service delivery. This had arisen from certain form of unwillingness of the two programmes to breakaway from institutional autonomy at the national level in committing time and resources to designing effective integration of TB and HIV. This has trickled down to the regional, district and facility levels. In most facilities, TB and HIV clinics exist separately although joint management benefits both patients and the health system.

As part of involving all available health service providers in TB control, private facilities have been included in diagnosis and treatment of TB patients, known as PPP especially in high prevalence areas. Despite the fact that the respondents hailed this initiative, there was no data to ascertain the contributions of private and public facilities to TB control. Some of the challenges of PPP is/was the lack of a policy on PPP, hasty implementation, unmet expectations of private facilities, and weak monitoring of private facilities

Conclusions

TB was and still is one of the major diseases of public health importance in the Gold Coast and in present Ghana. Although for most times, both the political authority and public health experts recognised the need for proactiveness, the commitment of the former did not seem to match the rhetoric. Available evidence suggests that long-term interventions in socioeconomic conditions contribute to decline in TB infections. However, both pre- and post-independence governments have not shown enough enthusiasm in providing the socioeconomic environment for preventing most poverty-related infectious diseases, including TB. Secondly, funding, which is one of the core pillars for successful TB control remains uncertain for programmes because the contribution of the GoG has been minimal. For instance, in 20111, the GoG provided only 32 per cent of the $27 million required for TB control activities. The substantial amount of funds used for programmed activities are provided by donors, with the GFATM making the single largest contributions. Because external funds are not guaranteed, some interventions such as PPP, enabler's support and monitoring and evaluation have not been very successful as anticipated.

The entire three null hypotheses suggesting no relationships between region of residence and myths and misconceptions about transmission, awareness of cure and attitudes towards status disclosure of TB were rejected. Relationships were found in both bivariate and multivariable analyses. The spatial relationships in myths and misconceptions, awareness of cure and attitudes towards status disclosure may be pointing to inequities in reaching out with Information, Education and Communication (IEC) on TB. Such misconceptions may serve as the basis for stigmatisation of people infected with TB. There was high knowledge about transmission of, cure for TB but that did not correspond to similar positive attitudes towards disclosure.

Despite the apparent successes achieved by the NTP, at least since 1997 when surveillance data becomes available, much remains to be done to improve certain initiatives, which can contribute positively to the fight against the disease. The status of implementation of the PPP and TB and HIV services integration initiatives are not encouraging. This was the situation in spite of the programme leaders' recognition that these strategies could make important contribution to identifying and treating more patients successfully.

The study further underscores the importance of concurrent application of vertical and integrated elements into a single disease control programme, especially, diseases that require rapid response. Verticalisation under such circumstances has served to fast track the procurement of critical equipment and materials for service delivery and mobilisation of existing human and infrastructural resources within the generalised health system for service delivery. The verticalisation of some operations of the NTP such as data management has provided both programmers and external agents opportunities to examine progress over time and space. This points the usefulness of combining vertical and integrated elements into the control of diseases of public health importance. Thus, such approach results in some level of rapid response in tackling a disease and also allows the monitoring of progress within a single purpose framework.

Reflections on the conceptual framework

The elements of the conceptual framework applied to the study were epidemiological problem, interventions, output, mechanisms, health system functions, context and outcome. Overall, there was a good fit between the research objectives and the conceptual framework that guided this study. The epidemiological problem was clarified through an analysis of TB surveillance data from 1997-2010. The analysis of the surveillance suggested that treatment outcomes have improved although total case detections could be lesser than the prevailing number of people with TB.

The intervention component provided basis for analysis of TB/HIV partnership as well as public private partnership for TB control. Political commitment, an integral part of DOTS expansion was also assessed, which revealed that respondents were generally dissatisfied with the level of political commitment towards TB control. Under the same DOTS expansion, issues about improvements in diagnosis, which is a useful ingredient for high case detections also emerged from the accounts of respondents. Fixed-dose combination therapy was found to be one of the successes of TB control, which is premised on standardised treatment.

The health system functions stratum provided a basis for exploring some critical elements of TB control policy context. For instance, the demand generation component of health system functions served as the basis for exploring the views of respondents on the enablers' package. Monitoring and evaluation of control efforts were also investigated. Service delivery as a function of health system function made it possible to explore the preferred type of TB service delivery: integrated or vertical. Respondents' frequently indicated high preference for integrated service by fusing TB and HIV controls into the generalised health system and yet opposed integration of TB and HIV services.

The section on mechanism helped to explore views on the use of treatment supporters and enablers' support, improved diagnosis techniques and public-private partnership and their perceived contribution to TB control. The findings that these approaches appeared satisfactory to respondents validates this component of the model for the study.

The contextual variables i.e. political and socio-demographic characteristics in the model were used to analyse the perceptions of Ghanaians (females: 15-49 years and males: 15-59 years) on the mode of TB transmission, status disclosure and knowledge of cure for TB. It became obvious from the analysis that space, in concert with education, age, ethnicity, exposure to media, religion under different scenarios correlate with perceptions about transmission of TB, cure, and whether status of infected persons remained secret or public. Such observations are critical to the identification of needs of individuals and their communities in respect of empowerment (Macq et al., 2007).

Analysis of the five main TB treatment outcomes (cure, default, treatment failure, treatment completion and death) showed improvement from 1997 to 2010, a period with surveillance data. It is, however, difficult to make claims about reduced incidence of TB. In the case of TB, incidence data is not the best indicator of success. This is because of the desire of programme officers is to increase case finding given that the case notification rates fall short of the estimated prevalence. For instance, in 2010, 15,145 cases were detected as against the estimated 40,000 in the general population.

In all, the model provided useful support for studying TB control, given its blend of epidemiological problem, interventions, output, mechanisms, health system functions, context and outcome.

Contribution to knowledge

This study is one of the first studies that have explored TB control in the country based on historical records, dating back to 1902. It draws on records from the national archives of Ghana and the UK. It therefore provides other researchers with opportunities for identifying sources from which they can obtain health records for analysis in an attempt to reconstruct the past, the present and the future.

In terms of methods, the application of historical records from Ghana and the UK, the use of GDHS, institutional data from the NTP in addition to in-depth interviews have shown the relevance of using multiple data sources in investigating an issue with multifaceted dimensions.

Existing studies on TB control in Ghana had largely focused on clinical management of the disease (example, Kumpji & Akosah, 2000; Forson et al., 2010; Addo et al., 2010). Others have dealt with institutional and social responses to the disease such as stigma (example, Dodor et al., 2008; Dodor & Kelly, 2009; Dodor & Kelly, 2010). The evidence on institutional responses is limited. This study therefore added to the expanding literature on institutional level strategies for TB control. For instance, some portions of the thesis have also been published in peer-reviewed journals (Amo-Adjei, 2013a, 2013b; 2014; Amo-Adjei & Awusabo-Asare, 2013; Amo-Adjei & Kumi-Kyereme, 2013).

Implications of findings for policy

Among the key findings of the study with implications for policy are: First, the finding that knowledge of routes of transmission is low compared to knowledge of cure for TB suggests a need for improving advocacy and communication on TB transmission. The knowledge gap could be a potential for stigmatisation and discrimination of people infected. For instance, if an individual accepts that TB could be transmitted through sharing of utensils, then the likelihood of distancing him/herself from an infected person may be high. This therefore requires a scale-up of educational campaigns on TB. The entertainment-education concept as used in HIV/AIDS and family planning approaches may be resorted to in this direction by the NTP and other TB-related NGOs, for example, Management *for* Health Sciences.

The key indicators of political commitment are higher proportion of local funding against external funding in relation to human resource development, infrastructure and finances; social interventions; participation of political authority in advocacy and enactment of policies and laws which protect patients and health workers. Currently, these dimensions lack depth as the findings show. There is therefore a need for high levels of advocacy through civil society, cured TB patients as well as programme officers. The 2006 AU accord on TB, malaria and HIV could serve as the platform to push various advocacy strategies.

The motivations for PPP in TB control are laudable. However, the implementation as found from the study was ad-hoc. The NTP needs to re-design the entire package by emphasising on partnership ethics such as beneficence (that partnership should lead to public health gain), non-maleficence (must not lead to ill-health), autonomy (should not undermine each partner's autonomy) and equity (benefits should be distributed to those most in need) should be the new focus for the PPP to succeed.

The findings show that in spite of the importance of the enablers' support/package, there are some challenges associated with its management and disbursement. It is recommended that the NTP engage in regular monitoring and evaluation of the package in order to achieve its intended objectives.

TB and HIV control programmes have not been coordinated in a manner as to obtain economies of scale in spite of the awareness of the benefits of proper coordination by frontline personnel of the two programmes. To this end, the NTP and NACP need to stimulate and promote some form of active collaboration between the two programmes, or at the minimum. The preferred interface is integration of activities, at least at the facility level, creating a one-stop-shop. This will reduce the burden of accessing health care, particularly among the dually infected patients.

Limitations and opportunities for further research

Studies of this nature are likely to be limited in some respects. However, since academic studies are generally intended to contribute to, rather than terminate or consummate knowledge, the limitations of this study, which are highlighted here presents opportunities for further research in advancing knowledge in the field of TB control.

First, the use of archival materials or information in an attempt to reconstruct the past of TB control was challenging, given the gaps in the data points for specific periods and places. Data on TB could not be located for the entire Gold Coast except along coast and few other areas where the government had political and economic interest to protect. It would have been preferable to conduct trend analysis but the gaps in available data did not inspire such analysis. Nevertheless, the availability of text, which allowed the use of content analysis helped to throw light on the generality of issues prevailing since 1900. Although trend analysis is not possible due to the fragment nature of historical epidemiologic analysis, there is a need for more of such studies, perhaps, not necessarily on TB but on other diseases of current and past public health importance, for instance, malaria.

Another limitation of the study was the use of cross-sectional data drawn from Ghana Demographic Health Survey data. Cross-sectional quantitative data does not permit search into meanings and explanations behind the numbers. Future studies may be well served with qualitative data, which can explore people’s perceptions and knowledge about TB transmission, availability of cure and probably sources and attitudes towards real and hypothetical disclosure. That notwithstanding, the GDHS provides a nationally representative sample for achieving results that are popular reflection of prevailing views on a subject in the country.

Some other findings that present opportunities for further research is the fact that the perceived impacts of specific strategies on TB control are not based on experimental controlled studies. In spite of the observation that treatment outcomes confirm improvement in TB as the respondents narrated, experimental controlled trials would be relevant to identify and quantify the impacts of the various innovations.

The paucity of data in terms of quality, coverage and quantity on patterns of co-morbidity of TB and HIV rates in the country did not allow for analysis of trends of the two diseases. Similarly, data on TB treatment outcomes from private and public health facilities were aggregated and this made it impossible to conduct a comparative analysis to estimate the actual contributions of each of the service providers if the NTP re-structures its data collection by disaggregating between public and private facilities. Again, joint data collection by the NTP and NACP will help future studies engage in cohort analysis of treatment outcomes of TB/HIV particularly patients who experience comorbidity.

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APPENDICES

Appendix 1: Health professionals in Ghana by region

Profession	Ashanti	BA	Central	Eastern	Greater	Northern	U E	U W	Volta	Western	Total
Medical Officers	499	106	79	140	820	38	34	18	72	77	1,880
Dental Surgeons	7	2	0	3	13	0	0	0	2	4	31
Pharmacists	322	92	47	90	304	60	47	33	61	73	1,129
Medical Assistants	85	50	38	47	70	59	34	15	29	37	464
Nurses	1,604	764	740	1,009	2,624	714	459	346	827	688	9,775
Auxiliary Nurses	731	474	644	1,031	1,350	509	403	251	797	667	6,857
Physiotherapists	11	8	2	4	30	3	2	0	5	3	68
Health Service administrators	33	13	12	20	31	12	3	7	13	11	155
Health Educators	10	14	5	0	18	2	1	2	3	2	57

Appendix 1 continued.

Architects & Engineers	131	83	85	92	429	50	40	32	138	52	1,132
Account officers	282	198	119	176	415	121	84	64	194	115	1,768
Dispensing technicians	66	42	37	65	84	20	14	10	56	27	421
Estate officers	13	5	5	4	19	7	3	2	3	5	66
Health research	2	9	1	0	16	0	11	1	1	0	41
Dental technologist	4	0	0	0	3	1	0	0	1	0	9
Bio-statisticians	77	53	49	65	128	28	13	9	71	53	546
Catering officers	83	49	91	64	183	49	32	15	93	72	731
Dieticians	2	1	1	1	2	0	1	0	1	0	9

Appendix 1 continued.

Nutrition	137	55	63	85	366	70	72	39	61	44	992
Technical	352	214	146	236	468	126	92	80	233	175	2,125
Administrative staff	376	236	191	195	504	187	79	92	242	230	2,332
Health planner	0	0	2	0	14	0	1	0	0	0	17
Technical staff	167	145	93	140	161	110	47	52	96	78	1,086
Artisans	40	28	54	21	63	16	14	14	46	23	316
Security	170	120	100	85	159	83	86	40	121	92	1,056
Other staff	2,425	1,226	1,279	1,450	1,754	780	396	387	1,624	940	12,261
Total	7629	3987	3880	5026	10028	3045	1968	1509	4790	3468	45330

Source: Ghana Health Services, 2009

Appendix 2: Health infrastructure in Ghana

Region	Teaching	Regional	Psychiatry	Hospitals	Poly	Health Centre	CHPS	Total
UE		1		5		80	91	178
UW		1		11		80	72	164
Northern	1	1		20	4	138	69	237
Central		1	1	22		105	67	223
BA		1		27		164	40	270
Volta		1		31	3	238	61	356
Western		1		31	2	146	112	329
Eastern		1		34	2	210	247	523
Greater	1	1	2	63	8	172	12	320

Appendix 2 continued.

Ashanti	1			104	1	280	24	510
Total	3	9	3	349	18	1,955	795	3,110

Source: Ghana Health Service, 2009

Appendix 3: In-depth interview guide

UNIVERSITY OF CAPE COAST

FACULTY OF SOCIAL SCIENCES

DEPARTMENT OF POPULATION AND HEALTH

SOCIAL AND POLICY CONTEXT OF TUBERCULOSIS CONTROL IN GHANA

General information about research

Tuberculosis has, for decades, been a threat to public health and it is expected to dominate the profile of curable infectious disease for some time. It has been argued that analysing the policy environment within which control programmes have been undertaken would provide important leads for achieving the desired efforts. This is because historically, political decisions have played significant roles in reducing or ameliorating the impact of diseases and epidemics. This study seeks to contribute to the discourse on analysis of disease control policy space. This study is for a PhD programme. Your confidentiality is assured, as the information you will provide will not be disclosed to any third party.

Procedures

To find answers to some of these questions, we invite you to take part in this research project. If you accept, you will be required to participate in an interview with (**Joshua Amo-Adjei**) or his representative. Your selection is purposive given your role in Tuberculosis control in the country and can contribute significantly to the success of this study. If you do not wish to answer any of the questions posed during the interview, you may say so and the interviewer will move on to the next question. The interview will take place at an agreed upon place and no one else but the interviewer will be present. The information recorded will be treated confidential, and will be used only for research purposes. The expected duration of the interview is 45 minutes.

Possible risks and discomforts and benefits

There will be no foreseeable risks or discomfort to you as a participant. However if you have any reservation about some of the questions or have any discomfort, you have every right to refuse to answer that specific question or terminate the discussion. Similarly, there will be no personal benefits to you as a respondent. The findings are expected to be used for academic purposes and also contribute to policy dialogue on tuberculosis control.

Confidentiality

We will protect information about you to the best of our ability. You will not be named in any of the reports that will be generated from this study. Where verbatim statements will be stated, such quotations will be anonymised.

Compensation

There is no compensation for your participation in this study

Voluntary participation and right to leave the research

Your participation in this project is entirely voluntary and it is your right to withdraw at any point. Nonetheless, your full participation is highly encouraged.

Contacts for additional information

You can contact the following individuals for further clarification: Prof. Kofi Awusabo-Asare, Phone: 0244704605, Department of Population and Health, University of Cape Coast, Cape Coast; or Dr Frank Bonsu, Phone: 0244318134, National Tuberculosis Control Programme, Accra

..

Respondent's signature

Background: level of formal education (emphasis on specialised training in disease control or TB specifically); status and your job description in this organisation.

HISTORICAL ANTECEDENTS

As you may be aware, TB has existed for a while in the world and obviously Ghana. I will like us to discuss some issues on prior to NTP and immediately after.

1. Can you describe the tuberculosis control situation in the country prior to the establishment of National Tuberculosis Programme? **Probe for main driver for establishment of NTP (key power actors; advocacy coalitions).**
2. What would you consider to be the historical landmarks in the approaches to control? **Probe for why those are considered to be the landmarks?**

3. What are key changes since NTP? Probe for why the changes occur or what do you think accounted for the changes landmarks? (**Probe for both political and programmatic dimensions)**

4. What were the concerns (**opposition or acceptance)** at the early years? **Probe for** why those concerns? Who were the main actors? How were those concerns addressed?

POLICY CONTEXT AND AGENDA SETTING

1. Can you kindly describe for me how TB control is been projected or pursued in Ghana? **Probe for the structure? What is/are the main driving forces (Probe for: local and international drivers in terms of content, processes, actors and context)**

2. What have been the roles of changes in institutional level/state governance TB control? What do you consider to be the major ones? (**Probe for: factors that accounted for the changes; e.g.** political concern or bureaucratic agenda (based on research evidence) or public opinion (e.g. through the media)**) (Probe for: positive and negative impacts of the changes).**

3. Would you say that TB control in Ghana has received adequate political commitment? **Probe for evidence, e.g. funding, political statements**

4. In your assessment, what are the strengths of the current policy vis-à-vis the former policies? **Probe for reasons.**

5. The NTP has had two strategic plans: 2002-2006 and 2009-2013. What is your assessment of the two strategies? How different is the later from the former? Why do you say so?

6. How will you describe your level of involvement of in the two strategies? (**Probe for specific roles played; probe for reasons for involvement or non-involvement)**

7. What challenges do you face in executing the agenda towards reducing TB rates in your area of operation? **(Probe for issues concerning** funding (reliability/timeliness and adequacy; competition for attention with other diseases; e.g. HIV, malaria); drugs supply (adequacy and reliability); personnel (quality versus quantity); other resources (e.g. transportation); physical infrastructure)

8. What are the main concerns regarding sustainability of the NTP? **(Probe for: funding, personnel, etc.)**

9. How do you access overall management, monitoring and supervision of TB control programmes at national, regional, district and facility levels?

10. **INTEGRATION OF TB WITH HIV/AIDS**

One of the major challenges of TB control is its interface with HIV. I would like us to discuss the interface with you at the programmatic level.

1. How would you describe the interface between these two programmes?? (**Probe for concept surrounding the nature**

Let us now talk about resource mobilization to support the two programmes

2. How would you describe the current resource mobilization for the two programmes? Has one been affected by the other? If so in what way?

3. What do you think about integration as against collaboration and vice versa?

4. What do you consider to be the major challenges that you face in the implementation of joint TB/HIV programmes at the national, regional, district and facility levels? (**Probe for areas of potential conflicts such as:** personnel, funding, political attention, monitoring and supervision etc, **Probe for** how these conflicts have impacted on deliverables? **The key actors normally involved in the conflict; how have the conflicts been resolved?**

5. How best do you think the conflicts can be managed for the mutual benefits of AIDS and TB?

PUBLIC-PRIVATE PARTNERSHIP

The strategic policy for TB control has a section on PPP.

1. What are your views on this component of the strategy?

2. What is the current level of involvement of the private sector in the strategy? **Probe for reasons for low or high participation.**

3. How do you assess the level of involvement? **Probe for reasons behind assessment**

4. What factors do you perceive to account for patients to transfer their treatment facilities from public to private facilities for treatment?

5. What do you envisage for PPP in the near future and in the long term? **Probe for reasons.**

6. What do you consider to be some of the challenges associated with the implementation of this strategy? **Probe for:**

    a. training of personnel (adequacy or inadequacy);

    b. Technical issues such as NTP guidelines?

    c. Remuneration

d. Infrastructural limitations to perform public health functions, e.g., defaulter tracing.

e. Doubts/mistrust about PP quality of care in NTPs?

7. What is your assessment of the Public-Private Partnership in tuberculosis control in the country?

8. How best do you think PPP can be effectively deployed to improve case detection, treatment success and defaulter tracing?

Appendix 4: Tuberculosis treatment outcome in the Western Region

	Treatment outcome				
Year	Cured	Treatment completed	Died	Failure	Default
1997 (ref)	1	1	1	1	1
1998	0.988	0.797	0.512***	1.200	2.672***
	(0.800-1.221)	(0.543-1.169)	(0.354-0.739)	(0.663-2.172)	(2.005-3.561)
1999	2.827***	0.746	0.679*	3.500***	3.531***
	(2.377-3.362)	(0.505-1.102)	(0.485-0.950)	(2.129-5.753)	(2.675-4.661)
2000	2.659***	0.881	0.488***	1.550	1.281
	(2.233-3.167)	(0.607-1.280)	(0.336-0.709)	(0.883-2.719)	(0.924-1.777)
2001	1.711***	2.220***	0.321***	0.700	1.203
	(1.418-2.064)	(1.633-3.019)	(0.208-0.496)	(0.354-1.386)	(0.864-1.676)

Appendix 4 continued.

2002	2.757***	1.153	0.429***	1	2.594***
	(2.317-3.281)	(0.813-1.633)	(0.290-0.633)	(0.538-1.859)	(1.944-3.461)
2003	2.671***	0.864	0.667*	2.200**	3.328***
	(2.242-3.180)	(0.594-1.257)	(0.475-0.935)	(1.297-3.732)	(2.517-4.401)
2004	3.295***	2.508***	0.512***	1.550	3.813***
	(2.779-3.906)	(1.855-3.392)	(0.354-0.739)	(0.883-2.719)	(2.895-5.021)
2005	4.127***	1.712**	0.798	1.500	4.219***
	(3.496-4.873)	(1.242-2.360)	(0.579-1.100)	(0.852-2.641)	(3.213-5.540)
2006	4.682***	2.322***	1.048	1.700	2.531***
	(3.973-5.517)	(1.711-3.151)	(0.777-1.413)	(0.979-2.953)	(1.895-3.381)
2007	5.312***	2.407***	1.012	0.750	0.578**
	(4.516-6.249)	(1.777-3.260)	(0.748-1.368)	(0.384-1.465)	(0.386-0.867)

Appendix 4 continued.

2008	5.289***	2.780***	0.798	0.700	0.672*
	(4.496-6.222)	(2.064-3.743)	(0.579-1.100)	(0.354-1.386)	(0.457-0.989)
2009	5.370***	2.695***	0.571**	0.600	0.547**
	(4.565-6.316)	(1.999-3.633)	(0.401-0.815)	(0.293-1.227)	(0.362-0.826)
2010	5.156***	2.814***	0.607**	0.350*	0.484***
	(4.381-6.068)	(2.090-3.787)	(0.429-0.860)	(0.148-0.828)	(0.315-0.744)
Constant	173.0***	59.00***	84.00***	20.00***	64.00***
	(149.0-200.8)	(45.71-76.15)	(67.83-104.0)	(12.90-31.00)	(50.09-81.77)
Log likelihood	-56.62	-44.61	-40.76	-34.63	-45.13
Chi-squared	1813.1	316.7	84.04	116.7	790.6
N	14	14	14	14	14

Exponentiated coefficients; 95% confidence intervals in brackets

$p < 0.05$- ** $p < 0.01$- *** $p < 0.001$

Appendix 5: Tuberculosis treatment outcome in the Volta Region

	Treatment outcome				
Year	Cure	Treatment completed	Died	Failure	Default
1997 (ref)	1	1	1	1	1
1998	1.537***	0.709*	1.762**	1.308	1.116
	(1.301-1.817)	(0.511-0.985)	(1.207-2.573)	(0.635-2.692)	(0.846-1.472)
1999	2.088***	0.733	1.524*	1.538	1.011
	(1.783-2.446)	(0.529-1.014)	(1.033-2.249)	(0.765-3.093)	(0.761-1.342)
2000	2.586***	0.640**	1.976***	9.33e-09	1.032
	(2.219-3.014)	(0.456-0.897)	(1.363-2.864)	(0-.)	(0.778-1.368)
2001	2.617***	0.640**	1.571*	9.33e-09	0.758
	(2.246-3.049)	(0.456-0.897)	(1.067-2.314)	(0-.)	(0.558-1.029)

Appendix 5 continued.

2002	2.485***	0.663*	1.381	1.462	0.832
	(2.130-2.898)	(0.474-0.926)	(0.928-2.054)	(0.722-2.959)	(0.617-1.121)
2003	2.670***	0.581**	1.405	0.923	0.589**
	(2.292-3.109)	(0.410-0.824)	(0.946-2.087)	(0.421-2.023)	(0.424-0.820)
2004	2.163***	0.663*	1.310	1.077	0.421***
	(1.848-2.531)	(0.474-0.926)	(0.876-1.957)	(0.506-2.291)	(0.291-0.609)
2005	2.229***	0.395***	1.024	0.538	0.389***
	(1.906-2.607)	(0.266-0.588)	(0.669-1.566)	(0.215-1.350)	(0.266-0.569)
2006	2.123***	0.430***	1.333	0.846	0.284***
	(1.813-2.486)	(0.293-0.632)	(0.894-1.989)	(0.379-1.889)	(0.185-0.436)
2007	1.899***	0.279***	0.976	0.462	0.158***
	(1.617-2.230)	(0.178-0.439)	(0.635-1.501)	(0.175-1.214)	(0.0916-0.272)

Appendix 5 continued.

2008	2.286***	0.372***	0.571*	0.154*	0.137***
	(1.956-2.672)	(0.248-0.558)	(0.346-0.944)	(0.0347-0.682)	(0.0766-0.244)
2009	2.934***	0.547***	0.357***	0.462	0.0842***
	(2.524-3.411)	(0.383-0.780)	(0.198-0.644)	(0.175-1.214)	(0.0409-0.173)
2010	1.590***	0.791	0.857	0.0769*	0.179***
	(1.347-1.878)	(0.575-1.087)	(0.549-1.338)	(0.0101-0.588)	(0.107-0.300)
Constant	227.0***	86.00***	42.00***	13.00***	95***
	(199.3-258.5)	(69.62-106.2)	(31.04-56.83)	(7.549-22.39)	(77.69-116.2)
Log likelihood	-55.99	-40.18	-39.86	-23.77	-38.82
Chi-squared	401.1	68.25	99.07	87.52	342.5
N	14	14	14	14	14

Exponentiated coefficients; 95% confidence intervals in brackets
* $p < 0.05$- ** $p < 0.01$- *** $p < 0.001$

Appendix 6: Tuberculosis treatment outcome in the Upper East Region

	Treatment outcome				
Year	Cure	Treatment completed	Died	Failure	Default
1997 (ref)	1	1	1	1	1
1998	0.746**	0.407*	0.753	1	0.309***
	(0.607-0.918)	(0.202-0.821)	(0.531-1.069)	(0.323-3.101)	(0.179-0.532)
1999	0.656***	0.519*	0.575**	0.167	0.309***
	(0.528-0.813)	(0.272-0.989)	(0.394-0.841)	(0.0201-1.384)	(0.179-0.532)
2000	0.278***	0.333**	0.370***	2.53e-08	0.127***
	(0.207-0.371)	(0.157-0.709)	(0.238-0.575)	(0-.)	(0.0580-0.279)
2001	0.603***	0.815	0.493***	0.833	0.327***
	(0.483-0.752)	(0.464-1.431)	(0.331-0.735)	(0.254-2.731)	(0.192-0.557)
2002	0.545***	0.333**	0.397***	0.833	0.364***

Appendix 6 continued.

	(0.434-0.685)	(0.157-0.709)	(0.258-0.611)	(0.254-2.731)	(0.218-0.607)
2003	0.488***	0.185***	0.397***	0.500	0.182***
	(0.385-0.618)	(0.0713-0.481)	(0.258-0.611)	(0.125-1.999)	(0.0927-0.357)
2004	0.464***	0.407*	0.219***	0.667	0.327***
	(0.365-0.590)	(0.202-0.821)	(0.128-0.376)	(0.188-2.362)	(0.192-0.557)
2005	0.483***	0.296**	0.342***	0.667	0.145***
	(0.381-0.613)	(0.135-0.652)	(0.217-0.539)	(0.188-2.362)	(0.0693-0.305)
2006	0.574***	0.0370**	0.260***	0.833	0.0909***
	(0.459-0.719)	(0.00503-0.273)	(0.157-0.431)	(0.254-2.731)	(0.0364-0.227)
2007	0.847	0.296**	0.466***	0.333	0.182***
	(0.693-1.035)	(0.135-0.652)	(0.310-0.700)	(0.0673-1.652)	(0.0927-0.357)
2008	0.732**	0.370**	0.342***	0.833	0.218***

Appendix 6 continued.

	(0.594-0.902)	(0.179-0.765)	(0.217-0.539)	(0.254-2.731)	(0.117-0.407)
2009	1.043	0.0741***	0.315***	0.167	0.127***
	(0.863-1.261)	(0.0176-0.311)	(0.197-0.503)	(0.0201-1.384)	(0.0580-0.279)
2010	1.182	0.0741***	0.356***	0.667	0.0545***
	(0.983-1.421)	(0.0176-0.311)	(0.228-0.557)	(0.188-2.362)	(0.0171-0.174)
Constant	209***	27.00***	73.00***	6.000***	55.00***
	(182.5-239.3)	(18.52-39.37)	(58.04-91.82)	(2.696-13.36)	(42.23-71.64)
Log likelihood	-47.20	-26.96	-36.77	-20.32	-30.10
Chi-squared	253.2	68.59	79.90	18.15	108.4
N	14	14	14	14	14

Exponentiated coefficients; 95% confidence intervals in brackets

* $p < 0.05$- ** $p < 0.01$- *** $p < 0.001$

Appendix 7: Tuberculosis treatment outcome in the Upper West Region

Year	Treatment outcome				
	Cure	Completed treatment	Died	Failure	Default
1997 (ref)	1	1	1	1	1
1998	0.746**	0.407*	0.753	1	0.309***
	(0.607,0.918)	(0.202,0.821)	(0.531,1.069)	(0.323,3.101)	(0.179,0.532)
1999	0.656***	0.519*	0.575**	0.167	0.309***
	(0.528,0.813)	(0.272,0.989)	(0.394,0.841)	(0.0201,1.384)	(0.179,0.532)
2000	0.278***	0.333**	0.370***	2.53e-08	0.127***
	(0.207,0.371)	(0.157,0.709)	(0.238,0.575)	(0,.)	(0.0580,0.279)
2001	0.603***	0.815	0.493***	0.833	0.327***
	(0.483,0.752)	(0.464,1.431)	(0.331,0.735)	(0.254,2.731)	(0.192,0.557)
2002	0.545***	0.333**	0.397***	0.833	0.364***

Appendix 7 continued.

	(0.434,0.685)	(0.157,0.709)	(0.258,0.611)	(0.254,2.731)	(0.218,0.607)
2003	0.488***	0.185***	0.397***	0.500	0.182***
	(0.385,0.618)	(0.0713,0.481)	(0.258,0.611)	(0.125,1.999)	(0.0927,0.357)
2004	0.464***	0.407*	0.219***	0.667	0.327***
	(0.365,0.590)	(0.202,0.821)	(0.128,0.376)	(0.188,2.362)	(0.192,0.557)
2005	0.483***	0.296**	0.342***	0.667	0.145***
	(0.381,0.613)	(0.135,0.652)	(0.217,0.539)	(0.188,2.362)	(0.0693,0.305)
2006	0.574***	0.0370**	0.260***	0.833	0.0909***
	(0.459,0.719)	(0.00503,0.273)	(0.157,0.431)	(0.254,2.731)	(0.0364,0.227)
2007	0.847	0.296**	0.466***	0.333	0.182***
	(0.693,1.035)	(0.135,0.652)	(0.310,0.700)	(0.0673,1.652)	(0.0927,0.357)
2008	0.732**	0.370**	0.342***	0.833	0.218***

Appendix 7 continued.

	(0.594,0.902)	(0.179,0.765)	(0.217,0.539)	(0.254,2.731)	(0.117,0.407)
2009	1.043	0.0741^{***}	0.315^{***}	0.167	0.127^{***}
	(0.863,1.261)	(0.0176,0.311)	(0.197,0.503)	(0.0201,1.384)	(0.0580,0.279)
2010	1.182	0.0741^{***}	0.356^{***}	0.667	0.0545^{***}
	(0.983,1.421)	(0.0176,0.311)	(0.228,0.557)	(0.188,2.362)	(0.0171,0.174)
Constant	209^{***}	27.00^{***}	73.00^{***}	6.000^{***}	55.00^{***}
	(182.5,239.3)	(18.52,39.37)	(58.04,91.82)	(2.696,13.36)	(42.23,71.64)
Log likelihood	-47.20	-26.96	-36.77	-20.32	-30.10
Chi-squared	253.2	68.59	79.90	18.15	108.4
N	14	14	14	14	14

Exponentiated coefficients; 95% confidence intervals in brackets

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix 8: Tuberculosis treatment outcome in the Northern Region

	Treatment outcome				
Year	Cure	Treatment completed	Died	Failure	Default
1998 (ref)	1	1	1	1	1
1999	2.700***	0.875	2.333*	8.000*	1.226
	(1.776-4.105)	(0.578-1.324)	(1.069-5.095)	(1.001-63.96)	(0.763-1.970)
2000	2.433***	0.479**	2.556*	7.000	1.323
	(1.591-3.722)	(0.291-0.788)	(1.183-5.523)	(0.861-56.89)	(0.830-2.109)
2001	3.133***	0.458**	2.111	2.000	1.194
	(2.077-4.726)	(0.277-0.759)	(0.955-4.666)	(0.181-22.06)	(0.741-1.924)
2002	3.467***	0.396***	1.333	5.000	0.516*
	(2.309-5.204)	(0.233-0.673)	(0.562-3.164)	(0.584-42.80)	(0.282-0.944)
2003	3.800***	0.521**	2.111	2.000	0.484*

Appendix 8 continued.

	(2.542-5.681)	(0.321-0.845)	(0.955-4.666)	(0.181-22.06)	(0.261-0.896)
2004	5.433***	0.375***	3.111**	4.000	0.806
	(3.681-8.020)	(0.218-0.645)	(1.468-6.593)	(0.447-35.79)	(0.476-1.366)
2005	4.533***	0.625*	2.778**	1	0.452*
	(3.053-6.732)	(0.396-0.986)	(1.297-5.951)	(0.0625-15.99)	(0.240-0.849)
2006	4.800***	0.146***	1.556	3.000	0.516*
	(3.239-7.113)	(0.0660-0.322)	(0.673-3.594)	(0.312-28.84)	(0.282-0.944)
2007	5.700***	0.333***	2.222*	2.000	0.290**
	(3.867-8.402)	(0.189-0.587)	(1.012-4.880)	(0.181-22.06)	(0.138-0.610)
2008	8.200***	0.896	1.667	6.000	0.0645***
	(5.613-11.98)	(0.594-1.352)	(0.729-3.808)	(0.722-49.84)	(0.0154-0.270)
2009	8.033***	0.333***	2.000	4.000	0.0968***

Appendix 8 continued.

	(5.497-11.74)	(0.189-0.587)	(0.899-4.452)	(0.447-35.79)	(0.0296-0.317)
2010	7.667***	0.542*	2.444*	8.000*	0.323**
	(5.241-11.22)	(0.336-0.873)	(1.126-5.309)	(1.001-63.96)	(0.158-0.658)
Constant	30.00***	48.00***	9.000***	1.000	31.00***
	(20.98-42.91)	(36.17-63.69)	(4.683-17.30)	(0.141-7.099)	(21.80-44.08)
Log likelihood	-43.23	-32.40	-30.82	-20.09	-29.47
Chi-squared	412.0	67.42	18.85	19.50	115.7
N	13	13	13	13	13

Exponentiated coefficients; 95% confidence intervals in brackets

* $p < 0.05$- ** $p < 0.01$- *** $p < 0.001$

Appendix 9: Tuberculosis treatment outcome at Komfo Anokye Teaching Hospital

	Treatment outcome				
Year	Cure	Treatment completed	Died	Failure	Default
1997b	1	1	1	1	1
1998	3.600*	1.067	0.500	0.863	1.538
	(1.337-9.697)	(0.527-2.157)	(0.202-1.239)	(0.616-1.209)	(0.765-3.093)
1999	1.800	1.667	1.000	0.616*	1.769
	(0.603-5.371)	(0.879-3.161)	(0.477-2.098)	(0.425-0.894)	(0.896-3.492)
2000	1.200	2.200*	0.500	0.685*	0.615
	(0.366-3.932)	(1.195-4.050)	(0.202-1.239)	(0.478-0.982)	(0.255-1.485)
2001	0.800	2.333**	0.500	0.945	0.846
	(0.215-2.979)	(1.274-4.272)	(0.202-1.239)	(0.680-1.314)	(0.379-1.889)
2002	3.73e-09	2.400**	0.929	0.466***	1.154

Appendix 9 continued.

	(0-.)	(1.314-4.383)	(0.436-1.975)	(0.310-0.700)	(0.549-2.425)
2003	3.73e-09	3.000***	0.143*	0.178***	1.769
	(0-.)	(1.672-5.381)	(0.0325-0.629)	(0.0987-0.321)	(0.896-3.492)
2004	3.73e-09	2.800***	0.571	0.233***	0.231*
	(0-.)	(1.553-5.049)	(0.240-1.362)	(0.137-0.395)	(0.0658-0.810)
2005	0.400	3.533***	0.857	0.137***	0.385
	(0.0776-2.062)	(1.992-6.268)	(0.396-1.853)	(0.0707-0.265)	(0.137-1.079)
2006	3.73e-09	2.333**	0.214*	0.0822***	0.231*
	(0-.)	(1.274-4.272)	(0.0616-0.746)	(0.0358-0.189)	(0.0658-0.810)
2007	3.73e-09	1.133	0.214*	1.15e-09	1.07e-08
	(0-.)	(0.566-2.269)	(0.0616-0.746)	(0-.)	(0-.)
2008	2.200	2.600**	0.286*	1.15e-09	1.07e-08

Appendix 9 continued.

	(0.764-6.332)	(1.433-4.716)	(0.0940-0.868)	(0-.)	(0-.)
2009	1.600	1.600	0.286^{*}	1.15e-09	1.07e-08
	(0.523-4.891)	(0.839-3.050)	(0.0940-0.868)	(0-.)	(0-.)
2010	3.800^{**}	1.333	0.214^{*}	0.0548^{***}	1.07e-08
	(1.419-10.18)	(0.683-2.604)	(0.0616-0.746)	(0.0200-0.150)	(0-.)
Constant	5.000^{***}	15.00^{***}	14^{***}	73.00^{***}	13.00^{***}
	(2.081-12.01)	(9.043-24.88)	(8.292-23.64)	(58.04-91.82)	(7.549-22.39)
Log likelihood	-17.39	-36.45	-25.61	-27.57	-20.71
Chi-squared	103.1	59.75	34.68	404.7	130.6
N	14	14	14	14	14

Exponentiated coefficients; 95% confidence intervals in brackets

* $p < 0.05$- ** $p < 0.01$- *** $p < 0.001$

Appendix 10: Tuberculosis treatment outcome at the Korle-Bu Teaching Hospital

	Treatment outcome				
Year	Cure	Treatment completed	Died	Failure	Default
1997 (ref)	1	1	1	1	1
	(1-1)	(1-1)	(1-1)	(1-1)	(1-1)
1998	0.421*	0.250***	0.257***	0.194***	0.348*
	(0.184-0.962)	(0.115-0.543)	(0.124-0.535)	(0.110-0.345)	(0.156-0.778)
1999	0.632	0.906	0.543*	0.847	1.565
	(0.307-1.301)	(0.548-1.498)	(0.311-0.949)	(0.602-1.192)	(0.928-2.641)
2000	1.579	0.594	1.029	0.597**	1
	(0.889-2.805)	(0.337-1.047)	(0.646-1.638)	(0.409-0.871)	(0.561-1.782)
2001	0.211**	0.844	0.257***	0.444***	0.652
	(0.0716-0.619)	(0.506-1.408)	(0.124-0.535)	(0.293-0.674)	(0.340-1.250)

Appendix 10 continued.

2002	0.579	1	0.257***	0.708	0.391*
	(0.276-1.217)	(0.613-1.632)	(0.124-0.535)	(0.495-1.014)	(0.181-0.846)
2003	0.211**	0.938	0.257***	0.208***	0.913
	(0.0716-0.619)	(0.570-1.543)	(0.124-0.535)	(0.119-0.363)	(0.505-1.650)
2004	0.211**	0.562	0.114***	0.153***	0.652
	(0.0716-0.619)	(0.316-1.002)	(0.0406-0.322)	(0.0810-0.288)	(0.340-1.250)
2005	0.211**	1	0.286***	0.167***	0.435*
	(0.0716-0.619)	(0.613-1.632)	(0.141-0.577)	(0.0905-0.307)	(0.207-0.913)
2006	0.105**	1.250	0.400**	0.0694***	0.435*
	(0.0245-0.452)	(0.785-1.990)	(0.215-0.743)	(0.0281-0.172)	(0.207-0.913)
2007	0.158**	1.594*	0.171***	0.111***	0.130***
	(0.0467-0.534)	(1.024-2.480)	(0.0721-0.408)	(0.0535-0.231)	(0.0392-0.434)

Appendix 10 continued.

2008	0.789	1.344	0.0571***	0.111***	0.348*
	(0.401-1.554)	(0.850-2.123)	(0.0137-0.238)	(0.0535-0.231)	(0.156-0.778)
2009	0.105**	1.156	0.114***	0.0694***	0.783
	(0.0245-0.452)	(0.720-1.856)	(0.0406-0.322)	(0.0281-0.172)	(0.422-1.450)
2010	0.105**	0.719	1.18e-08	0.0278***	0.826
	(0.0245-0.452)	(0.421-1.228)	(0-.)	(0.00682-0.113)	(0.450-1.517)
Constant	19.00***	32***	35.00***	72.00***	23***
	(12.12-29.79)	(22.63-45.25)	(25.13-48.74)	(57.15-90.71)	(15.28-34.61)
Log likelihood	-25.51	-36.16	-26.64	-31.92	-31.08
Chi-squared	86.51	57.23	122.4	272.0	60.55
N	14	14	14	14	14

Exponentiated coefficients; 95% confidence intervals in brackets

* $p < 0.05$- ** $p < 0.01$- *** $p < 0.001$

Appendix 11: Tuberculosis treatment outcome in the Greater Accra Region

	Treatment outcome				
Year	Cure	Treatment completed	Died	Failure	Default
1997 (ref)	1	1	1	1	1
	(1-1)	(1-1)	(1-1)	(1-1)	(1-1)
1998	1.410***	2.276***	1.139	1.100	0.818*
	(1.239-1.604)	(1.471-3.522)	(0.728-1.782)	(0.600-2.015)	(0.686-0.976)
1999	1.310***	1.069	0.583*	0.550	0.618***
	(1.149-1.494)	(0.644-1.774)	(0.341-0.999)	(0.264-1.148)	(0.511-0.748)
2000	1.575***	1.655*	0.833	0.550	0.680***
	(1.388-1.787)	(1.044-2.624)	(0.513-1.353)	(0.264-1.148)	(0.565-0.819)
2001	1.552***	1.379	0.778	1.050	0.742**
	(1.367-1.762)	(0.855-2.225)	(0.475-1.274)	(0.569-1.937)	(0.619-0.889)

Appendix 11 continued.

2002	1.707***	1.621*	0.833	0.400*	0.527***
	(1.508-1.934)	(1.020-2.575)	(0.513-1.353)	(0.176-0.908)	(0.431-0.645)
2003	2.020***	2.276***	1.278	0.250**	0.415***
	(1.790-2.280)	(1.471-3.522)	(0.826-1.976)	(0.0938-0.666)	(0.333-0.516)
2004	2.308***	0.414*	1.778**	1.100	0.127***
	(2.050-2.598)	(0.211-0.811)	(1.182-2.674)	(0.600-2.015)	(0.0895-0.181)
2005	2.356***	0.345**	2.833***	1.250	0.120***
	(2.094-2.651)	(0.168-0.708)	(1.938-4.143)	(0.694-2.250)	(0.0836-0.172)
2006	2.743***	0.448*	3.222***	1.300	0.0655***
	(2.444-3.079)	(0.233-0.862)	(2.217-4.683)	(0.726-2.329)	(0.0406-0.105)
2007	2.394***	0.862	2.389***	1.450	0.0836***
	(2.129-2.694)	(0.505-1.472)	(1.619-3.525)	(0.820-2.563)	(0.0547-0.128)

Appendix 11 continued.

2008	2.728***	1.310	2.194***	1.000	0.0764***
	(2.430-3.062)	(0.808-2.125)	(1.480-3.255)	(0.538-1.859)	(0.0490-0.119)
2009	2.929***	2.793***	2.333***	0.900	0.0909***
	(2.612-3.284)	(1.828-4.269)	(1.579-3.448)	(0.476-1.701)	(0.0604-0.137)
2010	2.598***	2.448***	2.167***	0.700	0.0618***
	(2.313-2.919)	(1.590-3.771)	(1.460-3.216)	(0.354-1.386)	(0.0379-0.101)
Constant	393.0***	29***	36***	20***	275.0***
	(356.0-433.8)	(20.15-41.73)	(25.97-49.91)	(12.90-31.00)	(244.3-309.5)
Log likelihood	-59.36	-37.64	-40.62	-32.49	-42.20
Chi-squared	990.1	178.4	207.9	41.28	1103.3
N	14	14	14	14	14

Exponentiated coefficients; 95% confidence intervals in brackets

* $p < 0.05$- ** $p < 0.01$- *** $p < 0.001$

Appendix 12: Tuberculosis treatment outcome in the Eastern Region

	Treatment outcome				
Year	Cure	Treatment completed	Died	Failure	Default
1997 (ref)	1	1	1	1	1
1998	1.581***	1.465	1.765***	2.714**	0.662***
	(1.410-1.773)	(0.994-2.159)	(1.344-2.319)	(1.471-5.009)	(0.559-0.783)
1999	0.760***	1.093	1.062	1.071	0.468***
	(0.664-0.871)	(0.723-1.653)	(0.784-1.438)	(0.517-2.220)	(0.387-0.565)
2000	0.217***	0.674	0.160***	0.714	0.162***
	(0.175-0.268)	(0.421-1.080)	(0.0894-0.288)	(0.317-1.608)	(0.122-0.215)
2001	1.010	3.977***	0.914	2.571**	0.741***
	(0.891-1.146)	(2.847-5.556)	(0.667-1.252)	(1.387-4.767)	(0.630-0.872)
2002	1.090	0.953	1.198	1.071	0.432***

Appendix 12 continued.

	(0.963-1.233)	(0.622-1.463)	(0.892-1.608)	(0.517-2.220)	(0.356-0.525)
2003	1.252***	1.721**	1.370*	1.357	0.444***
	(1.111-1.412)	(1.182-2.506)	(1.029-1.825)	(0.680-2.707)	(0.367-0.538)
2004	1.115	1.512*	0.901	0.857	0.476***
	(0.985-1.261)	(1.028-2.222)	(0.657-1.237)	(0.396-1.853)	(0.395-0.575)
2005	1.321***	0.953	1.074	1	0.326***
	(1.173-1.487)	(0.622-1.463)	(0.794-1.454)	(0.477-2.098)	(0.264-0.404)
2006	1.296***	1.279	0.988	1.357	0.165***
	(1.150-1.460)	(0.858-1.906)	(0.725-1.345)	(0.680-2.707)	(0.124-0.219)
2007	1.533***	1.163	0.938	0.857	0.147***
	(1.367-1.720)	(0.774-1.748)	(0.686-1.283)	(0.396-1.853)	(0.109-0.198)
2008	1.604***	1.535*	1.284	1.214	0.0618***

Appendix 12 continued.

	(1.431-1.798)	(1.045-2.254)	(0.960-1.717)	(0.599-2.463)	(0.0398-0.0960)
2009	1.608^{***}	1.628^{*}	1.111	0.929	0.121^{***}
	(1.435-1.802)	(1.114-2.380)	(0.823-1.500)	(0.436-1.975)	(0.0872-0.167)
2010	1.333^{***}	2.605^{***}	1.358^{*}	1.643	0.159^{***}
	(1.185-1.501)	(1.832-3.702)	(1.019-1.809)	(0.845-3.193)	(0.119-0.212)
Constant	480^{***}	43^{***}	81.00^{***}	14.00^{***}	340.0^{***}
	(438.9-524.9)	(31.89-57.98)	(65.15-100.7)	(8.292-23.64)	(305.7-378.1)
Log likelihood	-56.73	-41.51	-43.52	-32.74	-45.05
Chi-squared	947.0	213.0	151.6	45.35	857.2
N	14	14	14	14	14

Exponentiated coefficients; 95% confidence intervals in brackets

* $p < 0.05$- ** $p < 0.01$- *** $p < 0.001$

Appendix 13: Tuberculosis treatment outcome in the Central Region

	Treatment outcome				
Year	Cure	Treatment completed	Died	Failure	Default
1997 (ref)	1	1	1	1	1
1998	1.269**	1.019	1.654**	0.513*	0.930
	(1.093-1.473)	(0.697-1.488)	(1.172-2.334)	(0.299-0.879)	(0.808-1.071)
1999	1.453***	0.491**	1.673**	0.872	0.883
	(1.257-1.680)	(0.307-0.784)	(1.187-2.359)	(0.550-1.381)	(0.766-1.019)
2000	1.612***	0.623*	1.827***	1.333	0.948
	(1.398-1.857)	(0.403-0.962)	(1.303-2.562)	(0.880-2.020)	(0.824-1.090)
2001	1.366***	0.604*	1.269	0.641	0.796**
	(1.179-1.582)	(0.389-0.936)	(0.882-1.825)	(0.388-1.059)	(0.687-0.922)
2002	1.731***	0.962	2.173***	0.436**	0.724***

Appendix 13 continued.

	(1.505-1.992)	(0.655-1.413)	(1.565-3.018)	(0.247-0.770)	(0.623-0.842)
2003	1.540***	1.377	1.558*	0.385**	0.883
	(1.335-1.778)	(0.967-1.962)	(1.100-2.207)	(0.212-0.698)	(0.766-1.019)
2004	1.392***	1.660**	1.712**	0.487*	0.672***
	(1.202-1.611)	(1.181-2.335)	(1.216-2.410)	(0.282-0.843)	(0.576-0.784)
2005	2.120***	0.736	1.635**	0.487*	0.512***
	(1.852-2.427)	(0.487-1.113)	(1.158-2.308)	(0.282-0.843)	(0.433-0.606)
2006	2.013***	0.642*	1.808***	0.487*	0.197***
	(1.756-2.307)	(0.417-0.987)	(1.288-2.536)	(0.282-0.843)	(0.154-0.250)
2007	2.544***	0.868	1.231	0.462**	0.0672***
	(2.230-2.901)	(0.585-1.288)	(0.854-1.775)	(0.264-0.807)	(0.0455-0.0992)
2008	2.673***	0.472**	1.288	0.231***	0.0373***

Appendix 13 continued.

	(2.346-3.046)	(0.293-0.759)	(0.897-1.851)	(0.112-0.476)	(0.0223-0.0625)
2009	3.010^{***}	0.849	1.135	0.256^{***}	0.0697^{***}
	(2.646-3.423)	(0.571-1.263)	(0.782-1.647)	(0.128-0.514)	(0.0475-0.102)
2010	2.790^{***}	0.830	1.019	0.308^{***}	0.0473^{***}
	(2.450-3.177)	(0.557-1.238)	(0.695-1.494)	(0.161-0.588)	(0.0298-0.0749)
Constant	309.0^{***}	53.00^{***}	52.00^{***}	39.00^{***}	402^{***}
	(276.4-345.4)	(40.49-69.37)	(39.62-68.24)	(28.49-53.38)	(364.6-443.3)
Log likelihood	-57.10	-39.25	-43.19	-33.73	-47.20
Chi-squared	846.5	81.83	54.50	75.70	1816.8
N	14	14	14	14	14

Exponentiated coefficients; 95% confidence intervals in brackets

* $p < 0.05$- ** $p < 0.01$- *** $p < 0.001$

Appendix 14: Tuberculosis treatment outcome in the Brong-Ahafo Region

	Treatment outcome				
Year	Cure	Treatment completed	Died	Failure	Default
1997 (ref)	1	1	1	1	1
1998	0.980	0.707	0.910	1.524	0.631*
	(0.834-1.151)	(0.474-1.054)	(0.660-1.255)	(0.879-2.642)	(0.427-0.932)
1999	0.763**	0.897	0.679*	0.524	0.785
	(0.642-0.906)	(0.617-1.304)	(0.479-0.963)	(0.253-1.086)	(0.544-1.132)
2000	0.773**	0.931	0.897	0.619	0.862
	(0.651-0.917)	(0.643-1.349)	(0.650-1.239)	(0.310-1.236)	(0.603-1.232)
2001	0.803*	0.862	0.744	0.857	1.123
	(0.677-0.951)	(0.591-1.258)	(0.529-1.045)	(0.457-1.609)	(0.804-1.569)
2002	0.993	0.569**	0.782	0.714	0.692

Appendix 14 continued.

	(0.846-1.166)	(0.371-0.872)	(0.559-1.093)	(0.368-1.386)	(0.473-1.012)
2003	0.957	0.483**	0.885	0.429*	0.708
	(0.813-1.125)	(0.308-0.758)	(0.640-1.223)	(0.196-0.936)	(0.485-1.032)
2004	0.836*	0.414***	0.667*	0.381*	0.908
	(0.707-0.989)	(0.257-0.666)	(0.469-0.947)	(0.169-0.860)	(0.638-1.291)
2005	0.793**	0.448***	0.731	0.619	0.877
	(0.668-0.940)	(0.282-0.712)	(0.519-1.028)	(0.310-1.236)	(0.614-1.251)
2006	0.836*	0.862	0.692*	0.810	0.769
	(0.707-0.989)	(0.591-1.258)	(0.489-0.979)	(0.427-1.534)	(0.532-1.112)
2007	0.943	1	0.667*	0.476	0.508**
	(0.802-1.110)	(0.695-1.439)	(0.469-0.947)	(0.224-1.011)	(0.334-0.772)
2008	1.007	0.793	0.423***	0.619	0.138***

Appendix 14 continued.

	(0.858-1.181)	(0.539-1.168)	(0.282-0.636)	(0.310-1.236)	(0.0690-0.278)
2009	1.298***	0.707	0.603**	0.381*	0.385***
	(1.116-1.509)	(0.474-1.054)	(0.420-0.865)	(0.169-0.860)	(0.242-0.610)
2010	1.027	0.862	0.603**	1.000	0.446***
	(0.876-1.204)	(0.591-1.258)	(0.420-0.865)	(0.546-1.831)	(0.288-0.691)
Constant	299.0***	58.00***	78.00***	21***	65.00***
	(267.0-334.9)	(44.84-75.02)	(62.48-97.38)	(13.69-32.21)	(50.97-82.89)
Log likelihood	-52.18	-39.05	-41.07	-31.32	-38.94
Chi-squared	83.06	43.65	32.53	34.16	97.09
N	14	14	14	14	14

Exponentiated coefficients; 95% confidence intervals in brackets

* $p < 0.05$- ** $p < 0.01$- *** $p < 0.001$

Appendix 15: Tuberculosis treatment outcome in the Ashanti Region

	Treatment outcome				
Year	Cure	Treatment completed	Died	Failure	Default
1997 (ref)	1	1	1	1	1
1998	1.564***	0.649***	1.034	0.381*	0.816
	(1.359-1.799)	(0.510-0.826)	(0.723-1.479)	(0.169-0.860)	(0.611-1.088)
1999	1.090	0.429***	0.576*	0.286**	0.262***
	(0.937-1.269)	(0.325-0.565)	(0.378-0.879)	(0.115-0.708)	(0.172-0.400)
2000	0.938	0.327***	0.390***	0.571	0.534***
	(0.801-1.097)	(0.241-0.444)	(0.241-0.631)	(0.281-1.161)	(0.385-0.741)
2001	1.427***	0.524***	1.169	0.571	1.903***
	(1.237-1.646)	(0.405-0.678)	(0.826-1.656)	(0.281-1.161)	(1.499-2.416)
2002	1.729***	0.405***	1.356	0.524	1.282

Appendix 15 continued.

	(1.507-1.984)	(0.305-0.536)	(0.969-1.898)	(0.253-1.086)	(0.990-1.658)
2003	2.567***	0.387***	1.695**	0.810	0.388***
	(2.256-2.920)	(0.291-0.515)	(1.229-2.338)	(0.427-1.534)	(0.270-0.560)
2004	2.735***	0.512***	1.780***	0.524	0.835
	(2.407-3.108)	(0.395-0.664)	(1.294-2.448)	(0.253-1.086)	(0.627-1.112)
2005	2.860***	0.363***	1.780***	0.571	0.893
	(2.519-3.247)	(0.271-0.487)	(1.294-2.448)	(0.281-1.161)	(0.674-1.183)
2006	3.218***	0.411***	1.458*	0.381*	0.476***
	(2.839-3.647)	(0.310-0.544)	(1.047-2.030)	(0.169-0.860)	(0.339-0.668)
2007	3.006***	0.589***	1.407*	0.286**	0.136***
	(2.650-3.411)	(0.460-0.755)	(1.008-1.964)	(0.115-0.708)	(0.0778-0.238)
2008	3.218***	0.673**	1.356	0.429*	0.233***

Table 15 continued.

	(2.839-3.647)	(0.530-0.854)	(0.969-1.898)	(0.196-0.936)	(0.149-0.363)
2009	3.016^{***}	0.851	1.475^{*}	0.381^{*}	0.282^{***}
	(2.658-3.421)	(0.681-1.064)	(1.060-2.052)	(0.169-0.860)	(0.186-0.425)
2010	2.963^{***}	1.095	1.203	0.0952^{**}	0.262^{***}
	(2.611-3.362)	(0.889-1.350)	(0.852-1.700)	(0.0223-0.406)	(0.172-0.400)
Constant	321^{***}	168.0^{***}	59.00^{***}	21.00^{***}	103.0^{***}
	(287.7-358.1)	(144.4-195.4)	(45.71-76.15)	(13.69-32.21)	(84.91-124.9)
Log likelihood	-58.27	-44.51	-42.57	-28.44	-40.68
Chi-squared	1607.8	203.7	118.7	29.15	453.8
N	14	14	14	14	14

Exponentiated coefficients; 95% confidence intervals in brackets

* $p < 0.05$- ** $p < 0.01$- *** $p < 0.$