MINISTRY OF HEALTH

THE NATIONAL TUBERCULOSIS HEALTH SECTOR STRATEGIC PLAN FOR GHANA

2015–2020

Moving out of the box to end the TB epidemic
Post 2015 TB Control Strategy

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ACRONYMS AND ABBREVIATIONS

ACSM	Advocacy, communication, and social mobilisation
ART	Antiretroviral therapy
CB-DOTS	Community-based DOTS
CBO	Community-based organisation
CBTC	Community-based TB control
CCM	Country Coordinating Mechanism [Global Fund]
CHAG	Christian Health Association of Ghana
CHO	Community health officer
CHPS	Community Health Planning Service
CHW	Community health worker
CIDA	Canadian International Development Agency
CNR	Case notification rate
CPT	Co-trimoxazole preventive therapy
CSO	Civil society organisation
DANIDA	Danish International Development Agency
DFID	Department for International Development [UK]
DHMT	District health management team
DOTS	Directly observed treatment, short course
DST	Drug susceptibility testing
EQA	External Quality Assurance
FDA	Food and Drug Authority
GAVI	Global Alliance for Vaccines and Immunisations
GDF	Global Drug Facility
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GHS	Ghana Health Service
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GOG	Government of Ghana
HIV	Human immunodeficiency virus
HMIS	Health management information system
HO	Health objective
ICF	Intensified case finding
IEC	Information, education, and communication
IOM	International Organization for Migration
IPC	Infection prevention and control
IPT	Isoniazid preventive therapy
KAP	Knowledge, Attitude, and Practice
KNCV	KNCV Tuberculosis Foundation, Netherlands
MDG	Millennium Development Goals
MDR-TB	Multidrug-resistant TB
M&E	Monitoring and evaluation
MGIT	Mycobacterium growth indicator tube
MICS	Multiple Indicator Cluster Survey
MOH	Ministry of Health
MSH	Management Sciences for Health

NACP	National AIDS Control Programme
NDPC	National Development Planning Commission
NGO	Non-Governmental Organization
NHIS	National Health Insurance Scheme
NMIMR	Noguchi Memorial Institute for Medical Research
NPHRL	National Public Health Reference Laboratory
NTP	National Tuberculosis Control Programme
PLHIV	People living with HIV/AIDS
PMTCT	Prevention of mother-to-child transmission [of HIV]
OPD	Outpatient department
POW	Programme of Work
PPD	Purified protein derivative
PPM	Public-private mix
PPME	Policy Planning and Monitoring and Evaluation Division
PPP	Public-private partnership
QA	Quality assurance
RCC	Regional coordinating council
SOP	Standard operating procedures
SS+	Sputum smear–positive
SS-	Sputum smear–negative
TA	Technical assistance
TB	Tuberculosis
TB CAP	Tuberculosis Control Assistance Project
TB-IC	Tuberculosis Infection Control
TFR	Total fertility rate
UNIDO	United Nations Industrial Development Organization
USAID	US Agency for International Development
VCT	Voluntary counselling and testing [for HIV]
WHA	World Health Assembly
WHO	World Health Organization
XDR-TB	Extremely-drug-resistant TB

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The National Tuberculosis Control Programme (NTP) has once again successfully provided a framework for the national response to the tuberculosis (TB) epidemic in Ghana and has led various stakeholders to produce this comprehensive TB control strategic plan.

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FOREWORD

Tuberculosis control is important not only to individuals afflicted with the disease and those affected by their illness, but also to society as a whole.

Over the years, the Ministry of Health (MOH) has considered TB among its top priority diseases because the effect of inaction against this silent killer could be devastating. Presently, new and emerging forms of the disease, namely multidrug and extremely drug-resistant TB (MDR and XDR-TB), are threatening global security and health. The country has made progress in its treatment success rate, but the progress has been very slow. Our case detection still remains a major challenge. We need to improve the health infrastructure, expand the laboratory network and intensify advocacy, communication and social mobilisation activities.

Scaling up our priority interventions requires a heavy capital injection if we are to meet the new targets set for tuberculosis control by the post-2015 global TB strategy. Recent funding from the Global Fund to Fight TB, Malaria and AIDS has been of tremendous assistance.

However, we plan to scale up towards universal access for accelerated tuberculosis control. I, therefore, welcome this comprehensive strategic plan developed with the support and active involvement of all stakeholders as the national response to the ravaging epidemic.

The Government of Ghana, with incremental support, will provide a minimum of 30% of the annual budget necessary for implementation costs of this strategic plan in the medium to long term. Ghana will require additional assistance from partners and stakeholders to make up for the shortfall.

We invite all partners to contribute to help us stop TB. Let all of us work together to create "wealth through health."

Mr Alex Segbefia
Hon. Minister of Health

EXECUTIVE SUMMARY

The overall objective of the health sector's response to the national TB epidemic is to work towards achieving the post-2015 TB control strategy targets set by the World Health Assembly (WHA) and Stop TB Partnership. The mandate of the National Tuberculosis Control Programme, therefore, is to provide leadership and stewardship to accelerate intense and coordinated efforts to reduce the adult TB burden of 290 per 100,000 population recently established in the 2013 National TB Prevalence Survey. Other key challenges are low TB case notification, unacceptably high TB death rates, low antiretroviral therapy (ART) coverage among TB/HIV patients and low drug-resistant notification and treatment.

Goals:

1. To reduce by 20% the 2013 TB prevalence baseline level of 290 per 100,000 population by 2020 in line with the post-2015 Global TB Control Strategy.
2. To reduce by 35% the 2012 TB mortality rate baseline of 4 deaths per 100,000 population by 2020.
3. To end the TB epidemic in Ghana by 2035 without catastrophic cost due to TB-affected families.

Though very ambitious the plan recognises the limitation of resources in seeking to achieve these goals. To attain them, the country needs to detect over 70,000 new TB cases annually. The amount of funding needed to do this ranges from 56 million to 73 million USD per year. As the National Tuberculosis Control Programme adopts the post-2015 TB Control Strategy, the objectives are, therefore, set based on realistic projections of expected funding and the health systems capacity to rapidly scale up.

Objectives:

1. To early screen, detect and enrol into treatment all forms of notified (new cases) from 15,606 in 2013 to 37,956 by 2020, while increasing the proportion of bacteriologically confirmed pulmonary TB from 51% in 2013 to 60% by 2020.
2. To early detect and enrol into treatment at least 85% of confirmed MDR-TB cases among new and previously treated cases by 2020.
3. To attain higher treatment success for all forms of TB from 84% in 2012 to at least 91% by 2020 through improved quality clinical care and community TB care.
4. To reduce death rates of TB/HIV co-infected cases from 20% in 2012 to 10% by 2020 and uptake of ART coverage among co-infected from 5.7% in 2013 to 37% by 2020.
5. To improve programme management; coordination, monitoring & evaluation and operations research to support treatment and screening strategies for TB/HIV.

Three strategic plans have been successfully implemented within the period from 1994-2013. The current plan focuses on implementing and scaling up best practices while addressing the problems of key affected populations. The principle underlying implementation is to build a strong coalition with civil society organisations and communities (Stop TB Partnership, Ghana) and work in partnership with other state agencies such as the Attorney General's Department, to ensure protection and promotion of patients' rights, ethics and equity under

the National Health Insurance Scheme (NHIS), Food and Drugs Authority (FDA) and Public Health Act.

There is a shift from passive TB case finding to active case finding using superior screening algorithms and diagnostic tools. An award-winning, evidence-based WHO set of guidelines, *Systematic Screening for Active Tuberculosis: Principles and Recommendations*, which was piloted in Ghana, has guided prioritisation of the proposed interventions in this plan. Costing of the strategic plan was done using the WHO planning and budgeting tool.

The total funding need for this 6-year National Tuberculosis Health Sector Strategic Plan (2015-2020) is 358,817,198 USD. Through the Global Fund-financing mechanism 6% (21,008,049 USD) of the total funding needs in the next 3 years would be provided. The Government of Ghana will provide at least 30% of the annual budgetary needs of this plan.

The successful implementation of the plan will depend on a continuous stable political climate in the country and increased, predictable and sustained funding from other developmental partners.

1. BACKGROUND

1.1. Country Profile

The Republic of Ghana is centrally located on the West African coast and extends inland from the Gulf of Guinea. It is bordered on the south by the Atlantic Ocean, Togo to the east, Burkina Faso to the north, and La Cote D'Ivoire to the west. The country is bisected by the Greenwich Meridian and lies entirely within the northern tropics between latitude 4^{o} and 12^{o} N above the equator.

It covers a surface area of 238,537 sq. km and a coastline of 540 km, most of which is relatively flat and lies below an altitude of 150 km, except for a range of hills on the eastern border and Mt. Afadjato – the highest point above sea level (884 metres) – which is west of the Volta River.

Ghana can be divided into three ecological zones: the sandy coastline backed by a coastal plain, which is crossed by several rivers and streams; the middle belt and western parts of the country, which are heavily forested and have many streams and rivers; and a northern savannah, which is drained by the Black and White Volta Rivers. The Volta Lake, created as result of the construction of a hydroelectric dam in the eastern part of the country, is one of the largest artificial lakes in the world.

The country has a tropical climate with temperatures and rainfall varying according to distance from the coast and elevation. Annual rainfall ranges from about 1,015 millimetres (40 inches) in the north to about 2,030 millimetres (80 inches) in the southwest (DHS, 2008). Northern Ghana has a wet climate from April to October; the rest of the period is hot and dry with temperatures up to 38°C. In southern Ghana, the rains last from April to June, and from September to October. There are drier months in between these periods. Generally, temperatures are between 21°C-31°C in the south (Ghana Tourist Board website 2012).

The Harmattan, a dry desert wind, blows from the northeast between December and March, lowering the humidity and creating very warm days and cool nights in the north. In the south, the effects of the Harmattan are felt mainly in January. Average relative humidity ranges from nearly 100% in the south to 65% in the north. During the Harmattan season, relative humidity in the drier areas can fall as low as 12%.

Figure 1: Map of Ghana

Accra is the capital city of Ghana (a metropolitan city with population of 3-4 million). There are 10 administrative regions in the country (Figure 1), and 216 districts[1] including metropolitan and municipal areas. Each region is headed by an appointed regional minister who represents the president. Each district is headed by a chief executive who is nominated by the president and approved by the district assembly. Districts are also sub-divided into approximately 600 unit areas/sub-districts and are headed by elected executives. Due to the ongoing development and population increases, new districts are progressively being created. It is estimated that there are slightly more than 45,000 communities and 5,467,136 households with an average household size of 4.4[2].

1.1.1. Demographic Characteristics

Ghana's population is 27,273,723 (2014) projected from 2010 Population Census by the Ghana Statistical Service (GSS). The population is made up of 75 Ethnic groups: Akan 47.5%, Mole-Dagbon 16.6%, Ewe 13.9%, Ga-Dangme 7.4%, Gurma 5.7%, Guan 3.7%, Grusi 2.5%, Mande-Busanga 1.1%, others 1.6% (2010 Census). The population density per sq km has more than doubled from 36 persons per sq km in 1970 to 79 persons per sq km in 2013. Thirty-one percent (31%) of households in Ghana are headed by women. Furthermore, 33% of households in urban areas, and 44% of households in rural areas, have at least one child aged less than five years. The mean household size is 3.5 in urban areas, and 4.3 in rural areas. The most common household size is 2-3 household members (30%), while 27% have 4-5 household members.

1.1.2. Age-Sex Differentials

The age structure is typical of a young population characterised by high fertility. This type of population structure imposes a heavy burden on the social and economic assets of a country. Children less than 15 years constitute 42% of the total population and 5% of the population is in the older age groups (65 years and above). This has not changed much since 2003 (Figure 2).

Ghana's population is comprised of 51.2% females and 48.8% males resulting in a sex ratio of 95 males to 100 females. For both sexes, the largest population age-group is 15-24 years. For women, 34% are in this category, while for men, it is 31%. In addition, 6 in 10 women

[1] See www.ghanadistricts.gov
[2] 2010 Population and Housing Census. Summary Results of Final Report. Ghana Statistical Service, May 2012

and about 5 in 10 men are currently married/in union, while 30% of women and 40% of men have never been married/in union. Nearly half of the men (46%) and women (47%) live in rural areas.

For children under five years, Ghana has roughly the same proportion of girls and boys but there are more children in rural areas than in urban areas (57% against 44%). Children under five are also slightly more likely to live in the poorest households: 23% of the children under five live in the poorest households while 17% live in the richest.

1.1.3. Fertility

In Ghana, 70% of women have given birth at least once, and 24% gave birth in the last two years. The adolescent birth rate and total fertility rate (TFR) are respectively 60 per 1000 live births and 4.3 children per woman. The average is 3.3 children per woman in urban areas and 5.5 children per woman in rural areas. Regional variations are also observed with the highest TFR (6.2) in Northern region compared to the lowest TFR (3.2) in Greater Accra. The TFR decreases with educational level and by wealth index quintiles. The lower TFR is observed among women with secondary or higher education (3.1) and in the richest quintile (2.9) (Multiple Indicator Cluster Survey [MICS], 2011).

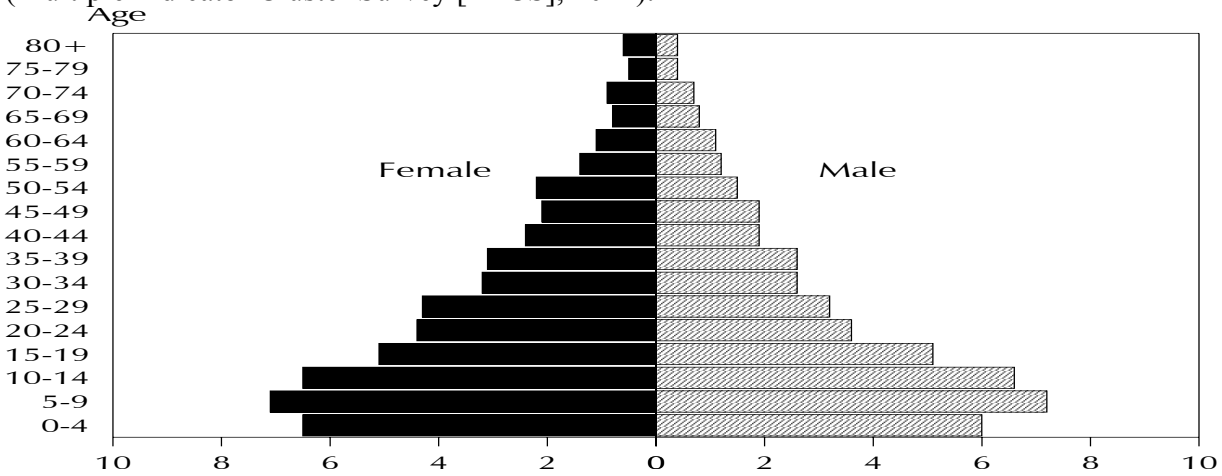


Figure 2: Population Pyramid of Ghana 2010 (GSS, 2013)

1.1.4. Literacy and Education

Sixty-one percent of young women (aged 15-24 years) and 71% of young men (aged 15-24 years) are literate. In the richest wealth quintile, 85% and 93% of young women and men respectively are literate, while in the poorest wealth quintile, only 31% and 41% of young women and men respectively are literate.

The primary school net attendance rate (adjusted) is 73%. In urban areas, the net attendance rate (adjusted) is 80% compared to 68% in rural areas. The secondary school net attendance rate (adjusted) is 42%, which is 51% in urban areas compared to 34% in rural areas. The gender parity ratio for net attendance rate (adjusted) is 1.02 in primary school and 1.10 in secondary school (MICS 2011).

Table 1: Demographics of Ghana

Indicators	2000	2010-2012
Population (total)	19.9 million	25.37 million
Population growth	2.2	2.0
Life expectancy at birth	56.7	64 (2011)
Infant mortality rate (per 1,000 live births)	68	53 (2011)
The maternal mortality rate (per 100,000 live births)	Data not available	485.2 (2010)
Prevalence of HIV	2.3	1.37 (2012)
School enrolment in primary education	80.5	88.4
School enrolment in secondary education	37.4	43.6
Ratio of boys to girls in primary and secondary education	89.4	92.6
Literacy rate, youth female (percentage of females ages 15–24)	Data not available	65.5
Doctors-to-population ratio	1: 8,288	1: 14,732 (2009)

Sources:
World Bank. 2013. World Databank. Washington, DC: World Bank.
Facts and Figures. Policy, Planning, Monitoring and Evaluation (PPME): 2005, Ghana Health Service
Ghana 2010 Population and Housing Census Report. Ghana Statistical Services

1.1.5. Society, Politics, Economics and Development

Ghana is a democratic nation with a centralised presidency. The president is both chief executive and head of state. There is also an appointed cabinet, a multi-party parliamentary system and an independent judiciary. The country is divided into 10 regions: Ashanti, Brong-Ahafo, Central, Eastern, Greater Accra, Northern, Upper East, Upper West, Volta and Western Regions. Each region is headed by an appointed regional minister who represents the president. The regional minister is assisted by a deputy regional minister and a regional coordinating council (RCC) to coordinate and formulate integrated district plans and programmes within the framework of approved national development policies and priorities.

Each region is sub-divided into districts which are led by a government-appointed chief executive. District management is led by the chief executive with support from the district coordinating director. The district assembly is the highest political and administrative authority in the district.

Ghana was the first country in sub-Saharan Africa to gain independence from colonial rule, and 2014 marks its 57th anniversary as an independent nation. A vibrant, liberalised media provides opportunities for the use of various media houses to transmit behaviour change communication information and engage civil society in health issues. Although there are no known legally enacted statutes that discriminate against any members in society, social arrangements and cultural practices have hindered women's ability to make choices that enhance their health. The country has enjoyed continued political stability since 1992 and this has impacted positively on the health sector (Ghana Health Sector Programme of Work, 2012).

The country has a mixed economy consisting of a dominant agricultural sector. About 60% of the adult labour force is involved in small-scale peasant farming. Ghana also has a relatively small, capital-intensive modern sector dominated by mining and other industrial activities and a rapidly expanding informal sector. In 2011, gross national income per capita was 1,830 USD.

There have been major changes to the country's economy in the past decade. In 2010, following re-basing of the Ghanaian currency, Ghana became a lower middle-income country. The performance of the economy has substantially improved as Ghana continues to experience macroeconomic stability indicated by the prudent fiscal and macroeconomic management put in place by the government. This has been accompanied by accelerated economic growth with a year-on-year, real GDP growth rate of 7.1% in 2013[3]. Inflation for year ending 2013 was 13.5%[4].

1.2. Health Sector

Ghana has a well-established health care system, but coverage is far from adequate to meet the population's needs. To guard against fragmentation caused by multiple projects, the Government of Ghana (GOG), along with its development partners, focuses on "big picture" issues such as reorganizing the MOH, comprehensive public health planning, and capacity building at both the central and local levels.

Health sector reforms since 1995 have led to the development of three five-year programmes of work (POWs) for the Ministry of Health: the first covering 1997–2001; the second covering 2002–2006; and the third covering 2007–2011. Currently, there is a 2013 POW which identifies TB as a priority disease (POW 2013 MOH) and mandates the NTP to implement a national strategic plan to increase TB case detection and cure rates.

The Government of Ghana is committed to improving the health of all people living in Ghana. This encompasses many specific objectives including increasing life expectancy, reducing avoidable deaths and improving quality of life. The health sector mission seeks to contribute to socio-economic development and wealth creation by promoting health and vitality; ensuring access to quality health, population and nutrition services for all people living in Ghana; and promoting the development of a local health industry.

The ultimate goals of the sector are to ensure that people live long, healthy and productive lives and reproduce without an increased risk of injury or death; to reduce the excessive risk and burden of morbidity, mortality and disability, especially in the poor and marginalized groups; and to reduce inequalities in access to health, populations and nutrition services and health outcomes. These are currently captured in the ministry's five strategic health objectives (HOs):

HO1: Bridge the equity gaps in infrastructure, human resources, and financial access to health care and nutrition services and ensure sustainable financing arrangements that protect the poor;
HO2: Improve governance and ensure efficiency and effectiveness in health systems;
HO3: Improve access to quality maternal, neonatal, child and adolescent services;
HO4: Intensify prevention and control of non-communicable and communicable diseases and promote healthy lifestyles;

[3] National Accounts Statistics: Gross Domestic Product 2014. Ghana Statistical Service. April 2014. See at: http://www.statsghana.gov.gh/docfiles/GDP/GDP_2014.pdf
[4] Newsletter: Consumer Price Index (CPI) December 2013. Ghana Statistical Service. December 2013. See at: http://www.statsghana.gov.gh/docfiles/new_CPI_pdfs/CPI_Newsletter_December_2013.pdf

HO5: Strengthen institutional care including mental health service delivery. (MOH Sector Medium Term Development Plan 2010)

The top 10 causes of outpatient-reported morbidity are malaria, upper respiratory infection, diarrheal diseases, skin disease, hypertension, home and occupational injuries, eye infection, pregnancy and related complications, rheumatic and joint diseases, and anaemia. It is believed that a number of missed TB cases are diagnosed as upper respiratory tract infections.

1.2.1. Commitment to the Abuja Declarations and International Resolutions

In the year 2000, Ghana participated in the African Development Forum in Abuja and signed on to implement the Abuja Declaration on HIV/AIDS, TB, Malaria and Other Infectious Diseases, which was extended in 2006 to 2015. Heads of states, including Ghana's president, committed themselves to taking concrete steps in their countries to intensify the fight against these diseases. As part of this commitment, the Government of Ghana is currently scaling up the Community Health Planning Service (CHPS) strategy which involves placing trained community health officers (CHOs) in communities to provide a package of essential health services including TB control.

1.2.2. The National Health Policy

The health sector was restructured in 1996 through the Ghana Health Service and Teaching Hospitals Act, 1996, Act 525 which created the Ghana Health Service (GHS) and granted autonomy to the teaching hospitals. The Act also refocused the functions of the MOH on the provision of leadership, policy formulation and coordination for the whole health sector. The MOH carries out its policy formulation function in consultation with the National Development Planning Commission (NDPC) and in partnership with development partners, its agencies, WHO, research and other relevant institutions. Policies developed through this collaborative process are usually informed by the outcomes of sector performance reviews, research findings and technical support provided by WHO and others. The health sector is currently implementing the 2013 POW and is far advanced in preparing the 2014-2018 health sector medium term development plan.

In 2012, the Public Health Act 2012, Act 851 was passed to give direction to and to facilitate the implementation of essential public health interventions. In essence, the objectives of the act include support to programmes and campaigns intended to improve public health and educate individuals about public health risks. Part one of the act covers communicable disease including tuberculosis.

1.2.3. Health Care System Organisation

Ghana's health sector is both public and private. Ghana Health Service and the Teaching Hospitals run the public sector. The private sector is made up of faith-based and private, for-profit health institutions. The current health sector organisation provides for leadership at the ministerial level supported by the following implementing agencies:

- Service delivery agencies--Ghana Health Service, teaching hospitals, psychiatric hospitals, ambulance service, blood service, the Christian Health Association of Ghana (CHAG), and herbal clinics;
- Health training and research institutions;
- National Health Insurance Authority;
- Regulatory bodies.

The Ghana Health Service is a three-tier health delivery system: primary, secondary and tertiary. At the primary level, a medical doctor heads a district hospital and a physician assistant is in charge of health centres. Community Health Planning & Services zones are in sub-districts. In these areas, Community Health Officers work with community volunteers to increase access to health care. A typical district with a population of about 100,000 has one hospital, 5 health centres and 10-15 CHPS zones. The leadership of the district is the District Director of Health Services who works with a District Health Management Team and reports administratively to the District Chief Executive (political head) and technically to the Regional Director of Health Services.

The regional hospital forms the secondary level of the health care system taking care of referrals from the primary level. At this level, general practitioners and specialists provide services for the primary level. There are ten regional hospitals receiving referrals from districts and providing specialist outreach support to districts in Ghana. The Regional Director of Health Services oversees all matters of health in the region, works with a team and reports administratively to the Regional Minister (political head) and technically to the Director General of the Ghana Health Service who reports to the Minister of Health through the GHS Council.

Komfo Anokye, Korle-Bu, Tamale and Cape Coast are the current teaching hospitals providing tertiary care and the training of doctors. The Chief Executives of these teaching hospitals report to the Minister of Health through their boards.

The health sector has adopted an integrated approach to delivery of health interventions. Preventive care, clinical care and emergency services are all important aspects of the health service delivery system. As part of this approach, public health interventions are packaged and delivered to communities at district, regional and national health facilities as part of CHPS and through other outreach activities.

Within the regions and districts, there are multi-purpose disease control technical officers that ensure integrated health service delivery. These officers report to their respective district and regional directors of health. At the sub-district and CHPS compounds, disease control technical officers, field technicians, community health nurses, midwives and medical assistants carry out TB control activities as part of their schedule of work.

A Traditional Medicine Department has been created within the sector which sets standards, issues certificates of registration to qualified practitioners and licenses their premises, and collaborates with international bodies such as the United Nations Industrial Development Organization (UNIDO).

There is a National Health Insurance Scheme under the National Health Insurance Act 2012, Act 852 that reimburses the cost of health care services in health facilities. However, TB care and services are provided free as mandated by the Hospital Fee Regulation, 1985 (L.I. 1313).

There are currently discussions to include TB services under the National Health Insurance package of services as part of ensuring universal health coverage and future sustainable developmental goals.

1.2.4. Human Resources in the Health Sector

The Ghana National Health Policy, sub-titled "Creating Wealth through Health," defines human resources as all human capacity involved in developing, providing, managing or supporting curative, preventive, promotive and rehabilitative health, both in-country and externally, who directly or indirectly influence health development (National Health Policy 2007). In light of this, human resources for the management of the Tuberculosis Control Programme will be examined at the national (central), regional, district, facility and community levels.

As of June 2013, the total workforce in the public health sector was 42,000 staff working in 2,205 health facilities. These facilities are made up of 321 hospitals, 760 health centres and 1,124 clinics. There are 2,007 highly trained doctors (1 per 10,000 population), 12,763 nurses (6 per 10,000 population), 1,321 pharmacists and 381 allied health professionals currently working in Ghana.

1.2.5. Health Management Information System

The health sector has an integrated monitoring and evaluation plan out of which Ghana Health Service has developed its monitoring and evaluation framework. The tracking of health indicators and performance in the country is through the use of the routine health information system, supervisory visits and review meetings.

The health sector developed and successfully deployed the District Health Information Management System (DHIMS) software in 2008 to facilitate the management of integrated routine service data for decision-making. The DHIMS is a web-based system centrally hosted by the Central Health Information Management (CHIM) centre which is a unit within the Policy Planning Monitoring & Evaluation division. In 2012, the established DHIMS was improved and upgraded to DHIMS 2. This provides a platform for managing health service data nationwide across all service delivery points. This includes data from public, some private, faith-based and quasi-government health facilities.

Registers are provided at service delivery points in health facilities for collecting client demographic and health service information. These are the primary data sources for monitoring and evaluation within the service. Standard forms are used to manually summarize data from the service registers monthly for transmission to the district level. At the district level, DHIMS is used to collate and analyse the data. Data in the DHIMS can be accessed by users through the use of a username and password. However, the extent to which data is accessed depends on the user rights and the use of data visualizer. At the facility, district, regional and national levels, data on TB can be analysed to generate information, which is important for monitoring trends of the programme.

In addition to DHIMS, regular supervisory visits and reviews are carried out. Supervisory visits are technical and can be conducted by districts, regions, programmes or the GHS

headquarters' Integrated Monitoring office. Review meetings are held at all the levels of the health system usually twice a year. Through these meetings, summary TB indicators5 are captured as part of a broad performance-monitoring matrix.

1.2.6. Health Sector Financial Management

The Financial Administration Act 2003, Act 654, its regulations (2004) and the Accounting Treasury and Financial Reporting Rules and Instructions are the key documents that guide accountability of funds received and managed in the sector. The sector also complies with project agreement and grant agreement documents in the custody, disbursement, accounting and reporting for funds. They provide regulations and guidance on how public funds should be managed including revenue receipts, expenditure, records, auditing.

1.2.7. Funding the Health Sector

The three main sources of finance for the health sector in Ghana are: the public sector, development partners, and the private sector, including households. These are channelled to the sector through a variety of mechanisms summarised in Figure 3 below.

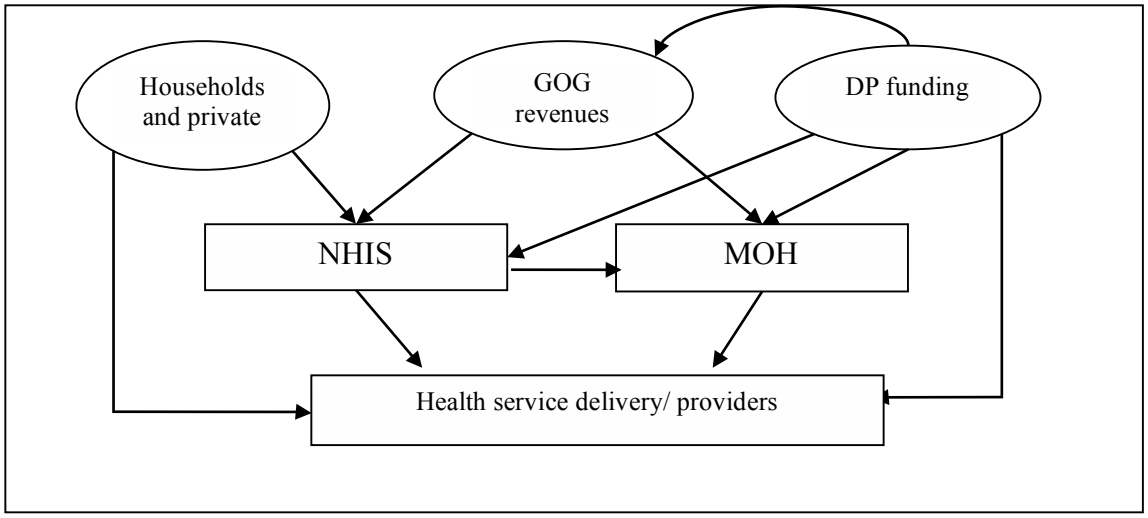


Figure 3: Flow of major funding sources within the Ghana Health Sector
(Source: Medium Term Health Sector Plan, MOH, 2010-2013)

GOG funding flows through two main routes. First, discretionary funds are allocated to the sector through the Ministry of Health as part of the routine budget. Secondly, statutory funding is allocated to the governing body of the National Health Insurance Scheme, the National Health Insurance Council (NHIC), in the form of the National Health Insurance Fund (NHIF). The NHIF is funded by a combination of sources. These include a 2.5% additional National Health Insurance Levy (NHIL) on domestic and imported goods and services, and a 2.5% contribution from the Social Security National Insurance Trust (SSNIT) of formal sector employees.

[5] TB Indicators Reported are: Number of Notified Cases, Treatment Success Rate, Case Fatality, Default Rate

Development partners provide funding through two main channels: Multi-Donor Budget Support (support through the GOG) or Sector Budget Support which is channelled to the MOH through the Ministry of Finance and Economic Planning. These funds are earmarked for specific activities and include both bilateral and multilateral partner support as well as funding from international health initiatives such as the Global Fund for AIDS, Tuberculosis and Malaria (GFATM) and the Global Alliance for Vaccines and Immunisations (GAVI). Development partners provide a combination of grants and loan funding. The range of partners is expanding to include bilateral arrangements with countries such as Kuwait and China and partnerships between governments and financing institutions, particularly for infrastructure projects.

The third source of funding to the health sector is from private sources. These private sources include households, corporate organisations, and individuals. Household sources are mainly through fees for services that they pay at the point of receiving care. Corporate organisations and individuals contribute in cash and in-kind to the health sector.

1.2.8. Accounting and Reporting

The Ministry of Health/Ghana Health Service currently serves as the principal recipient (PR) for Global Fund financing mechanism for tuberculosis. The principal recipient has a finance office that coordinates financial activities of the three Global Fund-supported programmes in the Ministry – HIV/AIDS, TB and Malaria. The PR finance office currently prepares payment vouchers and writes cheques to effect payment for the programmes. The cheques are sent to the programmes after they have been written and issued from there. The office also supervises the work of the three programmes, prepares the financial statements of the programmes for the Ministry, and coordinates financial monitoring and all audits of the Global Fund-supported programmes in the Ministry. Programme finance offices also exist to facilitate financial activities at the programme level.

All Ghana Health Service facilities are authorized to open and operate bank accounts in line with the Financial Administration Act. All funds received are lodged into the designated bank accounts and disbursed from these accounts. All disbursements are approved by the head of department and authorized by the head of finance. Authorisation involves checking to ensure there are funds available for the activity and whether the budget has been approved. Authorisation also involves checking to ensure that the activity has been performed according to specification and that all details on the payment documents are accurate. In most cases, payment vouchers are pre-audited by internal auditors before the cheques are written. Programme activity budget ledgers are maintained to track the movement of funds on key programmes and activities. In most cases, activities in the programme activity ledgers are pooled on the basis of broad disease burden, so it is cumbersome to decipher programme activity balances by a specific donor.

2. NATIONAL TUBERCULOSIS CONTROL PROGRAMME

Ghana Tuberculosis Service was formally established with the appointment of its first director in 1959. Earlier, from 1900 to 1953, TB experts in the then Gold Coast had the herculean task of convincing governors and ministers of parliament of the British colonial authorities that TB was a problem among the natives, until the epidemic took hold and cases were reported from almost all major mining towns in the country. The post-independence story (from 1957) continued with unpredictable funding efforts for tuberculosis control. It was not until 1994 that TB control was re-branded as the National TB Control Programme and received dedicated funding from DANIDA for its activities for the first time in decades. The funding was short lived, but during this period, the Programme was made visible within the MOH structures under the Disease Control and Prevention Department of the Public Health Directorate of Ghana Health Service.

The NTP was thus lifted from a state of neglect and many of its problems were addressed. This resulted in important achievements such as strengthening of the Central TB Unit; standardisation of diagnosis, case definitions, and treatment protocols; improved availability of drugs; and training for health staff. By the end of 1998, TB services had been integrated into primary health care, and Directly Observed Treatment, Short-course (DOTS) coverage at the district level was estimated at 98%. However, health sector reforms in 1998 ended the dedicated funding for TB control and subsequent financing of TB control activities came through the "common pot" or sector-wide approach. TB control suffered a temporary setback as TB was no longer prioritised at operational levels and no user fees were charged for providing services. In 2003, financing of TB control was improved through the Global Fund mechanism.

2.1. TB Control Plan Implementation 1994-2013

Three strategic plans have been successfully implemented within the period from 1994-2013. The implementation goals were to address the neglected TB problem, make it visible, and build the necessary infrastructure, with the ultimate goal of reducing the TB burden.

With the full-time appointment of a programme manager, the central level team was strengthened ensuring the establishment of the form and structure of the NTP as it is today. This set the stage for the development and implementation of strategic plans through resource mobilisation, capacity building, supervision, protocols and guideline development. The general approach of programme implementation was the systematic roll-out of interventions initially targeted at high-incident geographic populations and key affected populations.

The first plan addressed issues of quality TB diagnosis and treatment in the big cities of Accra and Kumasi from 2000-2004. The second plan focused on higher-incident geographic regions, addressed service quality in 60 districts and tackled key affected prisons populations (2005-2008). It was also expanded to address quality diagnosis and treatment issues in 6 cities (urban areas).

The third plan (2009-2013) expanded to cover 10 cities (regional capitals), and targeted the low-incident regions with quality diagnosis and treatment.

Through these strategic plan implementations, systems and infrastructure to improve quality access to at least 70% of the population is in place. This ensured the sustainability of TB control services which can be seen now.

The general collective efforts have been directed at:

- Correcting quality deficiencies of DOTS implementation and integrating DOTS into public sector facilities country-wide;
- Expanding private sector participation;
- Implementing community-based DOTS care.

The most recent strategic plan implementation from 2009-2013 focussed on putting in place infrastructure to address the problem of TB/HIV co-infection and multi-drug resistant TB.

In implementing all of these strategic plans, the National TB Control Programme has provided leadership to implementing partners to undertake multiple, comprehensive interventions in detail at the national, regional, district, sub-district and community levels through a coordinated approach. Key interventions are summarised below:

- Maintaining quality standards of DOTS in all public sector facilities;
- Engaging private sector providers in TB control;
- Developing the capacities of the laboratories and health staff to address multi drug-resistant TB;
- Streamlining drug procurement, distribution and logistics management;
- Implementing community-based TB care activities;
- Implementing TB/HIV collaborative activities;
- Implementing infection control interventions;
- Supporting control of bovine tuberculosis;
- Conducting relevant research for programme implementation;
- Supporting and strengthening programme management at all levels;
- Implementing advocacy, communication, and social mobilisation (ACSM) activities for stigma reduction and treatment adherence.

Presently, therefore, the way forward is to scale up and improve upon best practices while addressing bottlenecks along the way in a sustainable manner.

2.2. Financing

Funds for all of the plans have come from the Government of Ghana, DANIDA, and the Global Fund, Rounds 1, 5 and 10 grants. Technical assistance was provided by USAID's TB CAP and TB CARE I Projects and WHO. This is summarised in Table 2 below.

Table 2: Country Strategic Plan Funding Mechanisms

Strategic Plan Period	Funding Mechanism					Total
	GoG	Global Fund	USAID	WHO	Others	
1994 – 2000	Not Available	-	-	$2,400,000	DKK 11,000,000 ($ 1,870,748)	$ 4,270,748
1997 – 2002	Not Available	$ 5,687,055	-	$2,000,000	-	$ 7,687,055
2003 – 2008	$ 51,127,832	$ 31,471,684	-	$800,000	-	$ 83,399,516
2009 – 2013	$ 124,014,795	$ 31,779,698	$ 3,306,624	$ 1,060,000	-	$ 160,452,615

Funding from Global Fund grants has constituted between 15 to 60% of available funding for each year starting from 2003 to 2012 leaving each year with a further funding gap.

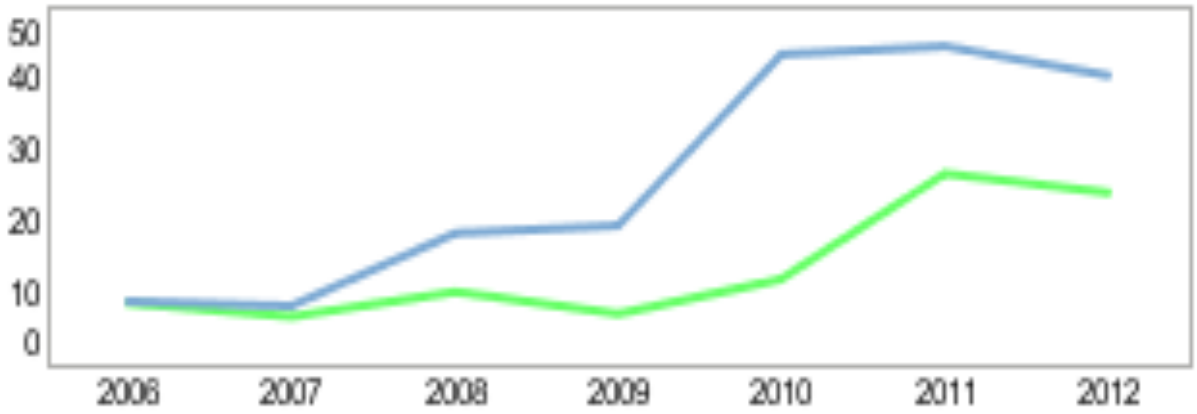


Figure 4: NTP Budget (Blue) and Available Funding (Green) (USD millions)

2.3. Best Practices: Improving Programme Quality and Accelerating TB Case Detection

Since the establishment of the National TB Control Programme, several best practices in providing quality TB diagnosis and treatment have come to light. The best practices described below highlight interventions that have proven successful and have been instrumental in the development of this plan.

2.3.1. Patient Support: The Enablers' Package

This is a pro-poor strategy that ensures that both provider and patient are supported to work together to achieve a cure. Application of the intervention immensely contributed to the overall quality in programme implementation resulting in almost 100% follow-up evaluation for all cases detected and treated, and a rapid decline in defaulting patients and other adverse treatment outcomes (Figure 5).

The Enablers' Package is a carefully formulated initiative designed to improve early case detection and adherence to treatment by providing financial or material incentives such as food, transport vouchers, money or material goods, which will reduce the cost of seeking TB

diagnosis and treatment. The current value of the Enablers' Package is 65 USD per patient for a 6-month period. In 2003, at the onset of implementation, the total value of the Enabler's Package was 100 USD per patient. The distribution is 50% for the patient, 30% for the health staff and 20% for the participating health facility. The package is an integral part of TB control in Ghana and appears to have led to a decrease in the defaulter rates since its inception.

An independent external review of the National TB Control Programme led by WHO and USAID in 2013 attributes the successes of the NTP to the Enablers' Package intervention[6] and the community-based TB care approach.

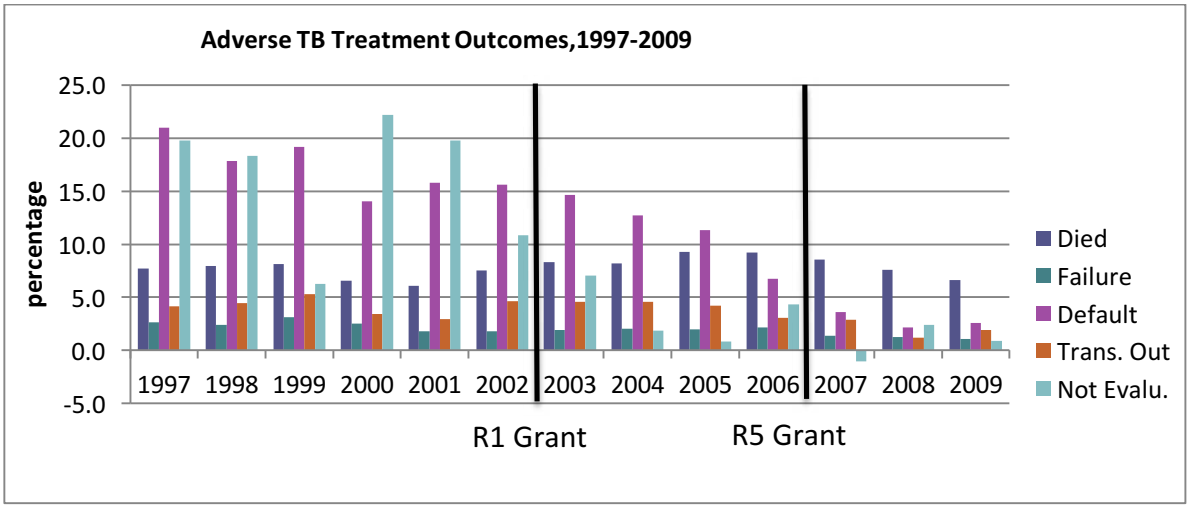


Figure 5: Trend of Adverse Treatment Outcomes, 1997-2009

In the early stages of implementing the national strategic plans, two major cities with large and busy health care facilities had the highest defaulter rates. Strategically, therefore, the programme piloted the Enablers' Package in these targeted facilities. This yielded effective results in improving the quality of treatment outcomes, remarkably reducing default rates in these cities from 19.7% to 0.8%. The default rate decline was much more rapid compared to the national default rate decline. The intervention positively impacted the overall national defaulter rate reducing it from 14.8% to 6.2% (See Figure 6 below).

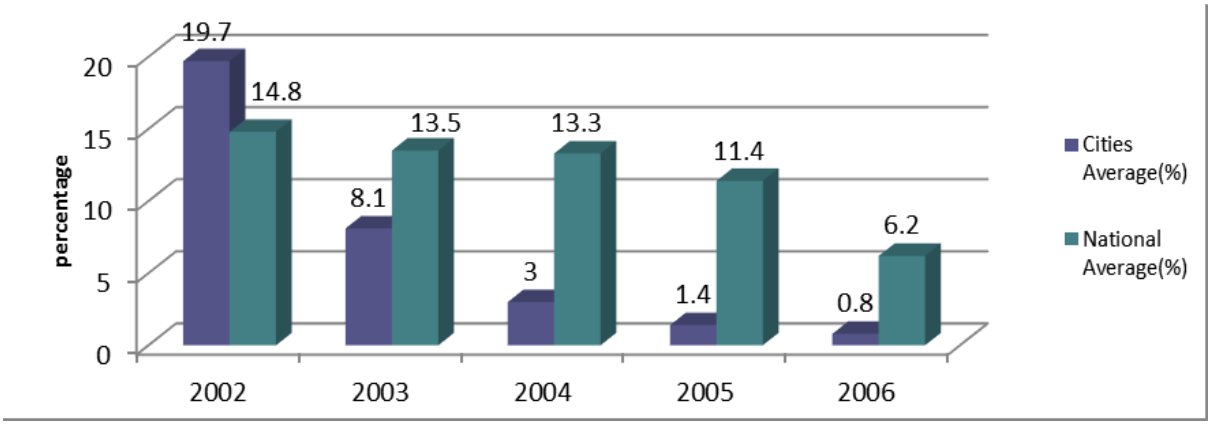


Figure 6: Comparative Trend of TB Defaulter Rates in Intervention Cities & National Average (2002-2006)

[6] Comprehensive Review Report 2013

Achievement/Lessons

Lessons learnt from correcting quality deficiencies in DOTS implementation, providing patient care and support through the Enablers' Package and engaging the private sector were systematically applied in health care facilities leading to remarkable better treatment outcomes with improvements in defaulter rates (<5%) and other adverse outcomes (Figure 7).

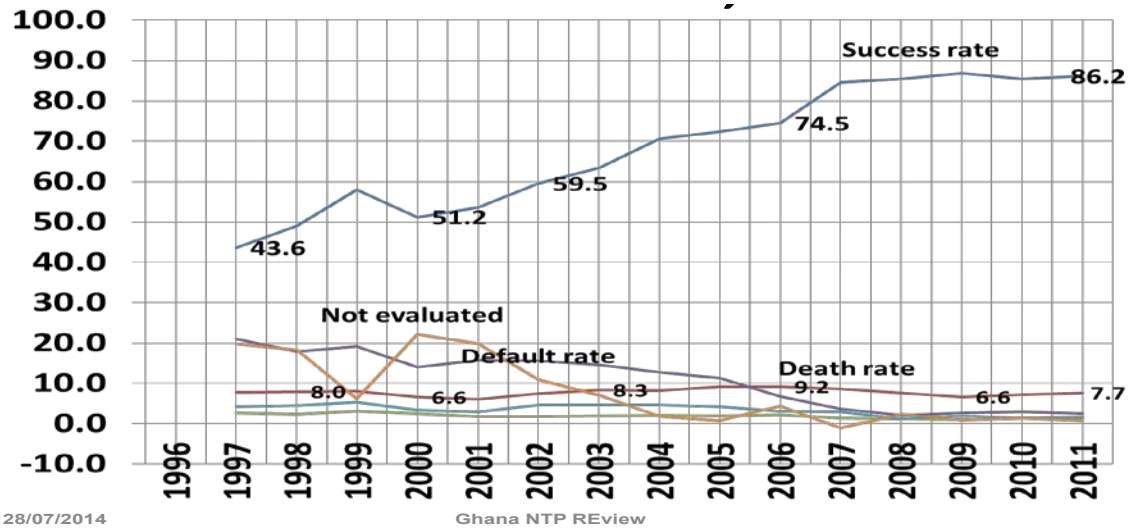


Figure 7: Trends of TB Treatment Outcomes 1996-2011

2.3.2. Implementing Innovative Case-Finding Activities in Accra

Logically, after successfully correcting deficiencies in the quality of TB treatment in health care settings, the next step was to look for sustainable ways of improving TB case detection. Generally, improvements in the programme quality and surveillance system also naturally led to increased numbers of notified TB cases during the application of Global Fund-assisted activities (Figure 8). Case notification rates, however, appear to have stagnated at around 60/100,000-person population in the last five years.

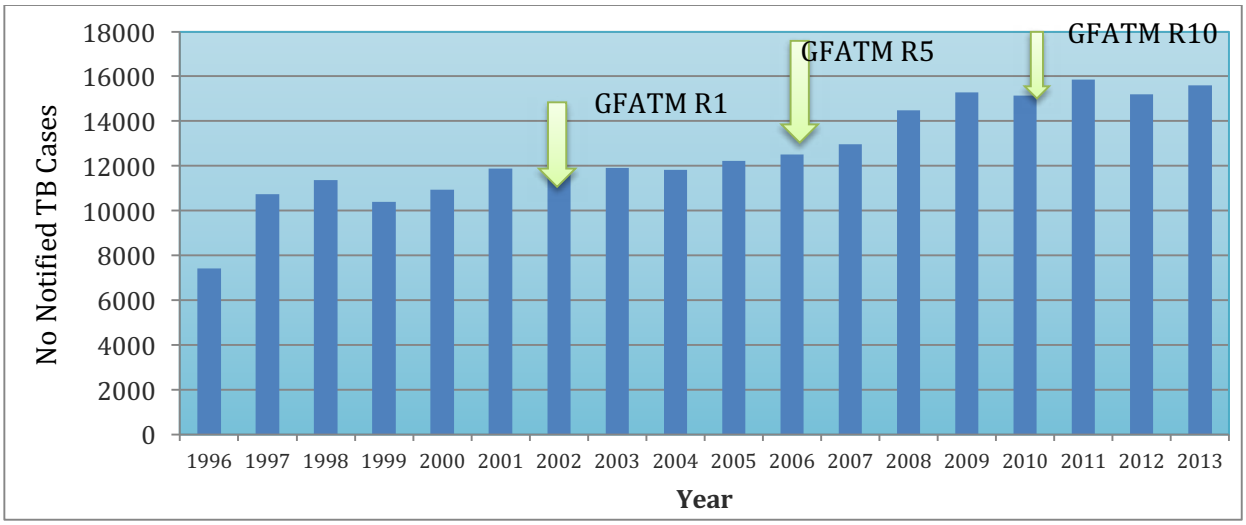


Figure 8: Trend of Reported TB Cases 1996-2013 Showing Global Fund Grant Start Years

To address this concern, a plan for accelerated progress towards TB case detection was designed informed by the following criteria: easy access to interventions, feasibility and programmatic experience and cost.

The NTP was not oblivious to the fact that communities with high TB prevalence would lead to a higher yield of cases and that more comprehensive screening would yield to more cases as well. An approach to TB screening was, therefore, designed based on the TB case-finding "Tree" as in Figure 9 below.

Figure 9: TB Case-Finding Tree

- High branches (low yield, difficult access):
  - Community wide (door-to-door, mobile units, prevalence surveys, enhanced case finding)
  - Door-to-door to find harder to reach patients
- Mid-range branches: (high yield, moderate access)
  - HIV-infected populations
- Low-hanging branches: (moderate/low yield; moderate access)
  - Diabetics, alcoholics, drug users, smokers
- Low-hanging fruit: (moderate/high yield, moderate access)
  - Contacts; HIV-infected populations (many smear negative cases needing culture and Gene Xpert)
- Fallen fruit: (moderate/high yield; easy access)
  - Prisons, prevention of mother-to-child transmission (PMTCT), voluntary counselling and testing (VCT), hospital-based case detection

The NTP implemented strategies to address the fallen fruit, low-hanging fruit, low-hanging branches and high branches of the TB case-finding "tree," drawing lessons to systematically expand and cover the network of health facilities that were already prepared to support any additional cases detected for better treatment outcomes.

The challenge for implementation was to address low TB case finding caused by health system and patient delays. (Estimated health system delay for TB diagnosis is 1.7 weeks and patient delay is 9 weeks). An intervention was designed and tested in the city of Accra using the city of Kumasi as a non-intervention control.

Intervention: Fallen/Low Hanging Fruit/Branches

Six relatively busy facilities with high outpatient attendance were selected for improvement in TB case detection in Accra. For the first time, a provider-initiated, enhanced TB screening strategy was introduced in these health care settings. First, a period of time was used to study

the health system through preparative activities aimed at getting the commitment of hospital leadership and clinical staff. This was followed by staff orientation and re-arrangement of the outpatient department and patient flow. A triage nurse systematically screened all patients presenting with respiratory symptoms for TB using a symptom-based questionnaire and those eligible were fast-tracked to the laboratory for examination. Frontloading of specimen was used and results were provided, as much as possible, within 24 hours, or at the latest, by morning of the following day. TB Care I developed standard operating procedures (SOPs) and diagnostic algorithms for TB case detection in hospitals, in contact tracing, for people living with HIV (PLHIV), for diabetic clinics and for community screening. These SOPs and algorithms were provided to institutions for use as reference materials after initial orientation. An institutional register was kept for each facility. As the intervention progressed, task shifting officers and laboratory technicians were recruited to support the increased workload in the busiest clinics.

A work plan was finally drawn up with the institutions, as shown below, to integrate TB activities as part of routine services and for implementation by designated institutional TB focal point persons. Larger hospitals were expected to implement minimum activities including:

- Outpatient department (OPD)-based case finding;
- Systematic screening for TB among PLHIV attending ART clinics and;
- Systematically screen for TB among vulnerable groups including diabetic clinics, children's clinics, admission wards and other patient waiting areas.

Table 3: Work Plan for Stepwise Introduction of Case Detection Strategies

Strategy	2009	2010				2011				2012			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Hospital-based case detection													
Contact investigation													
TB screening among Diabetics													
TB screening among PLHIV													
Involvement of pharmacies and chemical sellers in case finding													
Urban Slums													

Legend	
	Preparatory activities
	Initiative implemented
	Introduction of Task Shifting Officers

Linkages between facilities with TB control services and Public Health Teams (and the District TB Coordinator) were formally established. Facilities therefore received all "enablers"--surveillance tools, TB commodities and budget--to support patient care. The scope of work for institutions includes contact investigation and systematic screening for TB in PLHIV and diabetics (if the hospital runs a diabetic clinic). The work of the facilities was then linked with a network of supported health centres to ensure a good referral system.

In 2010, with close monitoring and assistance from, and in partnerships with WHO and the Canadian International Development Agency (CIDA), the measures presented in the Table 3 above were systematically introduced within the programme context.

Limitation/Barriers to Implementation and Proposed Solutions

The main barriers were:

- High laboratory work load;
- Inadequate personnel/ high staff turnover;
- Insufficient supervision from line managers;
- Slow response from health facility managers.

The graph below (Figure 10) shows the additional laboratory workload as a result of the implementation, and how it was resolved with mutual benefit to the health system. The number of TB suspects sent to the laboratory increased which led to complaints from laboratory technicians which threatened the implementation. The human resource aspects were addressed by using task-shifting officers and laboratory technicians in the very busy clinics.

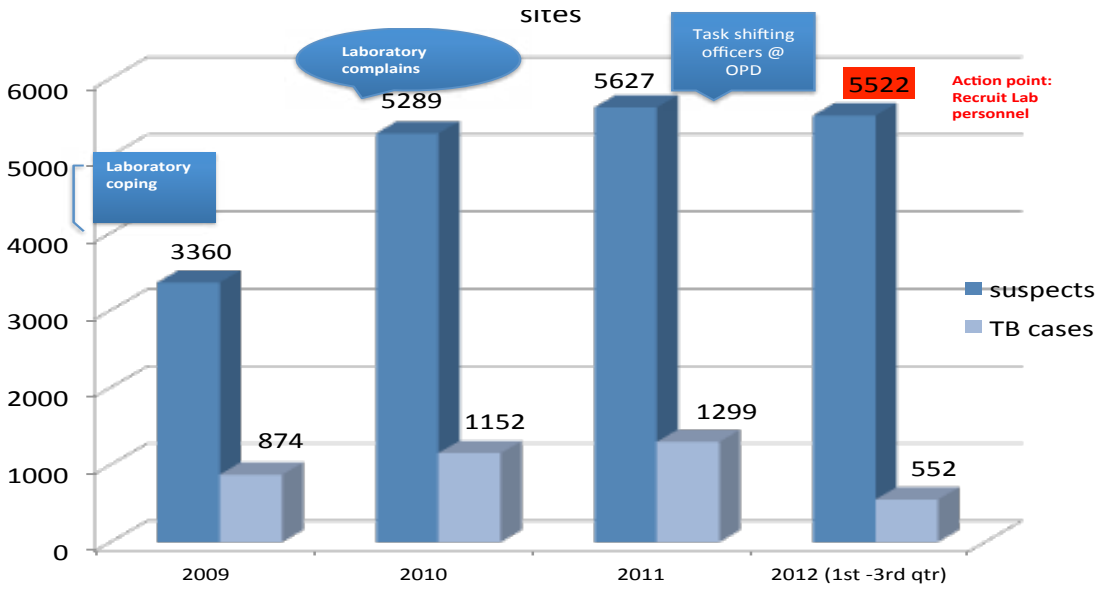


Figure 10: Trend of Suspects Screened With Smear Microscopy & Confirmed TB Cases at Intervention Sites Showing Health System Coping Mechanisms

Results

The interventions detected cases that previously may have been missed. Of all the interventions implemented, the hospital-based improvements exceeded targets (Figure 11). The second best yield for TB was from screening PLHIV, followed by contact tracing, diabetic screening and community screening in pharmacies in that order. Potentially, all the cases detected from the interventions would have been missed if the interventions had not been systematically introduced.

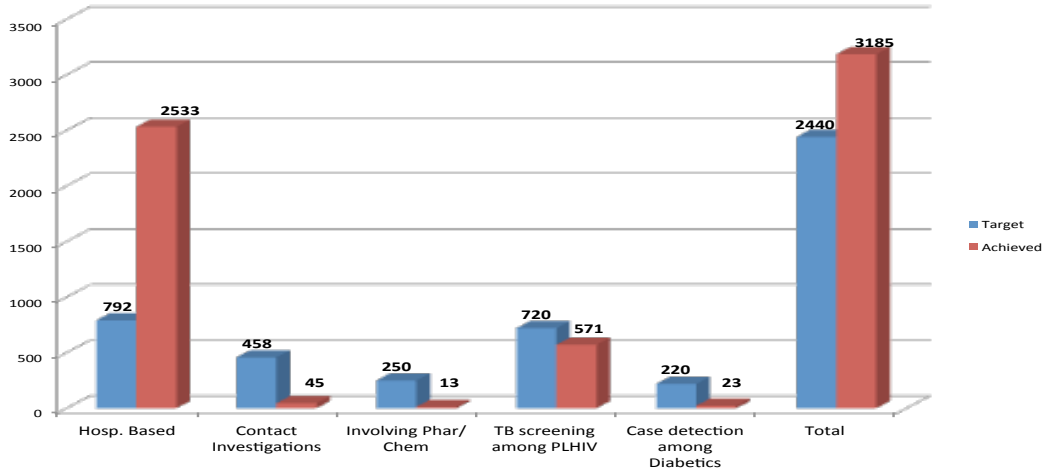


Figure 11: TB Case Finding Through Innovative Active Case Finding Interventions in Accra

Comparing trend analysis of TB case notification data with similar facilities in non-intervention city in Kumasi, an obvious increase in TB cases reported in the intervention city of Accra is observed (See Figure 12 below).

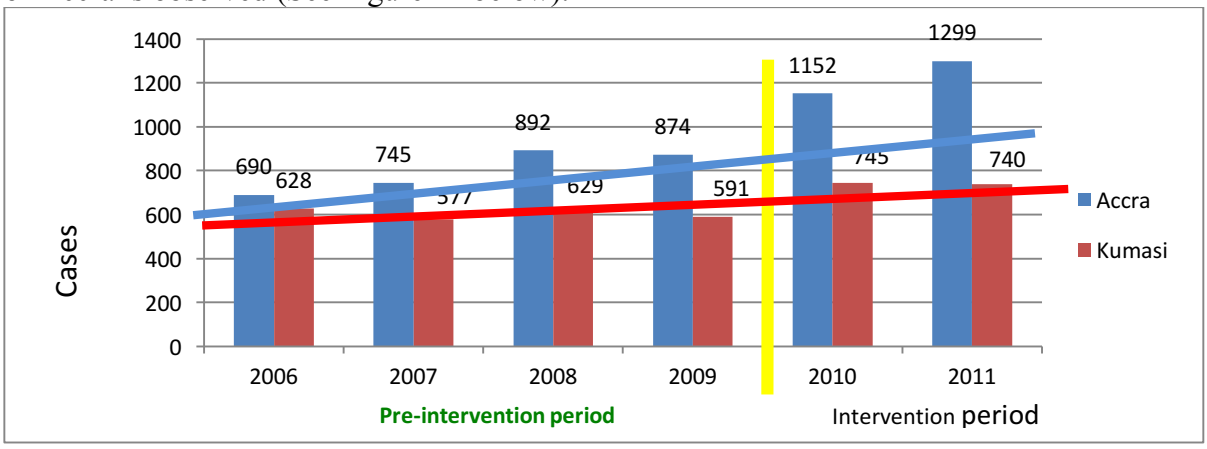


Figure 12: Comparative Trend of TB Cases Reported in Intervention and Non-Intervention Cities

Lessons

Important lessons are listed below:

- Health personnel are willing to rearrange outpatient department (OPD) systems to include routine TB screening for respiratory-symptomatic and other patients;
- Health laboratories accept sputum specimens from other health facilities without TB diagnostic capacity and referrals from civil society organisations (CSOs) working in the communities though this invariably increases the volume of work;
- Owing to the health system's unique challenge of high staff turnover at OPDs, hospitals with high throughput OPDs required task-shifting officers to support TB screening;

- Case yield among persons with non-specific TB symptoms was the same as that in persons with standard TB symptoms presuming a delay in TB diagnosis and supporting active case finding interventions;
- Pharmacies and chemical shops are effective referral points for TB case finding;
- TB services can be fully mainstreamed into the general health services at all levels of service delivery.

Additional Health System Strengthening Effects

Infection control: The changes made to the hospital systems were used to strengthen the health system by contributing to improving infection control at overcrowded OPDs. Potentially infectious, presumed TB cases were promptly removed thereby reducing duration of exposure to other patients.

Human resource: Task shifting officers introduced to support the increased workload at the OPDs as a result of the systematic screening were also utilized by the hospitals for other tasks that were neglected owing to the peculiar health system problem of rotational staff (staff turnover).

Additional laboratory personnel recruited to support the increased workload of sputum examination were also available to the hospital for other laboratory duties.

Way Forward

Further improvement and expansion to include the whole network of facilities should include:

- Intensified supervision and on-site coaching of case finding;
- Use of x-rays to compliment diagnosis as part of initial screening tool for suspects in selected implementing sites;
- Exploration of the use of newer diagnostics (e.g. Gene Xpert) to reduce turnaround time for diagnosis in PLHIV and at selected clinics.

2.3.3. Case Detection among Key Affected Populations

While the general population is at risk of TB infection owing to the nature of the epidemic in Ghana, the most vulnerable populations are PLHIV, prisoners, diabetics, and miners. These populations are scattered throughout the geographical spread in both high- and low-incident districts. The strategic approach to controlling TB in these vulnerable populations, therefore, is to identify and screen them in 4 key settings:

- Hospital care setting (PLHIV, diabetics, the elderly, pregnant women)
- Community (household contacts, community contacts)
- Residential institutions (prisons)
- Work places (miners and those exposed to silica)

This approach has been tested in Ghana among PLHIV, diabetics and household contacts in the hospital setting with positive results. Therefore, it will be systematically expanded to cover the entire network of health care facilities.

Prisons

Prisoners have been systematically reached and integrated into routine TB programme activities in a sustainable manner. This approach has been passive. The TB case notification rate among prisoners is higher than the case notification rate of 62 per 100,000 in the general population. (Table 4). In addition, HIV prevalence among the prison population is 2.3% (males 1.5%; females 11.8%) as compared to the general population of 1.3%[7].

Table 4: Trend of TB Cases Diagnosed among Prisoners in Ghana, 2007-2012

Year	Prison Population	TB Cases	TB Deaths	CNR/100,000 pop	Fatality	% TB among Inmates
2007	13,335	94	12	705	12.8%	0.7%
2008	14,128	127	23	899	18.1%	0.9%
2009	14,171	182	19	1284	10.4%	1.3%
2010	13,500	68	17	504	25.0%	0.5%
2011	14,671	35	11	239	31.4%	0.2%
2012	15,171	43	14	283	32.6%	0.3%
2013	14,000	24	10	171	41.7%	0.2%

Through an expanded collaboration with the AIDS Control Programme, different approaches will be employed in the current plan. Mobile digital X-ray equipment acquired in 2013 will be used to routinely screen all prisoners once a year to complement other interventions.

Mining Populations

Mining takes place in all regions of Ghana. The population affected by all mining in Ghana is not exactly known, but the population affected by precious mineral mining is estimated to be about one million including illegal miners scattered over 21 districts covering 6 geographic regions.[8]

There are well known precious mineral mining districts where the NTP has undertaken activities. These mining communities were systematically reached and the services integrated into the Programme. The approach has been passive. Results from these mining districts are presented in Table 5 below.

[7] IBBS Among Prisoners 2014
[8] Mining in Ghana 2013. Minerals Commission of Ghana

Table 5: Routine TB Case Notification and Treatment Success Rates in Select Mining Districts, 2010-2012

Region	District	Total Pop	Reported TB Cases			CNR/100,000 pop	Treatment Success		
		2013	2010	2011	2012	2012	2010	2011	2012
Upper East	Bolgatanga	134,726	248	261	212	171	92.37%	92.22%	89.83%
Brong-Ahafo	Asutifi North	110,768	42	58	48	47.1	90.50%	33.7	93.75%
	Tano North	83,694	54	59	41	53.2	78%	25%	90.24%
	Wenchi Municipal	93,914	26	27	32	37	53.80%	86.36%	84.32%
Ashanti	Obuasi Municipal	177,871	27	31	17	154.6	74%	83.90%	84.58%
	Asante Akim North	148,394	186	203	206	150.9	83.30%	69%	68.93%
	Amansie West	141,683	61	70	61	46.8	90.20%	98.60%	93.44%
Eastern	Kwaebibirem	200,735	362	208	129	69.9	66.60%	78.40%	77.36%
	Birim North	82,256	42	62	56	74	90.50%	91.90%	76.79%
	Denkyembuor	83,845			113	134.8			
	Atiwa	115,317	56	42	30	28.3	80.40%	95.20%	86.67%
	East Akim	77,394	70	84	78	109.5	94.29%	95.24%	98.72%
Central	Upper Denkyira East	77,394	70	84	78	109.5	94.29%	95.24%	98.72%
Western	Sefwi Wiawso	144,824	84	74	64	48	80.60%	82.43%	82.81%
	Bibiani-Bekwai	128,252	111	109	118	100	96.40%	88.07%	91.53%
	Prestea Huni Valley	165,740	160	134	159	104.3	86.90%	97.80%	99.43%
	Wassa Amenfi West	167,677	84	98	119	77.1	92.90%	94.90%	97.85%
	Aowin-Suaman	144,007	67	94	95	71.7	67.16%	97.87%	84.21%
	Tarkwa-Nsuaem	94,132	182	185	171	197.5	82.40%	93%	84.86%
	Mpohor Wassa East	129,005	38	41	41	34.5	81.58%	80.49%	78.57%
	Axim Municipal	63,285	85	78	59	101.3	98.82%	89.74%	96.77%
Total		**2,564,913**	**2,055**	**2,002**	**1,927**				

The varying responses from implementing districts are dependent on the availability of infrastructure and health personnel. Therefore, the pattern of case notification in mining districts does not appear to be different from other districts. This inconsistent performance indicates that the mining districts are at various stages of correcting underlying programme quality issues.

Active TB Screening (High Branch Interventions)

To address TB control in mining and other vulnerable urban communities, such as refugees and their host communities, in a higher incident region (Western Region), the Programme implemented a stepwise geographical community target approach using a mobile diagnostic van with an active case-finding team.

Some segments of the population in mining districts, urban slums and refugee populations do not use TB services or health care in general. These vulnerable populations are difficult to

reach. Often they do not use health services and are relatively poor as compared to the general population. The NTP, therefore, collaborated with TB REACH and the International Organization for Migration (IOM) to intensify case detection efforts through a community screening approach in Sekondi-Takoradi Metropolitan, Tarkwa-Nsuaem Municipal, Prestea-Huni Valley Municipal, Ellembelle District and Jomoro District, all in the Western Region of Ghana. We compared case detection efforts with a control population.

The target population for this project is estimated at 317,495 (30.3% of the total regional population) and is broken down as follows:

- Refugees, their host communities and the cross-border population in Jomoro District–39,695 (1,000 refugees, 20,716 host population, 17,979 cross-border population);
- Refugees and their host communities in Ellembelle District–29,932 (4,733 refugees, 25,199 host population);
- Miners and communities around mine fields in Tarkwa District–63,770 (10,594 miners, 53,176 population around mine fields);
- Miners and communities around mine fields in Prestea/Huni Valley District–46,542 (3,333 miners, 43,209 population around mine fields);
- Vulnerable urban population living in slum-like settlements in and round Secondi-Takoradi Municipality–137,556.

Control population: Five districts that do not share or minimally share borders with the intervention districts formed the control population. Names of the control districts and TB treatment centres are listed in Table 6 below.

Table 6: List of Facilities in Select Districts in Western Region Implementing Active Case Finding

District	Facilities
Aowin Suaman District	Enchi Hospital, Presby Hospital and Dadieso Health Centre
Juabeso District	Juabeso DHA Hospital; Mamudu Private Clinic; Bonso NKT Health Centre; Asempeneye CHPS and Bodi Health Centre
Sefwi Wiawso District	Sefwi Wiawso Hospital and Asafo Hospital
Sefwi Bibiani-Ahwiaso Bekwai District	Bibiani Hospital; Ahwiaso Health Centre; Bekwai Health Centre; Awaso Hospital and Asawinso Health Centre
Bia District	Essam Health Centre; Essam Hospital; Kwamebikrom Presby Health Centre; Kaase Health Centre; Adabokrom Peace Maternity; Adbokrom CHPS; Manfoase Saviour Clinic; Amoashed CHPS; Adjoafua St. Luke Clinic; Mempeasem Health Centre and Asamenynokrom Health Centre

The intervention period was over one year, and was implemented as follows:

- Community mobilisation and screening for chronic cough through door-to-door visits of targeted communities;
- TB testing of all presumed TB cases according to NTP guidelines using Gene Xpert MTB/RIF test, a more sensitive diagnostic tool.

Results

Initial results show that, for the period of Q2 to Q4 2013, the project achieved a 23% increase in new sputum smear/bacteriological TB case notifications and a 30% increase in all forms of TB (Table 7).

Table 7: Additional TB Case Finding through Active Case Finding Intervention in Western Region

	Population	Historical Baseline Notifications			Implementation Period Notifications			Unadjusted additional cases	% change from baseline
		Q2/12	Q3/12	Q4/12	Q2/13	Q3/13	Q4/13		
SS+/B+	Evaluation	139	113	142	145	170	149	70	18%
	Control	51	66	62	65	58	47	-9	-5%
	Difference (% Evaluation minus %Control)								23%
All forms	Evaluation	207	196	212	223	251	289	148	24%
	Control	65	92	95	85	75	77	-15	-6%
	Difference (% Evaluation minus %Control)								30%

Lessons:

Community active screening of key affected populations is much more expensive compared to other interventions and should be complimentary rather than used as a routine activity. The per capita cost to detect and successfully treat a TB case using a passive approach in the intervention region was USD 127. This compares to a per capita cost of USD 1,667 to only detect without treatment using active community TB screening.[9] It would be difficult to implement this "project-like" approach as an integral component of TB control services in higher incident regions and is unlikely to be sustained.
The effective social mobilisation lessons from this targeted approach are to complement provider-initiated hospital or facility-based TB screening (fallen/low fruits/branches interventions) with active case finding for maximum effect.

In the light of the above lessons, application of targeted screening among adults in general and males older than 65 years is likely to yield high numbers of TB cases. This comes against the backdrop of the results of the recent national prevalence survey which shows that TB prevalence increases with age. (See Table 8)

[9] Grantee Annual Narrative Report, TB REACH Project Western Region, Ghana. March 2013-July 2014. International Organization for Migration. Accra. October 2014.

3. STRATEGIC ANALYSIS

The NTP's major strength is in its successful track record and its capacity to implement multiple interventions in the primary health care setting of an integrated health system.

Other beneficial strengths are:

- The programme is integrated into the general health system and that makes deployment of new tools and technology much easier;
- TB services are delivered and built into existing structures to ensure sustainability;
- A dedicated and experienced Central TB Unit exists to ensure standards of TB care are maintained at all levels by the multipurpose health worker at operational levels;
- Ability to translate research and scientific findings into programme implementation;
- Progressive scale up of interventions based on programme results

However, there are inherent weaknesses that ought to be addressed and these include:

- Human resource constraints and the health system's inability to recruit adequate staff to deliver optimum care owing to a temporary governmental directive;
- High staff turnover owing to internal re-posting of staff to meet general demand for services;
- High competing demands on staff and high workload that leads to lower motivation particularly for staff working directly on potentially infectious diseases such as TB;
- Slow uptake of newer interventions due to competing health system demands

Notwithstanding the observed weaknesses, there are opportunities to mitigate some of the implementation challenges such as:

- Use of technical assistance missions that can address human resource issues and build local capacity
- Use of external resources to temporarily recruit staff to fill critical human resource gaps

The new observed programme challenge arises from the findings of the national prevalence survey which are:

- The wide gap between disease notification rate and estimated disease burden
- The lack of newer and more sensitive diagnostic tools to diagnose TB cases

Obvious threats that the NTP faces include emerging new infectious diseases with pandemic potential such as Influenza Virus Diseases, Ebola Haemorrhagic Disease. The high rate of transmission and rapid global spread would affect resources earmarked for old diseases.

Unstable domestic and global economic conditions, especially affecting the prices of commodities like cocoa and oil, also undermine the progress made by the NTP and pose a major threat to disease control interventions. Though Ghana has benefited immensely from global health initiatives like the Global Fund to Fight AIDS, Tuberculosis and Malaria, it is still faced with competing economies in accessing development funds.

3.1. Structure of the National TB Control Programme

TB control is seamlessly integrated into the GHS structure at the primary, secondary, and tertiary levels of care. Each region, district, and health facility has a TB team of health workers to implement TB control activities at that level headed by the Technical Head (Deputy Director Public Health, District Director of Health Services or Medical Superintendent). The TB Focal Person (Regional, District or Institutional TB Coordinator) supervises the daily implementation of TB programme activities. This team is also responsible for ensuring the success of the public-private partnership (PPP) DOTS programme, which is part of the integrated essential health package in all public health institutions and faith-based health facilities.

3.1.1. Central Level

The responsibilities of the NTP's Central Unit include ensuring political commitment to the programme as well as resource mobilisation. This entails liaising with various departments in the MOH and GHS and with numerous implementing partners to advocate that TB remains a national priority. The Central Unit also provides overall technical leadership through the development and publication of programme policies and guidelines. The NTP works closely with the Chief Pharmacist in the MOH to ensure a regular supply of quality-assured drugs. It also supervises the regional levels and participates in training at various levels. The NTP is the technical arm for the implementation of TB-specific grants and is responsible for the planning, budgeting and technical oversight of these activities.

One national-level meeting is held annually to present programme information covering the preceding year, to plan for the ensuing year, and to evaluate the implementation of programme activities. Information about upcoming initiatives is also disseminated at this meeting.

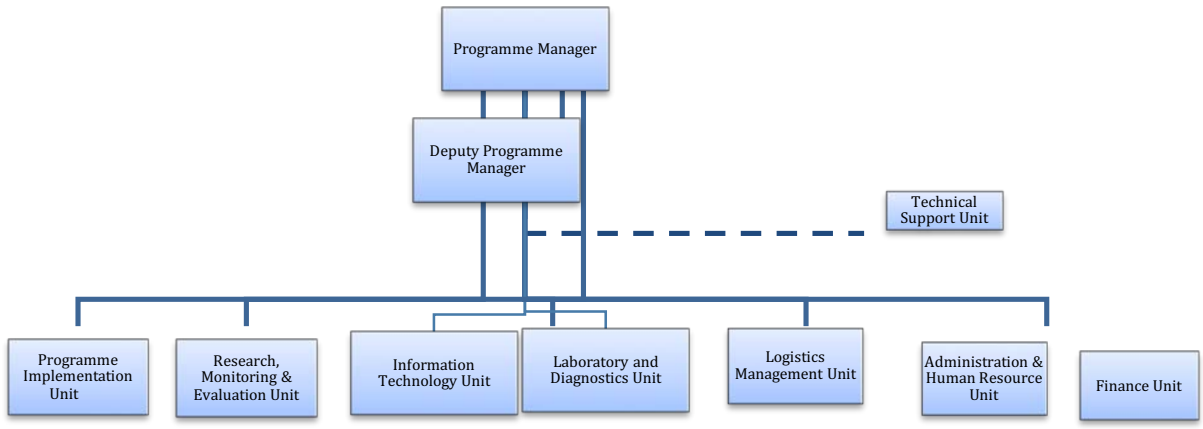


Figure 13: Organogram of the NTP

The **Programme Manager** is the overall manager of both technical and support functions of the NTP. He is an experienced senior public health specialist responsible for developing capacities and providing strategic direction for programme implementation.

The **Deputy Programme Manager** is also a public health specialist who supports the Programme Manager in day-to-day programme management but directly supervises programme implementation. The **Technical Support Unit** is made of international partner agencies that provide technical support to the NTP. These include WHO and other partners.

The Central TB Unit has seven units implementing programme activities. These units do not operate independently but are coordinated and supported by the larger health system structures such as the Public Health Division and the Policy Planning Monitoring and Evaluation Division. They are:

- **Programme Implementation Unit:** Directly supervises and oversees the implementation of programme interventions across the country. This unit is headed by the Deputy Programme Manager and links with the national health system through the Deputy Directors of Public Health.
- **Research, Monitoring & Evaluation Unit:** Monitors and evaluates the implementation of programme interventions. An experienced M & E Specialist heads the unit which consists of programme officers and regional M & E officers.
- **Information Technology Unit:** This Unit manages information technology systems in support of TB programme implementation at sub national levels for communication and reporting. An experienced Systems Administrator heads this Unit.
- **Laboratory and Diagnostics Unit:** This unit ensures delivery of quality laboratory services to meet international standards. The Unit is headed by a senior biomedical laboratory scientist.
- **Logistics Management Unit:** A senior pharmacist heads this unit which is responsible for programme medicines and other logistics.
- **Administrative Unit:** This unit manages the administrative business of the programme and human resources. An administrator manages daily activities and is supported by a focal person who coordinates human resource-related issues.
- **Finance Unit:** This unit manages the finance of the programme. A senior accountant with health systems management experience heads the unit. The unit ensures prudent financial management of programme finances and reports to relevant authorities.

Staff at the Central Unit are made up of permanent employees of the Ghana Health Service and contract staff to support the expanded scope of programme implementation. There are no dedicated staff for the NTP at lower levels of implementation. Beyond the national level, focal persons are appointed to exercise an oversight responsibility for tuberculosis-related activities. The focal persons are health workers with varying backgrounds who have additional TB control responsibilities at their level. They may not have had specific training in TB control prior to engagement but are trained on the job to build their capacity to support programme implementation. The organisational structure of the health service does not place these focal persons directly under NTP and they do not receive additional remuneration for the activities they perform. It is, however, the responsibility of Central Unit to ensure that TB services provided in this integrated arrangement is of optimum standard.

TB patients are diagnosed through the general outpatient clinics or on wards depending on how their care is managed from the DOTS Corners in these facilities. TB care is largely ambulatory with a few facilities occasionally admitting patients during the intensive phase of treatment. At the community level, there are community-based agents or volunteers who

perform the functions of treatment support[10]. TB control activities from CHPS compounds have not been optimized as part of community-based TB care in spite of the overwhelming body of evidence supporting the benefits of the CHPS concept for scaling up community-based TB control (CBTC).

Central Level Activities

- Organize and/or support training for:
  - Regional TB coordinators
  - Regional biomedical scientists and technicians
  - Teaching hospitals
  - Prisons, military, and police institutions
  - Civil society organisations
- Procure anti-TB medicines, commodities, equipment and supplies
- Organize and coordinate:
  - National TB review meetings
  - National TB advisory board meetings
  - Technical working group meetings
- Promote TB care among health staff and communities
- Conduct research including operational research:
  - Surveys
  - Special studies among TB patients
  - Internal review of programme interventions
- Develop operational guidelines and SOPs for TB control:
  - TB Control Manual
  - TB Training Manual
  - TB surveillance forms
- Undertake technical support visits to the regions
- Commission technical assistance in support of programme interventions
- Undertake resource mobilization

3.1.2. Regional Level

At the sub-national level, there are ten administrative regions and four teaching hospitals that report TB surveillance activities and manage programme resources. The Komfo Anokye, Korle Bu, Cape Coast and Tamale Teaching Hospitals–are major referral hospitals that provide inpatient and outpatient specialized services. They also support clinical supervision for TB care in collaboration with national and regional health services.

NTP management differs among regions. The Regional TB team is made up of various professionals: regional biomedical laboratory scientist, pharmacist, doctor in charge of TB clinic, deputy director of nursing services, regional disease control/surveillance officer, regional TB coordinator and Deputy Director of Public Health. In some regions, the full complement of the team may not be available.

[10] TB Training Manual. Introduction to WHO Stop TB Strategy and TB Control Programme. Pg 19-20

The functions of the regional team include data management and report writing, planning and budgeting, commodity distribution (anti-TB medicines, laboratory supplies, and materials), training of district managers, monitoring and supervision at the district level, and organizing regular quality assurance visits for sputum-smear microscopy. Each region has one trained doctor (the referral clinician) to provide support in the management of difficult cases (treatment failures, chronic cases) and other clinical problems that require assistance.

Regional Level Activities

Regional Coordinators will coordinate tuberculosis control activities in the region. The Regional Coordinator works closely with the Deputy Director for Public Health and is directly responsible to the Regional Director of Health Services. Responsibilities of the Regional Coordinator include the following:

- Train:
    - District TB Coordinators in cohort analysis and M&E
    - Hospital staff (regional and district) in TB management and control
    - TB laboratory focal persons in each district to implement the TB microscopy quality assurance programme
- Organize quarterly district and institutional TB coordinators review/update meetings
- Intensify technical support and monitoring visits to the district TB coordinators
- Promote ACSM activities, including World TB Day activities on 24th March
- Obtain TB drugs and other logistics regularly
- Develop region-specific plans to improve case detection and treatment outcomes
- Initiate innovations that will support TB control

3.1.3. District Level

In each district, the district director of health services has primary responsibility for TB control, with one technical person who is appointed as the district TB coordinator to assist in coordinating TB control activities. These activities include planning and budgeting, training and supervision of health staff, and programme monitoring through supportive supervision. As health services are integrated, all district TB coordinators assume various other responsibilities outside of TB control. Those districts that have public-private mix (PPM) activities are also responsible for monitoring, supervising, and reporting on such activities undertaken in their jurisdiction.

District Level Activities

District Directors of Health, whose duties include TB control, will support and supervise District TB Coordinators to:

- Set up DOTS centres in health facilities (at least two functional microscopy centres per 100,000 population)
- Train health personnel to support TB control in each sub-district
- Establish a system of transporting sputum specimens to diagnostic centres

- Link hospital-level TB activities with District Health Management Team (DHMT) activities
- Establish a mechanism to prevent, detect, and to trace defaulters
- Undertake ACSM, including World TB Day activities
- Involve community-based NGOs and others in TB treatment supervision, at least in the continuation phase
- Link TB and HIV activities where appropriate, especially in the field of counselling and patient care
- Develop district-specific plans for improving case detection and treatment outcomes
- Initiate innovations that will support TB control

3.1.4. Facility and Community Level

TB treatment can be accessed at both public (including mission health facilities) and private accredited facilities. More than 1,600 facilities provide TB DOTS, of which more than 75 are private facilities. As health services are integrated, a designated public health nurse (or any other health worker) will be responsible for TB control activities such as TB registration, follow-up of TB patients and compiling quarterly reports through cohort analysis.

Community health workers and community volunteers are involved in TB control through their participation as treatment supporters within the Enablers' Package programme, as well as assisting in defaulter prevention and tracing. The NTP collaborates with NGOs in various ways to enhance public awareness about TB with the goal of increasing TB case detection.

Facility/Community Level Activities

NGOs are expected to contribute to national goals and objectives. They are essential partners in case finding, treatment and control. Their responsibilities include the following:

- Collaborate to support district TB control activities
- Undertake community-based TB control activities, namely patient and community education, advocacy, social mobilisation, and defaulter prevention
- Provide support to home-based supervised treatment, including contact tracing
- Refer suspected cases of TB from the community to diagnostic centres
- Take part in district TB review meetings
- Participate in World TB Day celebrations
- Initiate innovations that will support TB control

3.2. Local Partners of the National TB Control Programme

The NTP has worked and continues to work closely with various stakeholders in planning and implementing TB control activities. Key stakeholders include Country Coordinating Mechanism of the Global Fund (CCM), STOP TB Partnership of Ghana, other Ghana Health Service Programmes, research institutions (Noguchi Memorial Institute for Medical Research), academia (University of Ghana School of Public Health), faith-based organisations, private practitioners, community-based organisations and civil society

organisations. Presently, the Stop TB Partnership, an umbrella body of civil society organisations, is housed within the NTP to enhance and facilitate collaboration towards TB elimination efforts to achieve a common goal.

3.3. International Partners of the National TB Control Programme

Since the re-structuring of the NTP in 1994, a number of international partners have provided and continue to provide financial and technical support to the Ghana NTP. These international partners include USAID, MSH (through the TB CAP and TB CARE I), DANIDA, KNCV Tuberculosis Foundation, WHO, International Union Against Tuberculosis and Lung Disease (IUATLD), the Department for International Development (DFID), and the Global Fund.

4. EPIDEMIOLOGICAL ANALYSIS OF THE TB BURDEN

4.1. Understanding and Knowing the TB Epidemic

Ghana conducted the second national TB prevalence survey in 2013, fifty-seven (57) years after the first survey. Results of the survey are presented in Table 8 below. The estimated national TB prevalence, 290 per 100,000 population, shows that the disease burden is four times higher than WHO estimates for the same year (71 per 100,000 population).
The TB prevalence among adults (15 years and above) estimated by sputum smear microscopy is 111 (76-145) and the bacteriologically-confirmed prevalence is 356 (288-425) per 100,000 population.
The national TB case detection rate, calculated using these new figures, is 20.7% (2013).

Table 8: Results of National TB Prevalence Survey per 100,000 Adult Population (95% CI)

		S+	B+ (All Study Cases)*	National (All Forms TB)
Prevalence Among Adult Population	Total	111 (76-145)	356 (288-425)	
	Male	198 (133-264)	431 (327-536)	
	Female	49 (21-76)	303 (223–382)	
	Age Group (Years)			
	15-24	49 (14-84)	185 (104-265)	
	25-34	35 (1-69)	228 (130-326)	
	35-44	101 (38-164)	295 (174-416)	
	45-54	223 (129-317)	470 (294-645)	
	55-64	245 (63-426)	607 (362-854)	
	65-74	262 (75-448)	894 (502-1286)	
	75+	136 (0-297)	927 (490-1364)	
Extrapolated Prevalence Among General Population	All Ages	77 (52-101)	247 (167-326)	290 (196-384)

** B+ is bacteriologically confirmed cases (microscopy and/or culture/Xpert MTB Rif test)*

Survey results further show that the TB burden is higher in males than in females. This is against a background in which HIV sero-prevalence among females is higher, and by trend analysis, consistently higher among females who are registered TB patients. (Figure 36) This may suggest that besides HIV, there are other drivers of the TB epidemic. Further analysis shows the nature of the epidemic is generalised, occurring in all age groups, but that older males (above 45 years) bear the biggest brunt of the TB burden (Figure 14) indicating perhaps that decades of interventions are having the greatest impact on the 15-34 age groups. These observations offer an opportunity to further explore the underlying reasons for the gender difference in TB burden through programme-based operations research.

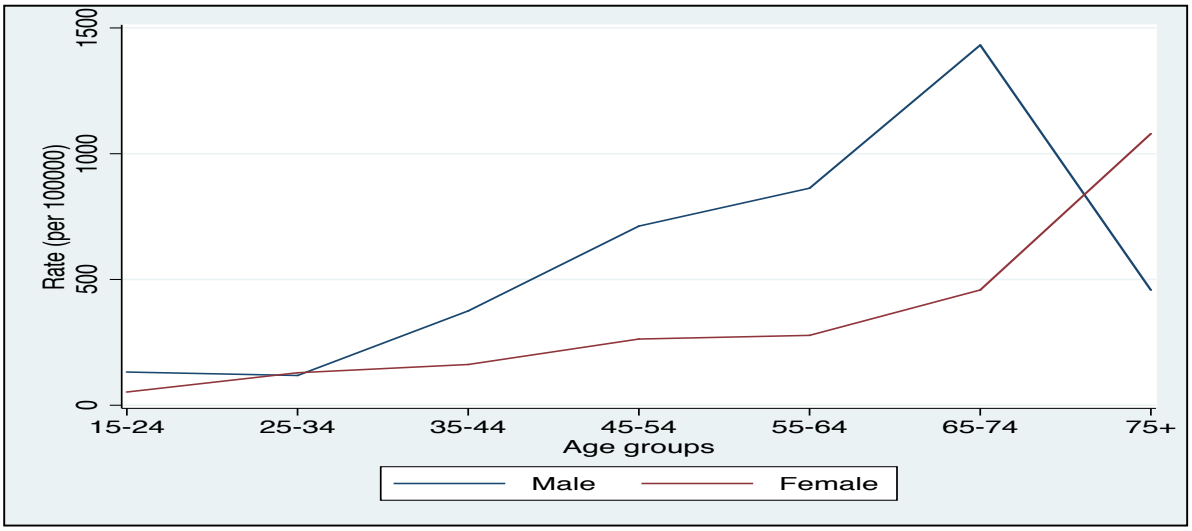


Figure 14: Case (crude) Prevalence by Age and Sex

Case notification data for 2013 shows low notification from the 15-34 and 65+ age groups, perhaps suggesting under-diagnosis in the routine system (Figure 15). Lessons from the prevalence survey suggest active case finding targeted at high-risk older age groups would yield more cases from this underserved sub-population which is perhaps not utilising TB services.

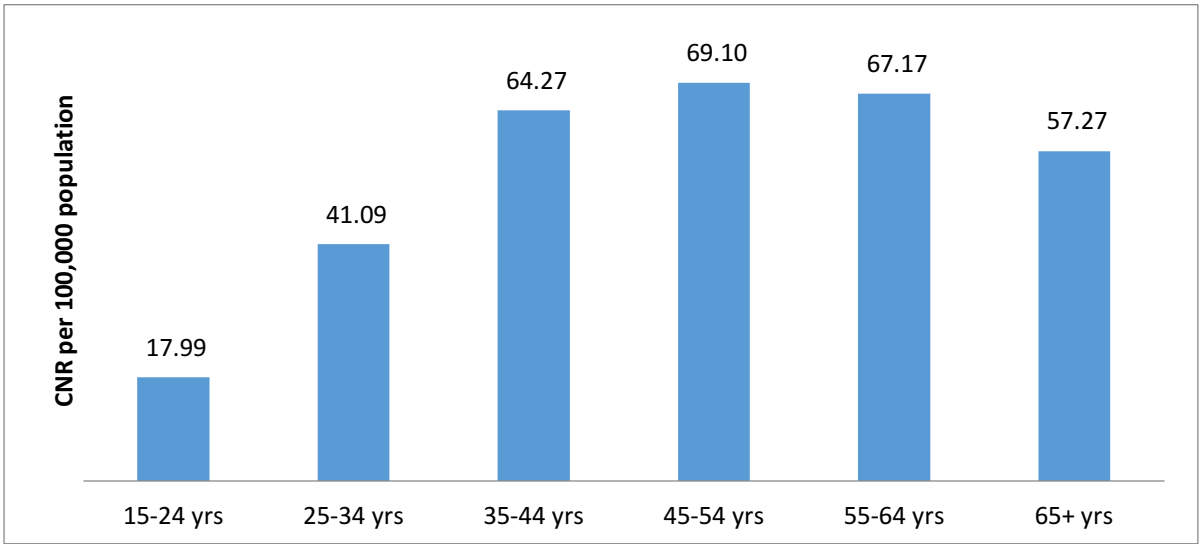


Figure 15: Case Notification Rate (CNR) by age group (2013 surveillance data)

Prevalence surveys are not designed to determine disease burden in sub-populations. However, notification data points to a countrywide epidemic with higher- and lower-incidence regions and districts (Figures 16 and 17).

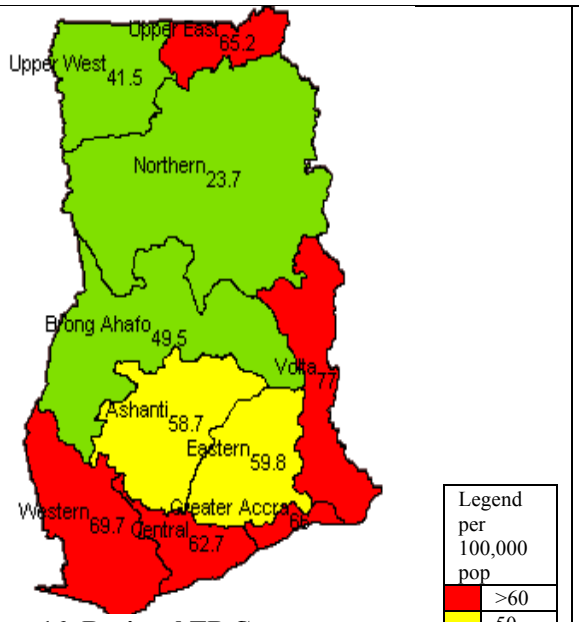


Figure 16: Regional TB Case Notification Rate per 100,000 Population, 2013

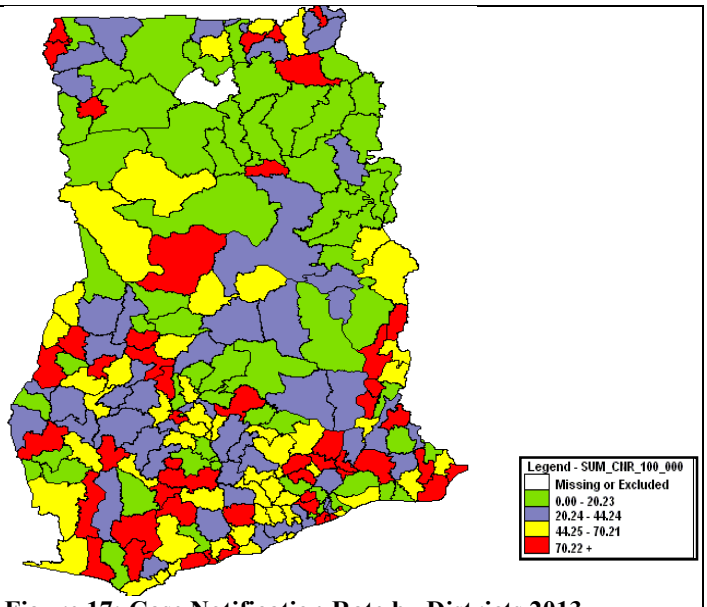


Figure 17: Case Notification Rate by Districts 2013

Among the low-incidence regions like Upper West, Northern and Brong-Ahafo (Figure 16), there are high-incidence districts (Figure 17). Of particular note are eight high-incidence districts that border neighbouring countries (Figure 17). It is also clear that most high-incidence districts are located in southern Ghana (Greater Accra, Central, Western, Ashanti Eastern and Volta) with Upper East being an exception. The health infrastructure coverage in these high-incidence regions is high compared to the 3 other low-incidence regions. Within regions with a low incidence of TB cases, there are districts with a high incidence of cases which have more health facilities and are relatively endowed. The geographical distribution of TB diagnostic and treatment facilities is also unequal between urban and rural areas and among the regions (Figures 18 and 19). Within some regions are areas with intense mining activities, and they are evenly spread throughout both high- and low- incidence districts.

Therefore, the TB epidemic in Ghana can be described as generalised and the appropriate response should vary minimally across the country's geographic regions. Response to the epidemic should be to facilitate access to TB services for at least 70% of the general population and 95% of the vulnerable populations through an extensive network of public and private facilities appropriately linked to health centres and tertiary facilities. Improving access to TB care and prevention should include a combination of targeted mobile or outreach programmes to populations with high TB prevalence, health facility-focused services and social mobilisation. Underlying and uncompromising to all these approaches is, at minimum, a dedicated and motivated health workforce, guaranteed and predictable supply of TB commodities and the removal of economic, socio-cultural and geographic barriers to care.

Access to major health facilities also remains a concern and has not changed much since 2009 when a study conducted in two regions showed that hardly any inhabitants had access to a health facility between a 5 to 15-kilometre radius[11]. The geographical access is particularly challenging in the Northern and Brong-Ahafo Regions where the population is sparsely distributed.

[11] Gyapong et. al 2009

4.2. TB Laboratory Services

There are three main types of clinical or health laboratories that provide TB services in Ghana, namely: public hospital-based, private hospital-based and independent (stand-alone) laboratories. These laboratories are unevenly distributed geographically across the country. Of the total number of public laboratories in the country, 67% perform TB microscopy. A majority of the independent (stand-alone) and private laboratories are located in the urban centres notably Accra, Kumasi and other regional capitals. Of these, only 22% perform TB microscopy (Table 9).

Table 9: Distribution and Ownership of Laboratories in Ghana, 2013

Regions	GOG	Faith-based/ quasi-gov't	Private	Total	TB centres including private	Private TB labs
Volta	46	8	10	64	33	2
Upper East	28	13	14	55	22	1
Northern	21	13	3	37	28	3
Ashanti	38	21	20	79	50	10
Western	25	19	8	52	25	3
Central	31	10	14	55	33	5
Greater Accra	28	5	90	123	60	14
Eastern	29	15	18	62	34	1
Upper West	14	4	3	21	10	1
Brong Ahafo	16	11	10	53	30	
Total	**260**	**108**	**180**	**601**	**325**	**40**

Even though laboratories were diagnosing TB as part of routine testing, there was no monitoring of the quality of TB microscopy in Ghana until 2000-2001 when a situational analysis of TB microscopy was done in 114 laboratories. Following this assessment, a pilot study to implement a quality assurance system was undertaken in the Greater Accra Region. A guidance manual was developed and regional staff were trained for scale up of external quality assessment (EQA) to all the ten regions in 2003. Currently there are 325 public and private health facility laboratories performing sputum smear microscopy in the country. Quality assurance in TB microscopy is performed quarterly by a trained assessor.

The capacity to perform a culture and drug susceptibility testing (DST) for research purposes started as far back as 2001 at the Noguchi Memorial Institute for Medical Research (NMIMR). At that time, DST was performed on solid media for first-line drugs. This was extended to the National Public Health and Reference Laboratory and Regional Hospital Laboratory in Koforidua using the Mycobacterium Growth Indicator Tube (MGIT) in 2010 and later, to the Korle Bu Teaching Hospital Chest Clinic Laboratory in 2011 which was given the status of National Reference Laboratory and linked to the WHO Supranational Reference Laboratory in Bostel, Germany.

Table 10: Geographical Distribution and Density of TB Microscopy Services in Ghana, 2013

Regions	Surface Area (Km²)	Population	Number Of Laboratories		% of TB diagnostics	TB Lab Density Per Km²	TB Lab – Population Ratio
			Absolute	TB diagnostic lab			
Ashanti	24,389	4,725,046	79	50	15.3	0.0020	1:94,500
Brong Ahafo	39,557	2,356,534	53	30	9.2	0.0007	1:78,551
Central	9,826	2,107,209	55	33	10.1	0.0033	1:63,854
Eastern	19,323	2,596,013	62	34	10.6	0.0017	1:76,353
Greater Accra	3,245	3,909,764	123	60	18.5	0.0184	1:65,162
Northern	70,384	2,468,557	37	28	8.6	0.0004	1:88,162
Upper East	8,842	1,031,478	55	22	6.7	0.0024	1:46.899
Upper West	18,476	677,763	21	10	3.0	0.0005	1:67,776
Volta	20,570	2,099,876	64	33	10.1	0.0016	1:63,632
Western	23,941	2,325,597	52	25	7.7	0.0010	1:93,023
Total	**23,8553**	**24,297,837**		**325**	**100**		

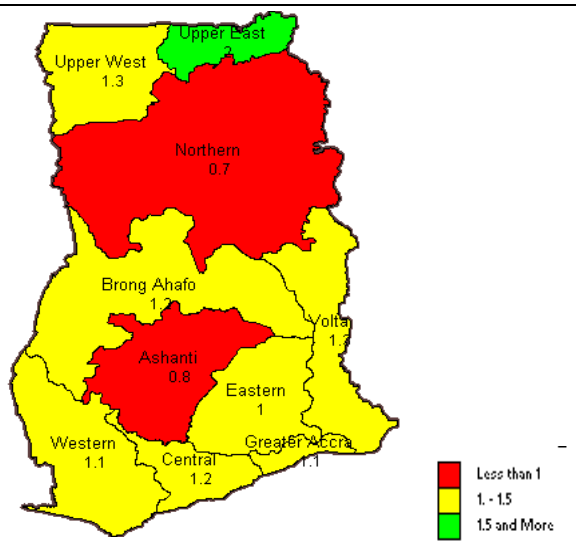


Figure 18: Microscope Distribution per 100,000 Population, 2013

Figure 19: Microscope Density by Region, 2013

4.3. Application of Resources to TB Control in Ghana

Per capita expenditure on detecting TB cases and successfully ensuring treatment success range from $75 to $349.50 varying across the geographic regions of the country (Figure 20). The variation is mainly explained by regional poverty levels (Figure 21), regional size and the availability and types of services. Regions with a high poverty index and low health facility coverage tend to have high per capita expenditures to detect and successful treat one TB case. Generally regions in southern Ghana are relatively endowed with the exception of the Central region. However, the Central Region is relatively better off in terms of health infrastructure coverage compared to the Northern Region. Regions with high land mass also tend to have high per capita expenditures to successfully detect and treat a case.

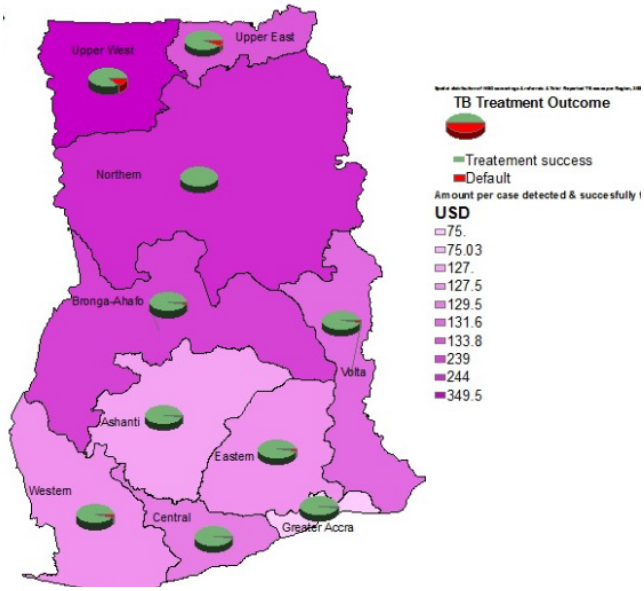


Figure 20: Per Capital Amount Successfully Detected and Treated, 2009

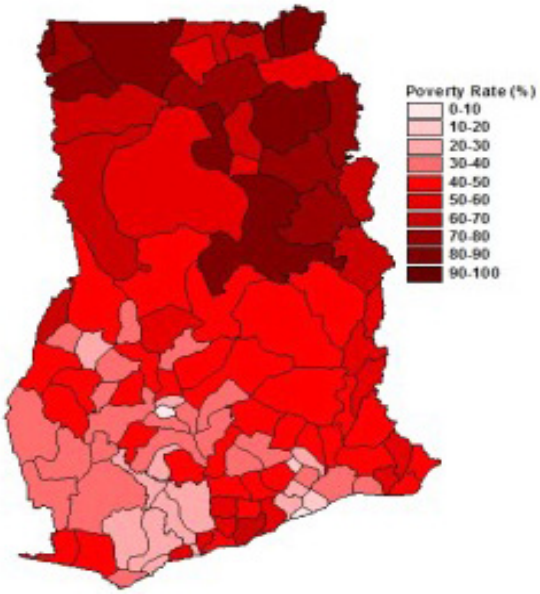


Figure 21: Poverty Levels by District, 2008

Table 11: Ranking of Multi-Dimensional Poverty Index (MPI) for Regions of Ghana, 2010

Region	National		Rural		Urban	
	MPI	Rank	MPI	Rank	MPI	Rank
Western	0.164	5	0.217	5	0.090	4
Central	0.155	4	0.184	2	0.122	6
Greater Accra	0.072	1	0.158	1	0.063	1
Volta	0.187	6	0.222	6	0.116	5
Eastern	0.147	3	0.196	4	0.083	3
Ashanti	0.121	2	0.189	3	0.077	2
Brong-Ahafo	0.217	7	0.278	7	0.139	7
Northern	0.371	10	0.430	10	0.236	10
Upper East	0.335	8	0.369	8	0.204	9
Upper West	0.341	9	0.376	9	0.158	8
Ghana	0.179	-	0.261	-	0.098	-

Source: 2010 Population and Housing Census Report: Non-Monetary Poverty in Ghana. Ghana Statistical Service; July 2013

4.4. Routine Programmatic Data Analysis

The general observation is that routine programmatic data analysis is largely consistent with the findings from the national prevalence survey. Trend analysis of reported TB cases generally shows increasing numbers of cases (Figure 22) likely resulting from improved programme quality and surveillance. A significant observation is the declining trend of notified TB cases among the 25-34 age group (Figure 23) that seems to confirm findings from the national prevalence survey estimating low prevalence among the same age group in Table 8.

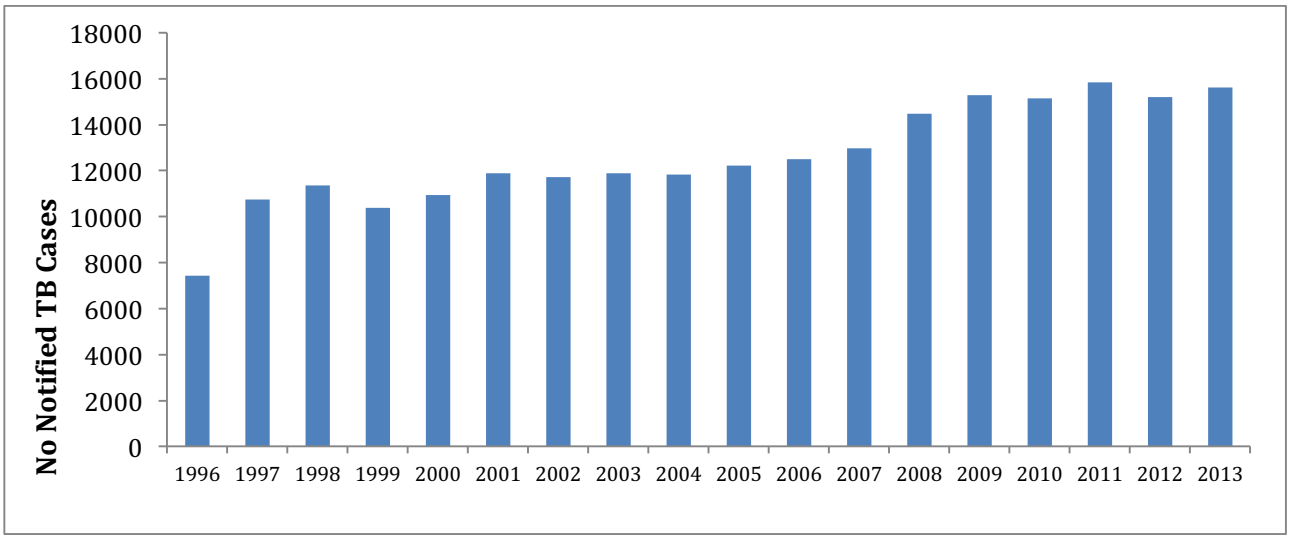


Figure 22: Trend of Reported TB Cases, 1996-2013

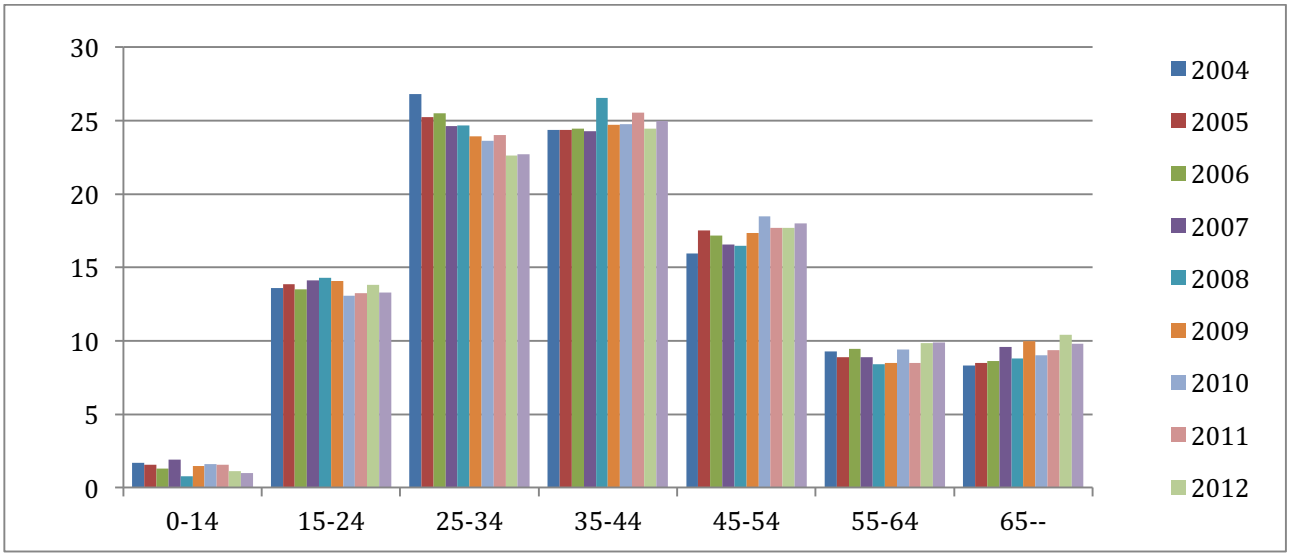


Figure 23: Trend of Age Distribution (%) of Notified TB Cases, 2004-2013

Case notification rates improved from 2007 when comprehensive capacity was built to integrate TB care and prevention into the general health services under Round 5 of the Global Fund grant (Figure 24).

A trend line analysis of annual case notification rates (Figure 24) appears to show a stagnating average case notification rate of 62.1 per 100,000 population for the last three years. There is, however, regional and district TB case notification rate variations that may require attention during implementation of current plan (Figure 25).

Before the application of Round 5 of the Global Fund grant in 2008, the high-incidence regions, namely Greater Accra, Eastern, Western and Central Regions, received adequate support and generally showed increasing TB case notification as compared to low-incidence regions such as Upper West and Brong-Ahafo Regions. After 2007, adequate attention was paid to the low-incidence regions which is currently reflected in the upward trend in case notification (Figure 25).

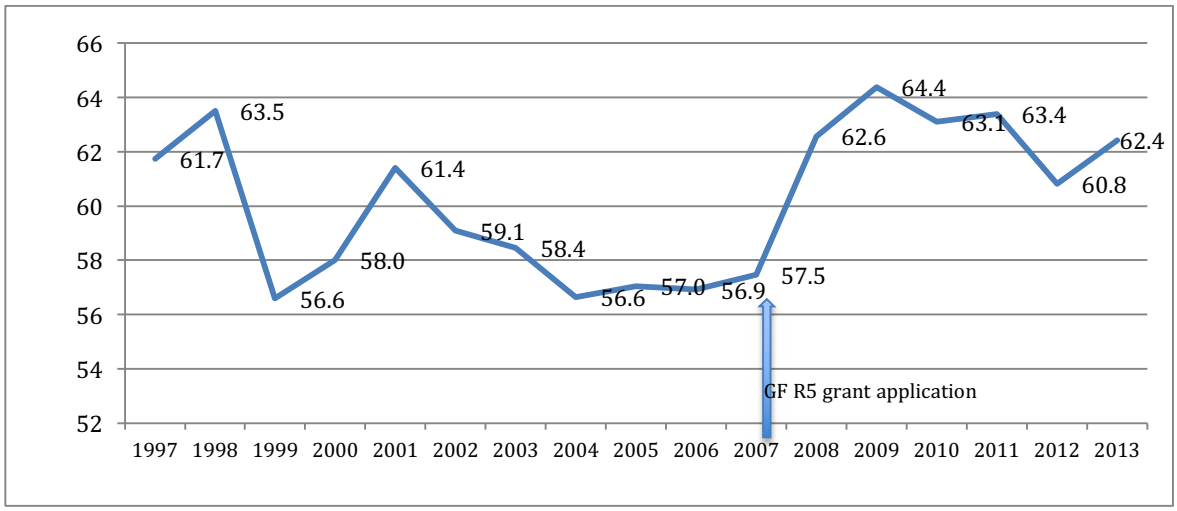


Figure 24: Trend of National TB Cases Notification per 100,000 Population, 1997-2013

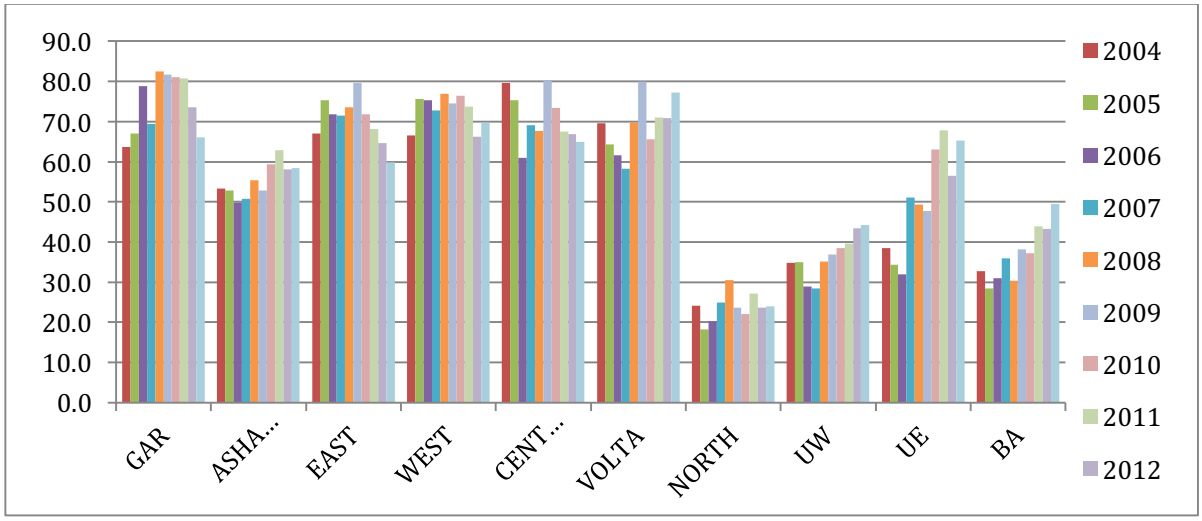


Figure 25: Trend of Regional TB Case Notification Rates per 100,000 Population 2004-2012

Figure 26 below shows the case notification rates for all forms of TB and smear positive cases in the ten regions compared to the national level three-year average. In 2013, the national CNR was 62.2/100,000 population for all forms of TB and 27.4/100,000 population for smear positive cases. Six regions, namely Eastern, Central, Upper East, Greater Accra, Western and Volta, reported rates that were higher than the three-year national average. The highest CNR for all forms of TB was found in Volta Region (77.1/100,000) followed by Western Region (69.7/100,000). Western Region had the highest notification rate for sputum smear positive TB cases (46.4/100,000) followed by Central Region. The Northern Region had the lowest notification for both categories.

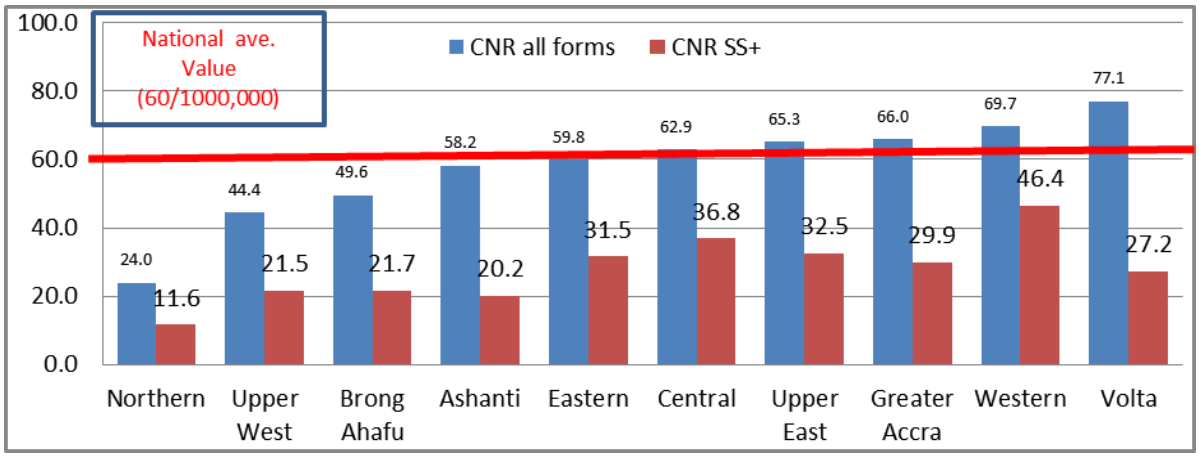


Figure 26: Variation in CNR of All Forms and New Smear Positive TB Among Regions, 2013

4.5. Age-Sex Differentials of TB Burden

Since 2008, programmatic data have consistently shown more cases among males than females among the notified TB cases. As shown in Figure 27, females accounted for approximately one-third of all the TB cases that were reported from 1996-2013 while males accounted for approximately two-thirds. The trend data show that the rate of increase of new cases among males is much higher than that among females. This can be explained by the fact that the burden of TB in males is higher as per the findings from the national prevalence survey. The underlying reasons can be further investigated through programme-based operations research.

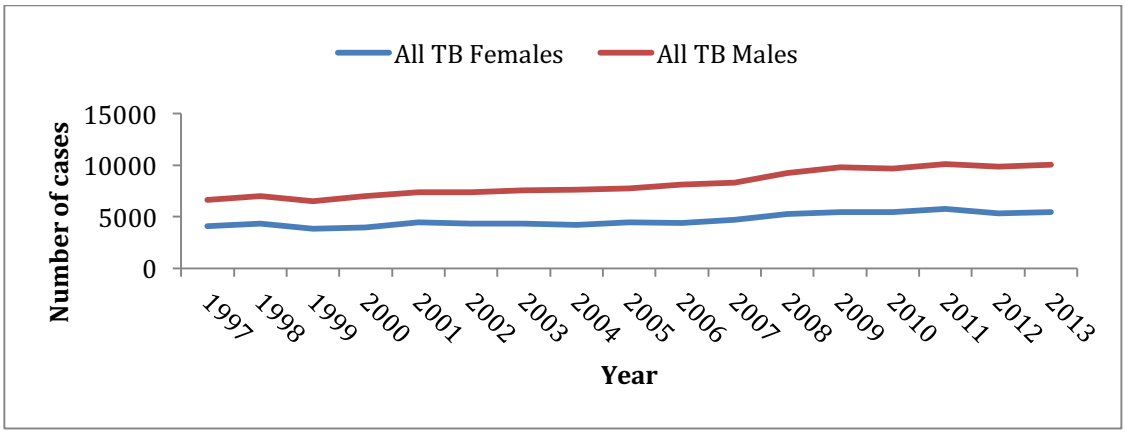


Figure 27: Number of TB Cases (All Forms) Among Males and Females in Ghana, 1997-2013

While 35.2% of all cases reported at the national level in 2013 were among females, there was no significant variation in the gender distribution of cases across the various regions. As shown in Figure 28 below, it is only in Volta Region, where females accounted for 41% of the reported cases, and Western Region, where 28.2% of the reported cases were among women, that the variation stood out.

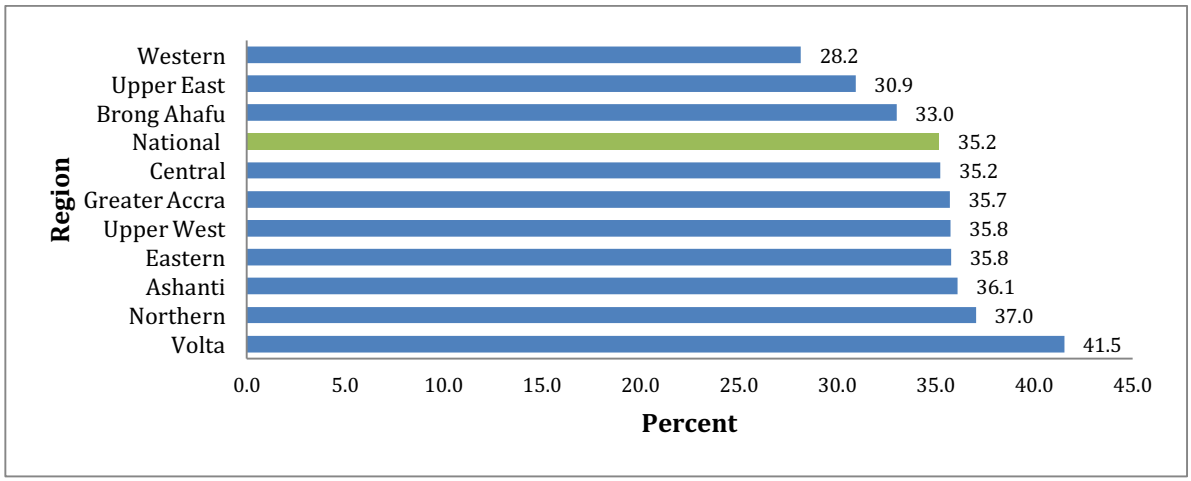


Figure 28: Regional Variation in Percentage of Women Among Notified TB Cases in Ghana, 2013

4.6. Characteristics of TB Cases

Figure 29 below shows the trends in patient type from 1997-2013. The data shows a progressive decline in the number of cases classified as sputum smear positive TB and an increasing number of smear negative and extra pulmonary TB cases. The reason for this pattern could be further investigated but it may reflect either changes in the performance of the laboratory system or non-compliance with diagnostic algorithms for TB at the different service delivery points in the system.

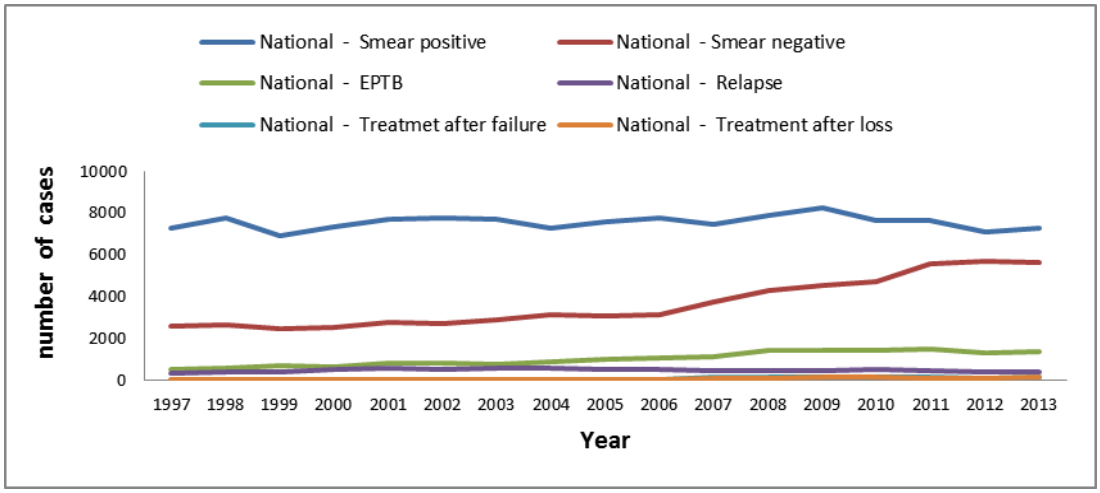


Figure 29: TB Patient Types in Ghana, 1997-2013

Using data from the cases notified in 2013, it can be observed that there are regional variations in the types of cases (Figure 30) suggesting that there are regional variations in utilisation of the diagnostic algorithms and/or laboratory capacity.

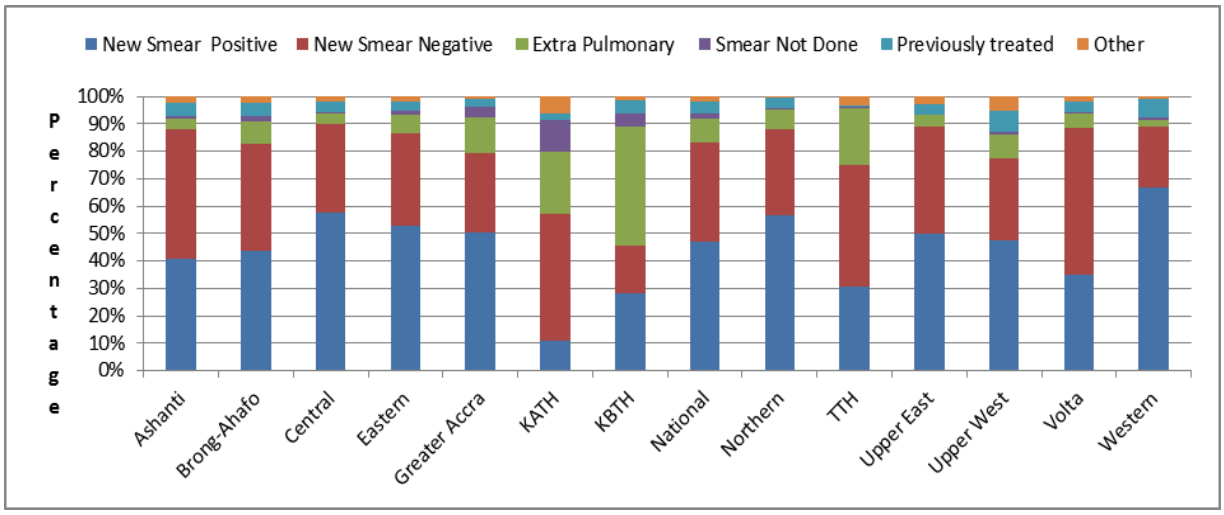


Figure 30: Proportion of Types of TB Cases by Region, 2013

4.7. Childhood TB

Between 2008 and 2013, cases among children constituted approximately 5% of all notified TB cases and ranged from 4.2% in 2009 to 5% in 2013. A case of TB in a child is a sentinel event in that it represents recent transmission of TB in a community.[12] Figure 31 below shows the proportion of TB cases among children between 2008-2013. The reason for the declining trends in the proportion of TB cases among children in Ghana should be further investigated. Figure 32 below shows the number of cases among children by gender between 2008-2013. As for adult cases, a greater proportion of the cases among children were among males than females.

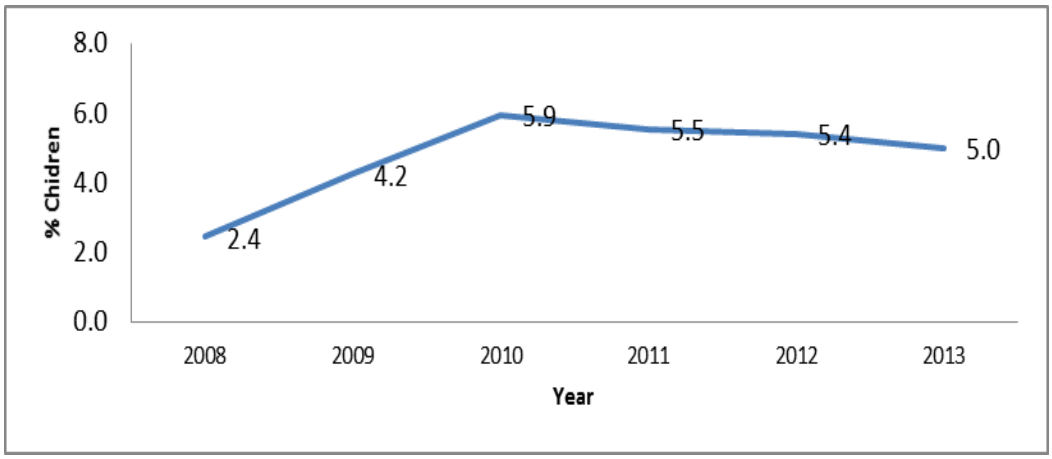


Figure 31: Percentage of TB Cases among Children (<15 years) in Ghana, 2008-2013

At the national level, 38.1% (296/778) of the TB cases among children did not have a sputum smear done; 27.2% (212/778) were classified as smear negative and 11% (87/778) were smear positive. As shown in Table 12 below, there are regional variations in cases notified.

[12] Bloch A, Snider D. How much tuberculosis in children must we accept? Am J Public Health 1986; 76: 14-15

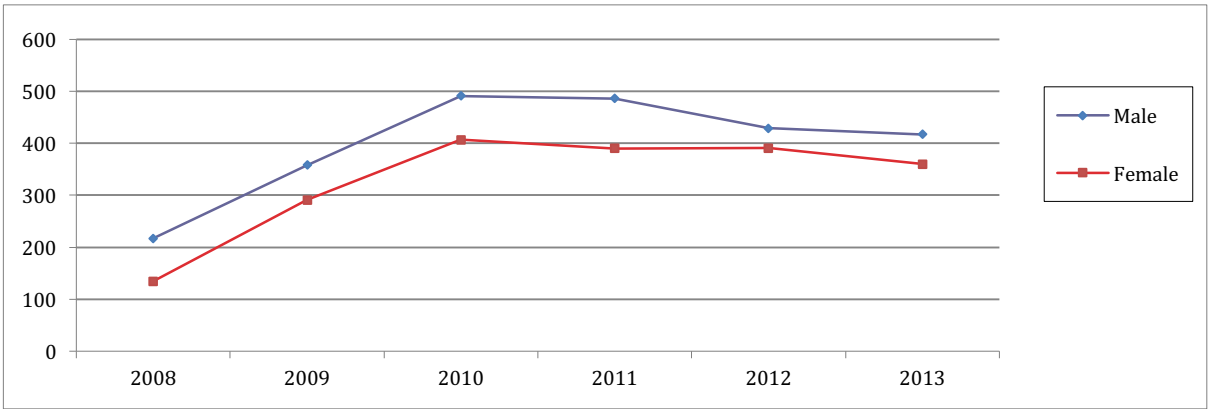


Figure 32: Male-Female Distribution of Childhood TB Cases 2008-2013

Table 12: Types of TB Cases Notified among Children from Regions, 2013

Region	New Smear Positive	New Smear Negative	Smear Not Done	Extra Pulmonary
Ashanti	9	23	28	7
Western	14	15	10	6
Central	10	19	2	10
Eastern	4	25	27	19
Greater Accra	16	37	86	26
Northern	3	6	2	3
Upper East	6	7	3	6
Upper West	4	10	2	2
Volta	6	34	11	14
Brong-Ahafo	9	25	20	15
KATH	0	0	70	26
KBTH	6	0	34	43
TTH	0	11	1	6
National	87	212	296	183

The regional variations reflect the capacity to diagnose TB in children on the ground. The inventory of childhood diagnostic capacity could be part of programme-based operations research.

4.8. TB/HIV Co-Infection

A joint planning document of stakeholders to harmonise and guide implementation of HIV and TB collaborative activities was developed and introduced at TB facilities in Ghana in 2007. Figures 33 and 34 below show the outputs of this collaboration for the period 2008-2013. The data indicate that there were improvements in performance in this component of the program during successive years. The proportion of TB patients tested for HIV rose from 17% during the first year of the introduction of TB/HIV activities to 77.8% in 2012 but declined to 72.7% in 2013. In addition, the percentage of HIV-positive persons with TB who were placed on ART increased from 13.9% in 2008 to 42.6% in 2013 while CPT uptake among HIV-positive patients remained steady at around 70% during the past six years. In spite of these increases, they are below programme targets and highlight important gaps to be addressed in this plan.

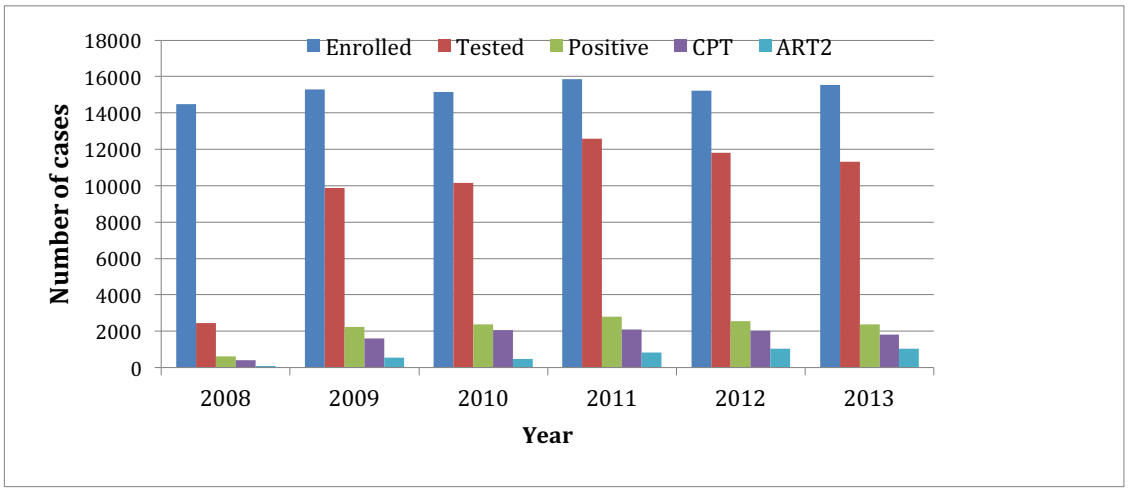


Figure 33: Trend of TB/HIV Service Coverage in Ghana, 2008-2013

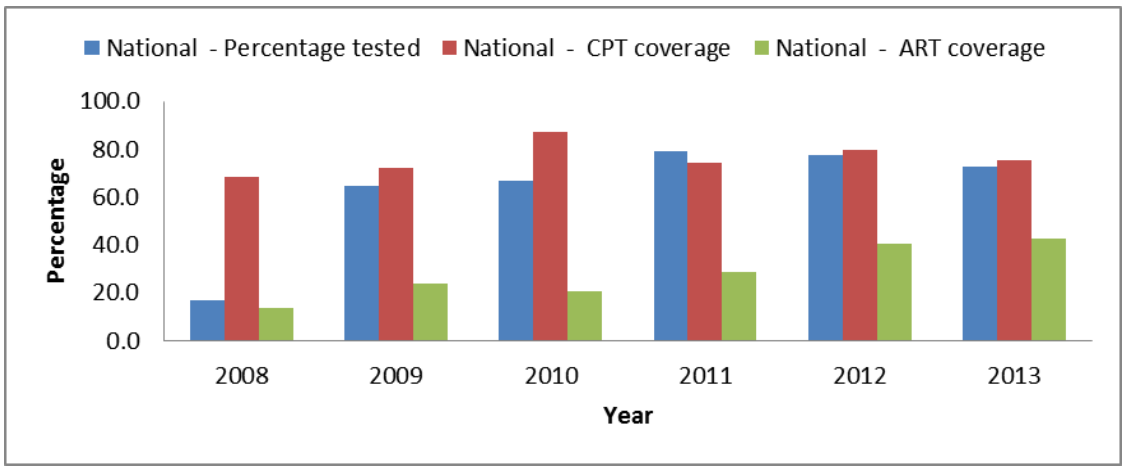


Figure 34: Percentage Coverage of TB/HIV Service in Ghana, 2008-2013

Further analysis of testing data for 2013 showed that there were regional variations in rates of uptakes for HIV testing (Figure 35). Four regions, namely Central, Volta, Western, and Ashanti, had rates that were lower than the national average.

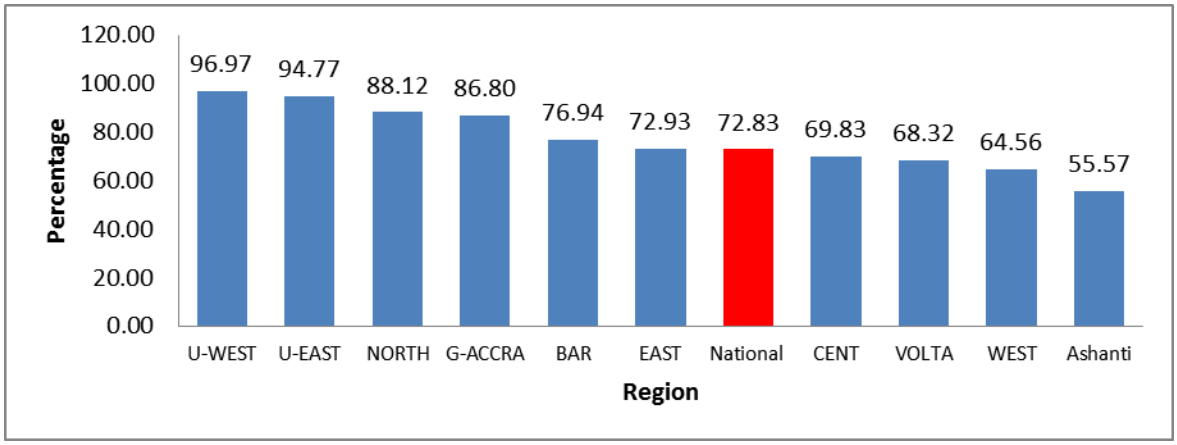


Figure 35: Percentage of Newly Registered Patients with HIV Test Results by Region in Ghana, 2013

HIV Seroprevalence: With regard to test results, HIV prevalence among TB patients varied in the different regions ranging from 33.4% in the Eastern Region to 9.4% in the Upper East. In all years, HIV sero-prevalence was consistently higher among women than men (Figure 36). In addition, data from 2013 showed variations in HIV sero-prevalence across the various regions and within districts in some regions.

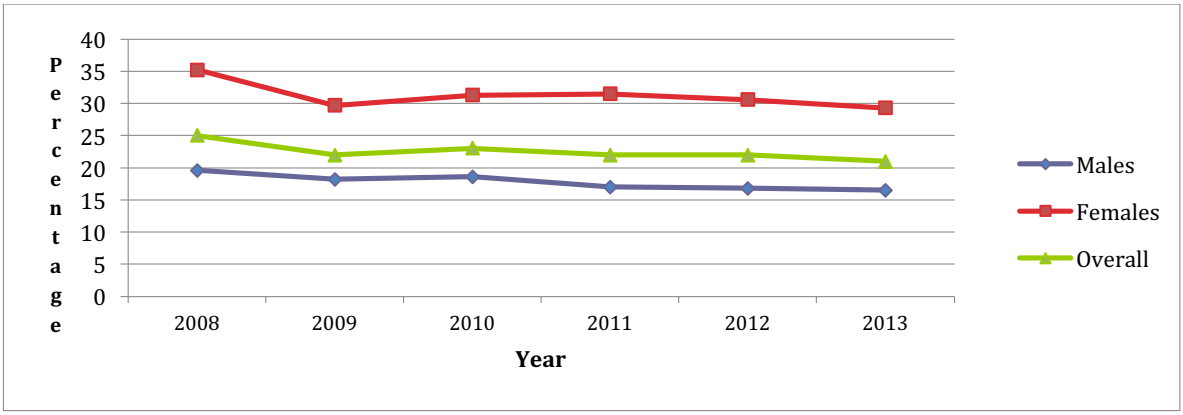


Figure 36: HIV Sero-prevalence Among Registered TB Patients in Ghana, 2008-2013

The general observation from mapping regional HIV sero-prevalence and regional TB case notification data is that an HIV sero-prevalence of 1.2% or more is associated with a TB case notification rate of at least 58 per 100,000 population or more (Figures 37 and 38). The exception is Brong Ahafo Region where an HIV sero-prevalence of 2.1% is associated with a TB case notification rate of 49.5 per 100,000 population. This can be a subject of programme-based operational research.

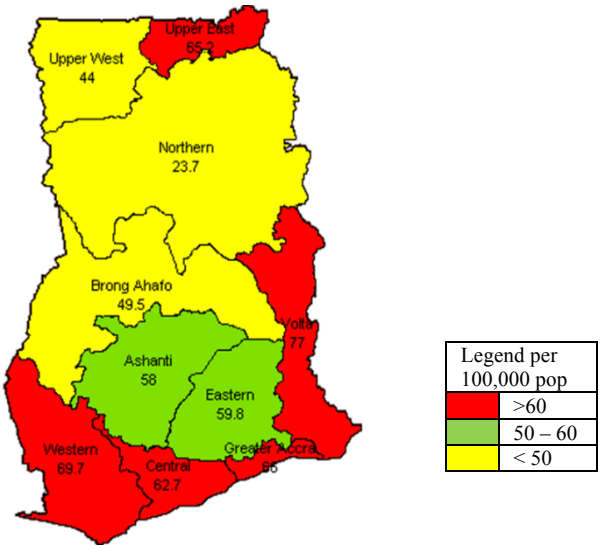


Figure 37: Regional TB Notification Rates, 2013

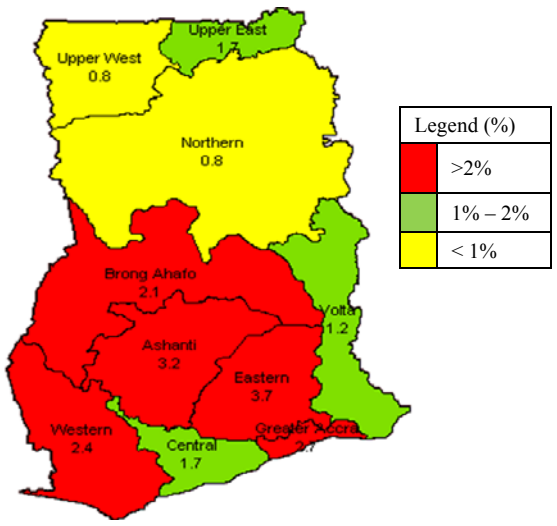


Figure 38: Estimated Regional HIV Prevalence Rate, 2013

ART and CPT coverage: ART coverage among HIV-positive TB patients increased from 13.9% in 2008 to 42.6% by 2013. There were regional variations in ART and CPT coverage (Figure 39). ART uptake is consistently higher in females than males at the national level and in all regions except in the Upper East and Volta Regions (Figure 39).

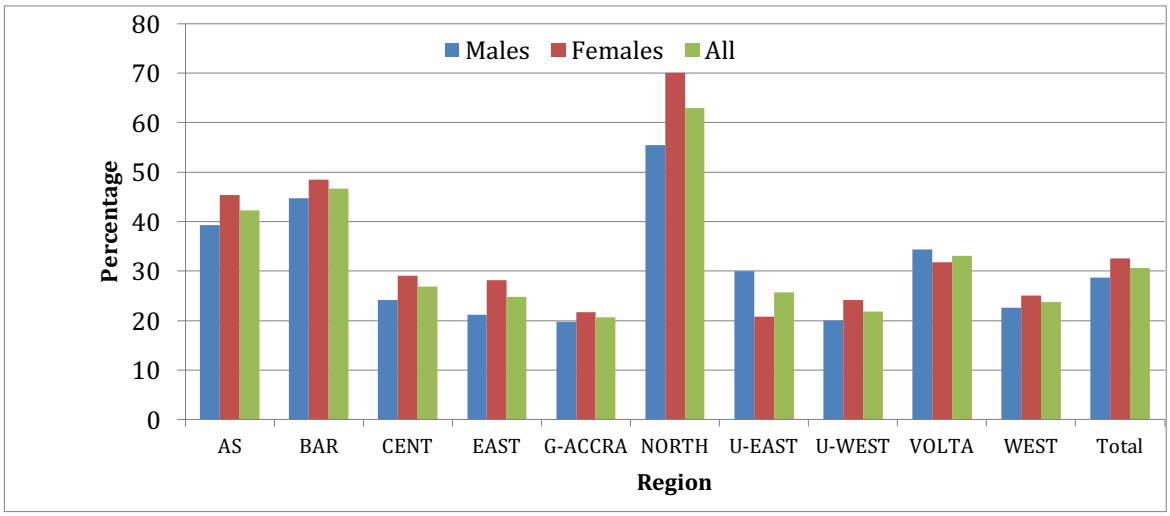


Figure 39: ART Uptake among Males and Females by Regions, 2013

4.9. Drug-Resistant TB Burden

The exact burden of MDR-TB is unknown, as a formal drug resistant survey has not yet been done. There is an obvious gap between expected MDR-TB cases and the number detected and enrolled on treatment (Table 13).

Table 13: Trend of Estimated Country MDR-TB Burden, 2008-2013

	2008	2009*	2010	2011	2012	2013
Estimated MDR-TB Cases	**1378**	**1574**	**1720**	**1852**	**1955**	**2027**
Number TB patients tested for MDR	100	-	58	392	251	690
Estimated number of MDR-TB cases to treat	**0**	**10**	**100**	**200**	**200**	**250**
Number MDR confirmed	2	-	14	28	30	38
Number on second-line treatment	0	-	0	2	2	27

* No data available

The process of certification for treatment from the Green Light Committee, which has since been modified, significantly contributed to the slow treatment uptake. The diagnostic gap for MDR-TB due to lack of laboratory capacity for diagnosis was resolved in 2013. Laboratory infrastructure to screen and confirm DR-TB has been completed and quality control is in place from the Supranational Reference Laboratory in Borstel, Germany which provides continuous supervisory support. Treatment capacity building is ongoing and needs to be further enhanced to include mono- and poly-resistant TB management.

4.10. TB in High-Risk Populations

4.10.1. TB in Prisons

The TB case notification rate among prisoners is higher than the case notification rate of 62 per 100,000 person population in the general population (Table 14). HIV prevalence among

the prison population in Ghana is 2.3% (Male 1.5%; Female 11.8%) compared with the general population of 1.3%.

Table 14: Trend of Notified TB Cases among Prison Inmates, 2007-2013

Year	Prison Population	TB Cases	TB Deaths	CNR/100,000 pop	Fatality	% TB Among Inmates
2007	13,335	94	12	705	12.8%	0.7%
2008	14,128	127	23	899	18.1%	0.9%
2009	14,171	182	19	1284	10.4%	1.3%
2010	13,500	68	17	504	25.0%	0.5%
2011	14,671	35	11	239	31.4%	0.2%
2012	15,171	43	14	283	32.6%	0.3%

4.10.2. TB in Pregnancy

TB is known to be a significant cause of ill health in pregnancy; however, this group is not systematically screened for TB. Data on TB in pregnancy are not available. Data from prevalence survey suggest that a significant number of asymptomatic pregnant women were culture-positive for tuberculosis (Source: 2013 National Prevalence Survey).

4.10.3. TB in Diabetics

In Ghana, the burden of diabetes has increased significantly over the years. Various studies put the burden of diabetes between 6 and 9% with a projection of 15% over the next decade.[13, 14, 15, 16] This represents a steady increase from the low prevalence of 0.2- 0.4% reported in the 1950s and early 1960s in Ghana.[17, 18] Data from the major health facilities in Ghana indicated that the number of reported diabetes cases increased five-fold from 2002 to 2010.[19] Table 15 below shows trends of regional reported cases of diabetes from routine data.

Table 15: Newly Reported Outpatient Diabetes by Region 2010-2013 (Source: DHIMS)

Region	2010	2011	2012	2013
Ashanti	35073	39583	46912	39953
Brong Ahafo	13609	17758	21088	18527
Central	12091	19530	31978	30792
Eastern	33423	37381	39376	29077
Greater Accra	31810	41780	54539	53870
Northern	2082	2780	1771	3032

[13] Agyei-Mensah, S. and A. de-Graft Aikins, *Epidemiological transition and the double burden of disease in Accra, Ghana.* J Urban Health, 2010. **87**(5): p. 879-97.
[14] Amoah, A.G., et al., A national diabetes care and education programme: the Ghana model. Diabetes Res Clin Pract, 2000. 49(2-3): p. 149-57.
[15] Cook-Huynh, M., et al., Prevalence of hypertension and diabetes mellitus in adults from a rural community in Ghana. Ethn Dis, 2012. 22(3): p. 347-52.
[16] Addo, J., L. Smeeth, and D.A. Leon, Hypertensive target organ damage in Ghanaian civil servants with hypertension. PLoS One, 2009. 4(8): p. e6672.
[17] Dodu S. and N. De Heer, *A diabetes case-finding survey in Ho, Ghana.* Ghana Med J, 1964. **3**: p. 75-80.
[18] Dodu Dodu, S.R., *The incidence of diabetes mellitus in Accra (Ghana); a study of 4,000 patients.* West Afr Med J, 1958. **7**(3): p. 129-34.
[19] de-Graft Aikins, A., *Ghana's neglected chronic disease epidemic: a developmental challenge.* Ghana Med J, 2007. **41**(4): p. 154-9.

Upper East	1254	1177	1213	2679
Upper West	277	397	552	673
Volta	9603	16807	18288	16699
Western	11872	12479	16828	18049
Total	**151094**	**189672**	**232545**	**213351**

Programmatic data collected on TB in diabetes is limited. Among 6,802 diabetics systematically screened for TB in two clinics using a symptom screening tool, 499 were eligible for sputum test out of which 23 TB cases were confirmed over a two-year period. The intervention has yet to be expanded.

4.11. Civil Society/Private Sector Contributions to TB Case Finding

The NTP operates in partnership with civil society organisations under the umbrella of the Stop TB Partnership Ghana. One hundred thirty-five CSOs have partnered with the NTP to perform case finding and treatment support activities in all regions of the country. This has contributed to increased access to TB services and improved support for patient care. At the end of 2013, their activities accounted for 2.6% of TB patients notified (Table 16).

Table 16: Trend of CSO Activities Contribution to TB Case Finding, 2007-2013

Year	Eligible & Screened for TB	Confirmed Cases	% eligible diagnosed with TB	Percentage Cases
2007	5601	355	6.3%	2.7
2008	18970	735	3.9%	5.1
2009	7780	1656	21.3%	10.8
2010	10082	1482	14.7%	9.8
2011	5185	1058	20.4%	6.7
2012*	-	-	-	-
2013	5969	403	6.8%	2.6

* No data available

Private sector engagement has tremendous potential to contribute to TB care and prevention. However, activities are dependent on adequate and sustained funding (Figure 40).

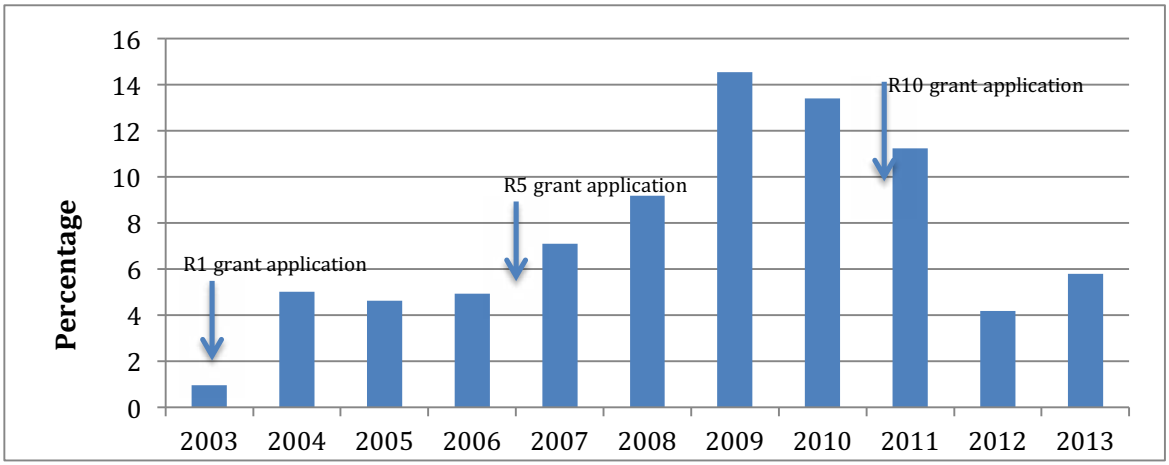


Figure 40: Trend of Proportion of TB Case Notification by Private Sector (including CSOs), 2003-2013

4.12. Programmatic Outcomes

4.12.1. Favourable Treatment Outcomes (New Sputum Smear Positive Cases)

Treatment success rates: The latest reported treatment success rate for cohorts of sputum smear positive TB patients in 2012 was 87%. The data show a remarkable improvement in treatment success rates among smear positive cases in the past 15 years. This improvement can be attributed to community TB treatment, the Enablers' Package and interventions against stigma and discrimination which encourage more persons to adhere to their treatment regimen (Figures 41 and 42).

Data from 2012 show regional variations in treatment success rates (TSR). The highest treatment success rate was reported from the Greater Accra Region (90.83%) and the least was reported from Eastern Region (81%). In 2012, seven regions and two hospitals reported TSRs among smear positive cases which were lower than the national average of 87%. One possible explanation for the low rates in the hospitals is that they are teaching and referral hospitals and are likely to receive more severe cases. Additional investigations are required to determine the reason(s) for the lower TSRs in the poorer performing regions.

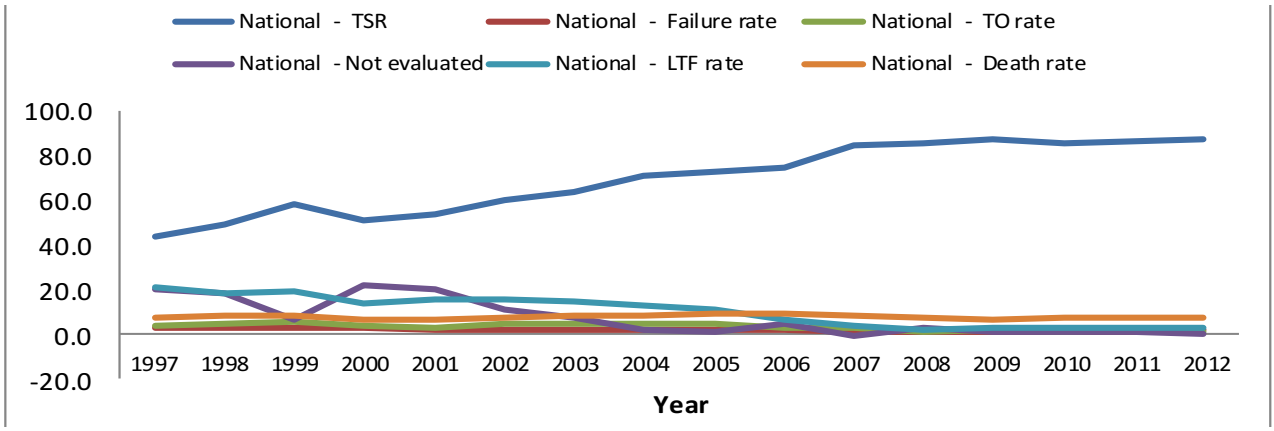


Figure 41: Trend of Treatment Outcomes of New Smear Positive TB Cases, 1997-2012

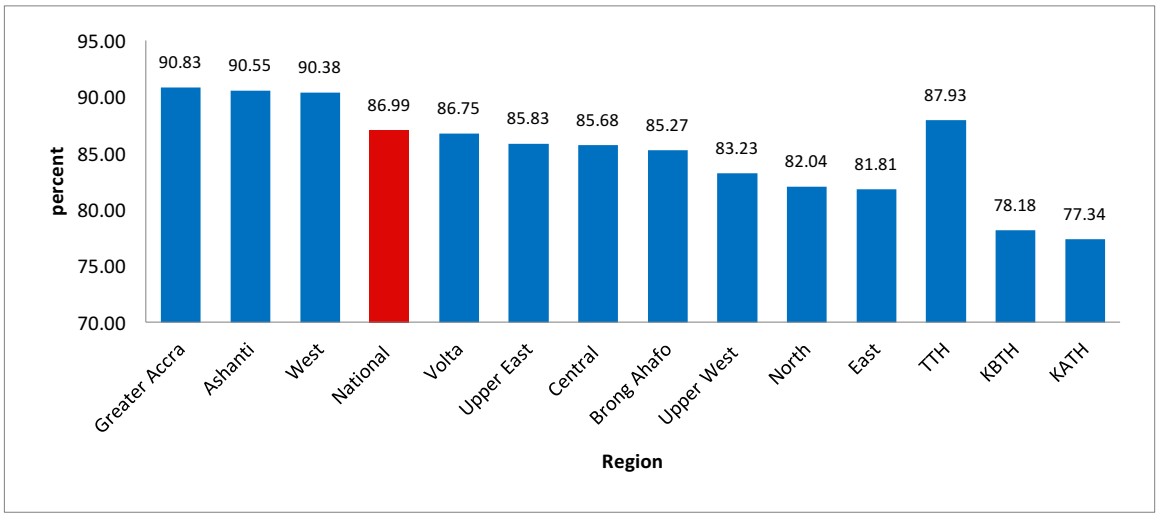


Figure 42: Regional Treatment Success Rates of Sputum Smear Positive TB Cases, 2012

As shown in Figure 42 above the three most populous regions–Ashanti, Greater Accra and Western Regions–reported the highest treatment success rates which were above the national rate. Best practices should be investigated to inform interventions in the other regions to improve on their treatment outcomes as well. Possible reasons are effectiveness of the application of the Enablers' Package, human resources strength and better case management.

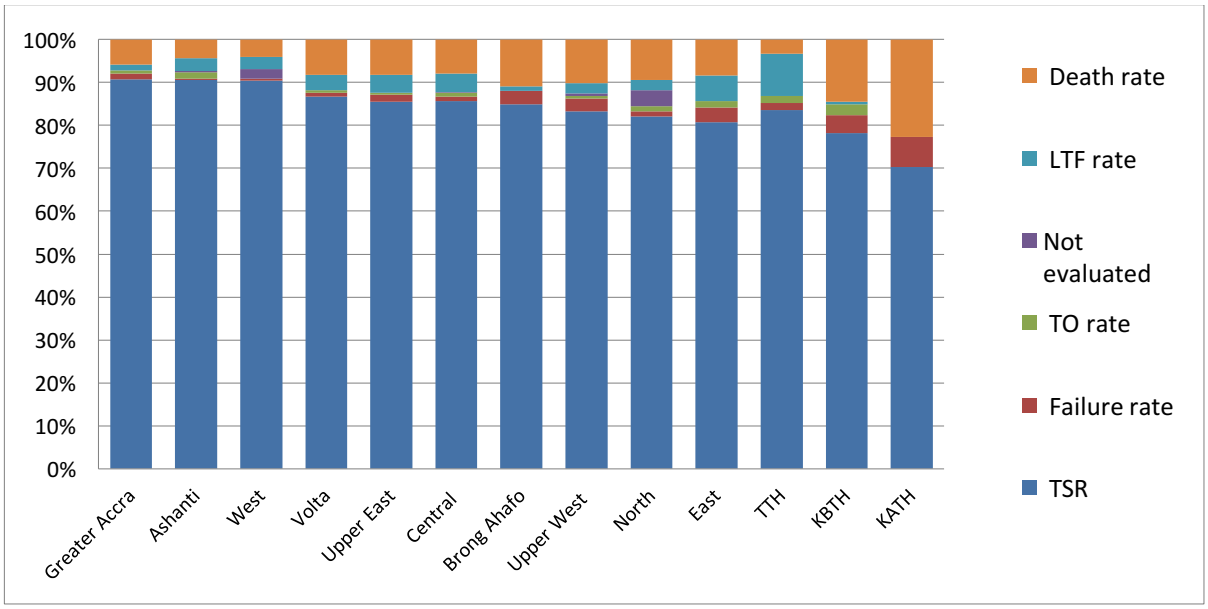


Figure 43: Treatment Outcomes by Region of Sputum Smear Positive TB Cases, 2012

4.12.2. Adverse Treatment Outcomes

Deaths: The death rate among smear positive cases has been stable over the last 15 years varying between 6 and 9% (Figure 44).

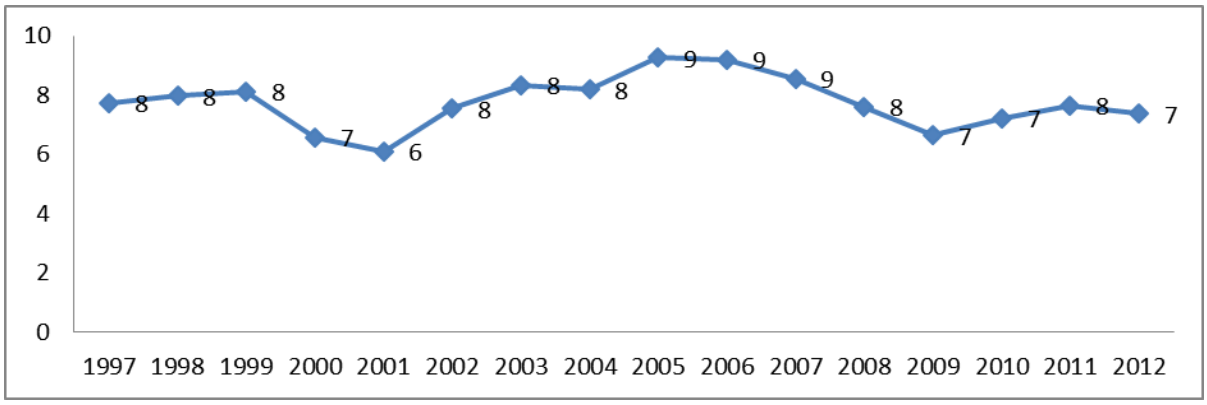


Figure 44: Trend of Death Rate among TB Patients, 1997-2012

While approximately 7% of the new smear positive cases reported at the national level died, regional variations in death rates were noted. Brong-Ahafo, Northern and Upper West Regions had the higher death rates while lower death rates were reported in Greater Accra, Ashanti and Western Regions (Figure 45). In 2012, two of the hospitals (KATH and KBTH) and even some regions reported death rates that were significantly higher than the national average. It is likely that the high death rates in the teaching hospitals may be due to high rates of TB/HIV co-infection, but this requires further investigation.

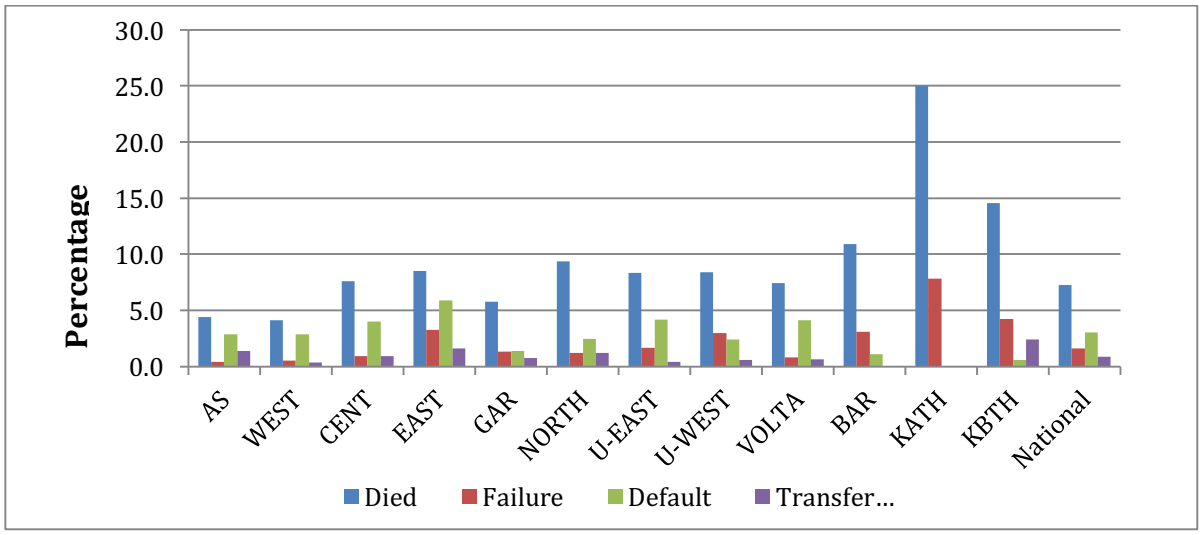


Figure 45: Adverse Treatment Outcomes by Region, 2012

Apart from Ashanti and Western Regions, all regions including the two teaching hospitals experienced case fatality rates greater than 5%. The NTP has had severe challenges over the years to lower the case fatality rate with little success. Implementation of clinical care and mortality audits in the regional hospitals is expected to address this long-standing challenge. All other adverse outcomes (lost-to-follow-up, failure) has shown declining trends (Figure 45).

4.12.3. TB/HIV Treatment Outcomes

As shown in Figure 46 below, initial crude analysis seems to indicate that there may be a correlation between ART coverage and death since regions with higher ART coverage reported lower death rates. It is possible that other potential co-variables may also help to explain some

of this variation. This observation highlights the need for better ART services to reduce TB deaths.

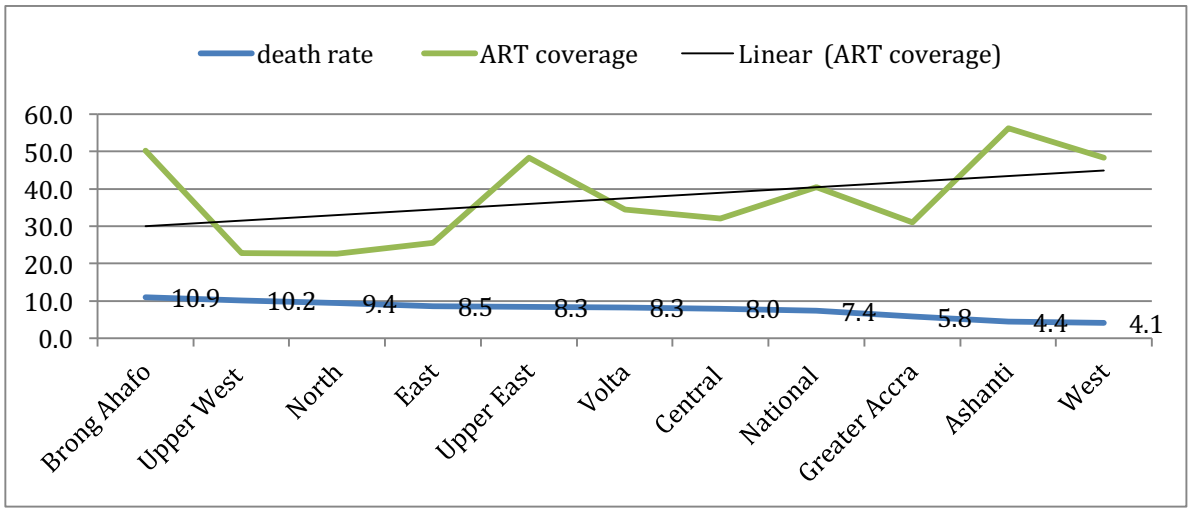


Figure 46: Relation between Regional ART Coverage and Death Rate among TB/HIV Co-infected, 2012

HIV co-infected smear positive patients: Treatment outcome results of smear positive TB/HIV co-infected patient cohorts for 2010-2012 show that TSR among smear positive co-infected patients was similar to that among those who were not infected however the death rate among co-infected patients was much higher than that among those patients who were not infected (Figure 47). This finding is consistent with that reported by other authors.[20]

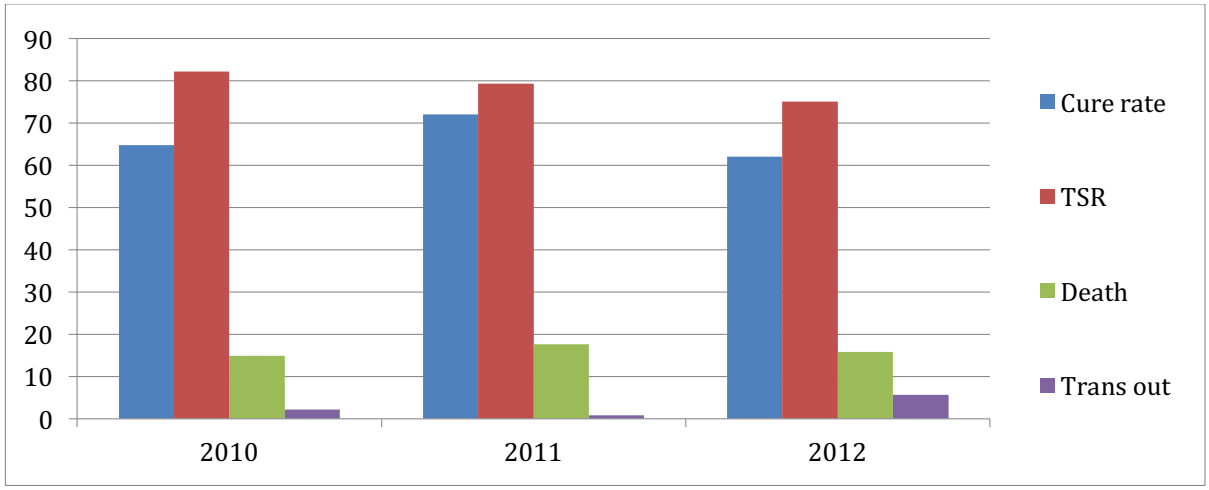


Figure 47: Treatment Outcomes of Smear Positive TB/HIV Co-infected Patients, 2010-2012

4.12.4. Treatment Outcome for Other Categories (Sputum Smear Negative and Extra-Pulmonary TB)

[20] Gloria Akosua Ansa, John D Walley, Kamran Siddiqi and Xiaolin Wei. Assessing the impact of TB/HIV services integration on TB treatment outcomes and their relevance in TB/HIV monitoring in Ghana. Infectious Diseases of poverty 2012, 1:13

Extra-pulmonary TB: Data on the outcomes for persons with extra-pulmonary TB (EPTB) are available from 2006-2012. As shown in Figure 48 below, the TSR among EPTB patients declined from 83.8% in 2006 to 79.0% in 2012. Death rate in this period however doubled from 7.8% in 2006 to 14% in 2012. In order to reduce mortality-related TB, the quality of service to patients needs to be improved. Death audits to explore contributing factors to mortality need to be considered.

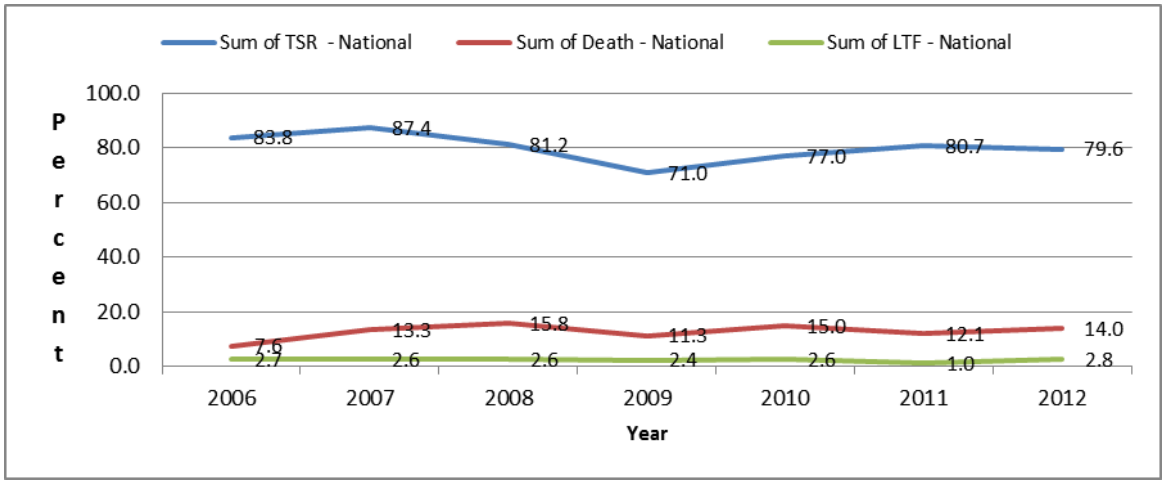


Figure 48: Trend of Treatment Outcomes of EPTB Patients, 2006-2012

Smear negative patients: The data show regional variations in treatment outcomes among smear negative patients (Figure 49). High death rates were reported in hospitals and in the Upper West Region. In order to reduce mortality-related TB, the quality of service to patients needs to be improved. Death audits to explore contributing factors to mortality need to be considered.

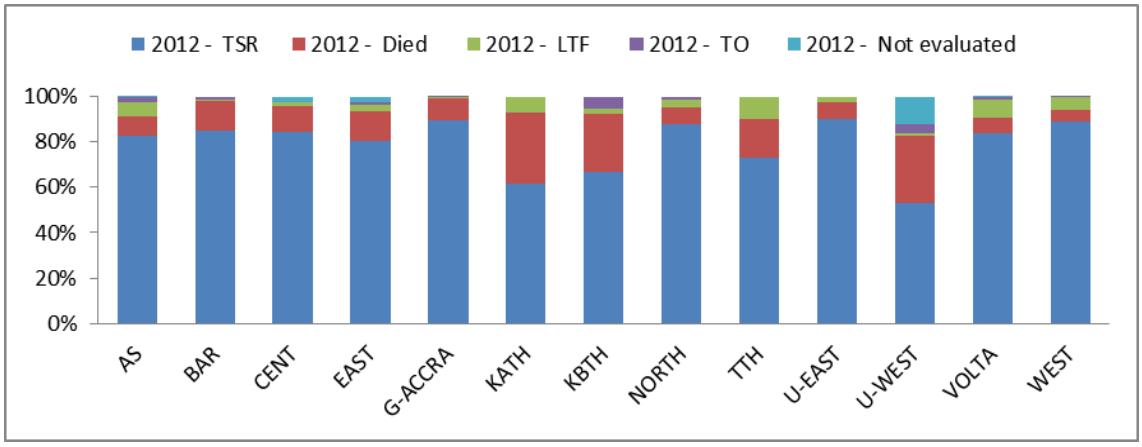


Figure 49: Regional Treatment Outcomes for Smear Negative TB Patients, 2012

Previously treated patients: Table 17 below shows the outcomes of previously treated (relapse, treatment after failure and treatment after lost to follow up) patients. The TSR among persons who were treated after relapse, failure and loss to follow up was 81.8%, 75.9% and 77.6% respectively. Culture and drug susceptibility testing needs to be strengthened in these groups to rule out MDR-TB at the earliest possible time.

Table 17: Composite Treatment Outcomes of Previously Treated TB Patients, 2006-2012

	Patient type		
	Relapse	**Treatment after failure**	**Treatment after default**
Number Registered (2006-2012)	1968	390	446
Cure rate (%)	56.8	54.1	42.4
TSR (%)	81.8	75.9	77.6
Died (%)	11.1	12.8	8.7
Failure (%)	2.0	4.4	2.0
Loss-to-follow-up	3.0	2.3	5.6
Transferred Out	2.3	1.5	1.1

TB in Children: Table 18 below shows the outcomes among children who were enrolled between 2010 and 2012. Approximately, 83% of the smear positive pulmonary TB cases completed treatment successfully compared to 80.5% of EPTB patients and 86.6% of smear negative patients. The death rates ranged from 2.9% among smear positive cases to 7.0% in smear negative cases and 11.1% among EPTB cases.

Table 18: Treatment Outcomes of TB in Children, 2010-2012

	Registered	**Cure rate**	**Treatment Success**	**Not evaluated**	**Died**
Smear positive patients	104	69.2%	82.7%	13.5%	2.9%
Smear negative patients	187	-	86.6%	-	7.0%
EPTB	162	-	80.5%	8.0%	11.1%

5. KEY PROGRAMMATIC GAPS

Comprehensively, this plan seeks to address five key gaps identified from epidemiological analysis, NTP reviews, evaluation of the TB surveillance system, the national prevalence survey, supervision reports and technical assistance mission reports. These gaps have been prioritized and summarised below.

5.1. Low TB Case Detection

The NTP aspires to provide universal access to TB case detection. However, the current case detection rate is 20.7% based on a recent estimate from the national prevalence survey (2013). Furthermore, less than one third of the estimated DR-TB cases are detected and enrolled in treatment, making it one of the weakest links in the programme. The proportion of childhood TB cases notified is also low and declining at 5% compared to the programme's acceptable target of 8-10%.

Additionally, only 0.2% of facilities have implemented provider-initiated, systematic TB screening of respiratory symptomatics among general OPD attendants. Of the 4,557 total health care facilities in Ghana (Table 19), only ten from Greater Accra and six from Eastern Region have benefited from sustained improvements in provider-initiated TB screening which yielded results.

Table 19: Distribution of All Health Facilities in Ghana by Type, 2013

Region	Teaching Hospitals	Hospitals	Clinics	CHPS	Health Centre	Midwife / Maternity	Mines	Polyclinic	Total
Ashanti	1	115	166	74	130	96	0	0	582
Brong-Ahafo	0	32	113	236	80	43	0	3	507
Central	1	27	65	189	62	33	0	2	379
Eastern	0	32	112	456	95	24	0	1	720
Greater Accra	1	72	270	125	20	81	0	11	580
Northern	1	29	45	163	88	8	0	4	338
Upper East	0	7	44	204	46	1	0	0	302
Upper West	0	10	12	132	69	4	0	0	227
Volta	0	29	56	196	144	16	0	2	443
Western	0	35	131	214	58	37	3	1	479
National	**4**	**388**	**1014**	**1989**	**792**	**343**	**3**	**24**	**4557**

All regions should be supported to implement lessons learnt from the TB screening interventions in a systematic, stepwise manner cascading from tertiary and regional-levels to district-level facilities.

5.2. Insufficient Laboratory Capacity to Bacteriologically Confirm TB Cases

Continuous decline of the proportion of pulmonary bacteriologically-confirmed TB cases is now at an unacceptable 49% in spite of expanded laboratory capacity across the country to perform sputum smear microscopy and a strong EQA system in place. This proves the limitation of Z-N microscopy which is the mainstay of TB diagnosis in Ghana.

5.3. Adverse Treatment Outcome

The programme has unacceptably high death rates among registered patients and intends to reduce death rates from the current 9% to less than 4%. Death rates are reportedly higher among prisoners (32.6%) and PLHIV (20%). Addressing death rates in these key populations is therefore a high priority.

5.4. Programme Management and Monitoring and Evaluation Systems

There is weak capacity at programme management levels. Increasing complexities in the management of logistics, commodities and the expanded scope of interventions require evidence from operations research or peer reviewed literature to support implementation. An evaluation of the TB surveillance system in Ghana using WHO evaluation criteria further identified gaps which the programme has not met (Table 20).[21] [22]

Table 20: Gaps in Standards of TB Surveillance in Ghana Using WHO Evaluation Criteria, 2013

Standard	Main findings	Result
C1 Surveillance data provide a direct measure of drug-resistant TB in new cases	Rifampicin susceptibility testing not done for new pulmonary TB cases	**NOT MET**
	Surveillance System currently does not include MDR-TB	
C2 Surveillance data provide a direct measure of the prevalence of HIV infection in TB cases	Coverage of HIV status of TB cases for 2012 was 77.4% nationally, less than the recommended >80% for settings with generalised epidemic state	**NOT MET**
	Coverage has improved markedly over the years	
	The target is for all TB cases to be tested for HIV	
C3 Surveillance data for children reported with TB are reliable and accurate **OR** all diagnosed childhood TB cases are reported	NTP started data collection on ages "0-4 years" and "5-14 years" in 2012 and full compliance was not achieved	**NOT MET**
	Therefore, the ratio of age groups "0-4" and "5-14" years cannot be determined	
	No nationwide inventory has been done to measure the level of under-reporting of childhood TB	

5.5. Civil Society and the Private Sector

The proportion of civil society (NGOs) and private sector contribution to the annual total TB case notified has fallen from 14.2% in 2009 to 5.6 % in 2013. Targeted interventions at high-risk populations are also weakened as a result sub-optimal performance from the civil society.

[21] Boakye Boateng K. (2013). Evaluation of Tuberculosis Surveillance System of Ghana. WHO Global Taskforce on TB Impact Measurement

[22] Boakye Boateng K. (2013). Evaluation of Tuberculosis Surveillance System of Ghana. WHO Global Taskforce on TB Impact Measurement

6. GOALS, OBJECTIVES, TARGETS AND STRATEGIC INTERVENTIONS

6.1. Introduction

This strategic plan is consistent with the Global TB Strategy endorsed by the WHA 67 resolution on health in the post-2015 sustainable development goals (SDGs). It builds on three strategic pillars:

1. Integrated, Patient-Centred Care and Prevention
2. Bold Policies and Supportive Systems
3. Intensified Research and Innovation

6.2. Principles

The guiding principles underlying the plan's implementation are:

1. Government leadership, stewardship and accountability with monitoring and evaluation by all partners;
2. A strong coalition with civil society organisations and communities (particularly the Stop TB Partnership);
3. Partnerships with other state agencies, such as the Attorney General's Department, to ensure protection and promotion of patients' rights, ethics and equity under the National Health Insurance Authority, Food and Drugs Authority (FDA) and the Public Health Act;
4. Revised strategy and targets in collaboration with WHO and other partners based on recent prevalence survey results.

6.3. Goals

1. To reduce by 20% the 2013 TB prevalence baseline level of 290 per 100,000 population by 2020 in line with the post-2015 Global TB Control Strategy.
2. To reduce by 35% the 2012 TB mortality rate baseline of 4 deaths per 100,000 population by 2020.
3. To end the TB epidemic in Ghana by 2035 without catastrophic cost due to TB-affected families.

6.4. Objectives

1. To early screen, detect and enrol into treatment all forms of notified (new cases) from 15,606 in 2013 to 37,956 by 2020, while increasing the proportion of bacteriologically confirmed pulmonary TB from 51% in 2013 to 60% by 2020.*
2. To early detect and enrol into treatment at least 85% of confirmed MDR-TB cases among new and previously treated cases by 2020.
3. To attain higher treatment success for all forms of TB from 84% in 2012 to at least 91% by 2020 through improved quality clinical care and community TB care.
4. To reduce death rates of TB/HIV co-infected cases from 20% in 2012 to 10% by 2020 and uptake of ART coverage among co-infected from 5.7% in 2013 to 37% by 2020.
5. To improve programme management; coordination, monitoring & evaluation and operations research to support treatment and screening strategies for TB/HIV.*

6.5. Indicator Definitions

6.5.1. Impact Indicators

- **TB Prevalence Rate:** Number of TB cases (all forms) per 100,000 population at a given time (Baseline, 2013);
- **TB Mortality Rate:** Number of TB deaths in the general population per 100,000 person population.

6.5.2. Outcome Indicators

- **TB Case Notification Rate (all forms):** Number of notified cases of all forms of TB (bacteriologically-confirmed plus clinically diagnosed, new and relapse) per 100,000 population;
- **Treatment Success Rate:** Percentage of all new TB cases (bacteriologically confirmed plus clinically diagnosed) successfully treated (cured plus treatment completed) among all new TB cases registered for treatment during specified period.

*The health system capacity to support detection of numbers that can lead to 20% reduction in Goal 1 above is currently limited. Expected cash inflows are expected to come from Government of Ghana and Global Fund resources only. As such, the numbers determined are based on realistic targets of what the health system can currently support.

Table 21: Goals and Impact Targets

	Impact indicators	Baseline			2015 Target	2016 Target	2017 Target	2018 Target	2019 Target	2020 Target	Source and Comments
		Value	Year	Source							
Goal 1	TB Prevalence Rate	290 per 100,000 pop.	2013	NTP/ WHO prev. survey results	290	280	268	256	244	232	NTP will conduct a TB prevalence survey.
Goal 2	TB Mortality Rate	4.4 per 100,000 pop.	2013	WHO Global Report	4.0	3.7	3.5	3.3	3.1	2.9	NTP routinely collects case fatality data. Mortality is modelled and reported in WHO Global Reports.
Goal 3	TB/HIV Mortality Rate	2 per 100,000 pop.	2013	WHO Global Report	1.8	1.7	1.6	1.5	1.4	1.3	NTP routinely collects case fatality data. Mortality is modelled and reported in WHO Global Reports.

Table 22: Objectives and Outcome Indicator Targets

Obj.	Outcome indicators	Baseline			2015 Target	2016 Target	2017 Target	2018 Target	2019 Target	2020 Target	Source and Comments
		Value	Year	Source							
Obj. 1	Case notification rate of all forms of TB per 100,000 population - bacteriologically confirmed plus clinically diagnosed, new and relapse cases (disaggregated by age <14 and >15, sex and HIV status)	60 per 100,000 pop.	2013	NTP R & R Systems	86	95	103	113	119	125	TB R & R Systems
Obj. 1	Case notification rate per 100,000 person population - bacteriologically confirmed, new and relapse cases (disaggregated by age <14 and >15 and sex)	30 per 100,000 pop.	2013	NTP R & R Systems	44	50	56	65	71	77	TB R & R Systems
Obj. 2	Treatment success rate of MDR-TB: Percentage of bacteriologically-confirmed drug resistant TB cases (RR-TB and/or MDR-TB) successfully treated	50%	2011	NTP R & R Systems	Not Due	55%	60%	65%	68%	70%	TB R & R Systems (Interim Assessment shall be used initially)
Obj. 3	Treatment success rate – all forms TB cases (disaggregated by age <14 and >15 and sex)	84%	2012	NTP R & R Systems	87%	88%	89%	90%	91%	91%	TB R & R Systems
Obj. 4	Treatment success rate – TB/HIV co-infection	73%	2012	NTP R & R Systems	75%	77%	79%	80%	81%	82%	TB R & R Systems
Obj. 4	TB/HIV Death Rate	20%	2012	NTP R&R Systems	17%	16%	15%	13%	11%	10%	TB R & R Systems

Table 23: Coverage / Output Indicators and Targets

	Coverage Output Indicators	Baseline			2015 Target	2016 Target	2017 Target	2018 Target	2019 Target	2020 Target	Source and Comments
		Value	Year	Source							
DOTS	Number of notified cases of all forms of TB - bacteriologically-confirmed plus clinically diagnosed, new and relapses	15,606	2013	NTP R & R Systems	23,153	26,211	28,870	32,990	35,615	37,956	TB R & R Systems
DOTS	Number of notified cases of all forms of TB - bacteriologically-confirmed, new and relapses cases	7,717	2013	NTP R & R Systems	11,808	13,629	15,590	18,475	20,656	22,774	TB R & R Systems
DOTS	Percentage of notified TB cases, all forms, contributed by non-NTP providers - private/non-governmental facilities	5.8% (905/ 15,606)	2013	NTP R & R Systems	8% (1852/ 23153)	10% (2621/ 26211)	12% (3464/ 28870)	14% (4619/ 32990)	17% (6054/ 35615)	20% (7591/ 37956)	TB R & R Systems
DOTS	Percentage of laboratories showing adequate performance in external quality assurance for smear microscopy among the total number of laboratories that undertake smear microscopy during the reporting period	53% (159 /300)	2013	NTP R & R Systems	65% (195 /300)	70% (210 /300)	75% (225 /300)	80% (240 /300)	85% (255 /300)	90% (270 /300)	TB R & R Systems
MDR-TB	Number of bacteriologically-confirmed, drug resistant TB cases (RR-TB and/or MDR-TB) notified	65	2013	NTP R & R Systems	137	171	205	253	294	336	TB R & R Systems
MDR-TB	Proportion of bacteriologically-confirmed drug resistant TB cases (RR-TB and/or MDR-TB) enrolled on SL treatment	41.5% (27/65)	2013	NTP R & R Systems	100% (137 /137)	100% (171 /171)	100% (205 /205)	100% (253 /253)	100% (294 /294)	100% (336 /336)	TB R & R Systems
TB / HIV	Percentage of TB patients who had an HIV test result recorded in the TB register	73% (11387/15606)	2013	NTP R & R Systems	75% (17364 /23153)	77% (20182 /26211)	80% (23096 /28870)	83% (26740 /32990)	85% (29528 /35615)	90% (33572 /37956)	TB R & R Systems
TB / HIV	Percentage of HIV-positive patients who were screened for TB in HIV care or treatment settings	20% (45217/224488)	2013	NTP R & R Systems	56% (104,666/ 185,261)	64% (122,031/ 190,944)	70% (135,774/ 194,821)	80%	85%	90%	TB R & R Systems
PSM	Percentage of reporting units reporting no stock-out of first-line anti-TB drugs on the last day of the quarter	78.7% (170/216)	2013	NTP R & R Systems	88% (190 /216)	93% (200 /216)	100% (216 /216)	100% (216 /216)	100% (216 /216)	100% (216 /216)	TB R & R Systems
Programme Management.	Number of functional diagnostic centres	300 /421	2013	NTP R & R Systems	305	310	315	320	325	330	TB R & R Systems

6.6. Strategic Interventions

6.6.1. Assessment and Prioritisation of TB Screening Strategy

Four main items informed the assessment and prioritisation of strategic interventions:

1. The programme's extensive operational experiences of active TB screening based on important programmatic key gaps as identified from epidemiological analysis and in the national prevalence survey
2. Evidence-based WHO Systematic Screening for Active Tuberculosis (2013)
3. The capacity of the health system (laboratories, x-ray equipment and human resources)
4. Characteristics and cost of the screening algorithm

Four potential settings for screening to improve TB case detection were assessed for the risk groups (key affected populations). They are:

1. Community (sub-populations with risk factors for TB, e.g. household and community contacts)
2. Hospital and health care settings
3. Residential institutions (e.g. prisons)
4. Workplaces (e.g. mines and others locations where workers are exposed to silica)

TB prevalent cases for each risk population were estimated for 2013. The total numbers to be screened and the estimated burden for each risk group were determined for each potential screening site. The size of the risk group as a percentage of the population and TB prevalence was also determined. A realistic reachable population of the risk groups informed by operational experience and published literature was estimated. Similarly, the proportion of probable TB cases likely to accept the screening strategy was determined as per the 2013 WHO Systematic Screening for Active Tuberculosis publication. The total prevalent TB cases based on the reachable and screening acceptable population for all risk groups came to 44,141 (calculated using the WHO prioritisation tool).

This assessment shows a 50% split in the burden of undiagnosed TB prevalent cases. In the general population, estimated prevalent TB cases were 22,786 comparable to the combined hospital care, residential institutions and workplace settings with estimated prevalent TB cases of 21,335. Therefore, the strategic focus of this plan is to preferentially address the low hanging fruit of TB screening at hospitals or health care settings, prisons and workplaces while simultaneously enhancing routine services. This strategy promotes a balance between feasibility of implementation, cost and TB yield for maximum impact.

The proposed interventions in this plan are not entirely new. However, the maximum potential under the routine programme conditions was not realised owing to the slow response of the health system to accept and adopt new or different ways of providing services and a new screening tool. Other barriers were human resources constraints.

Table 24 below shows the risk groups and scope of the screening strategy in the previous plan (2009-2013). The Cough Screen ➔ SSM algorithm used as a TB screening strategy has been assessed with the aid of the WHO screening prioritisation tool developed in 2013.

Table 24: TB Screening Strategy 2009 – 2013

Risk Groups	First Screening Tool: Algorithm	Second Screening Test	Diagnostic Tool	Implementing Sites
General OPD	Cough >2 weeks or Cough <1 week + Any symptom	Nil	Sputum smear / LED microscopy	40 districts
General OPD	Cough >2 weeks	Nil	Sputum smear microscopy	176 districts
PLHIV	Cough <1 week + Any symptom	Nil	Sputum smear microscopy	4 ART districts

For each risk group, the estimated number of people to be screened, the number needed to screen to detect one true case, the overall cost for screening and the cost per true case detected has been provided in Table 25 below.

Table 25: Risk Groups by Cough ➔ SSM Algorithm and Cost

Screening Algorithm	Risk Group	# People Screened	# True Cases Found	% True Cases Found	# False Positive	TP : FP	NNS per True Case	Cost for Overall Screening	Cost per True Case Detected
Cough Screen ➔SSM	General Pop	7,932,653	4471	21.35%	7,912	0.57	1,774	565,598	126
	HH Contacts	10,931	72	21.35%	11	6.83	151	873	12
	Comm. Contacts	12,393	24	21.35%	12	1.95	519	908	38
	PLHIV	171,187	1930	21.35%	162	11.90	89	14,807	8
	Diabetics	753,602	850	21.35%	750	1.13	887	54,335	64
	Gen Outpatients	301,441	340	21.35%	300	1.13	887	21,734	64
	Pregnant Woman	1,546,867	1308	21.35%	1,541	0.85	1,183	110,910	85
	Prisoners	132,211	149	21.35%	132	1.13	887	9,532	64
	Miners	13,327	23	21.35%	13	1.70	591	972	43

The TB screening strategic focus for 2015-2020 is different from that of the previous National Strategic Plan (2009-2013), and is presented in Table 26. The estimated number of people to be screened, the number needed to screen to detect one true case, the overall cost for screening and the cost per true case detected have also been provided in Table 27.

Table 26: TB Screening Strategic Focus 2015 – 2020

Risk Groups	First Screening Tool	Second Screening Test	Diagnostic Tool	Implementing Sites
Health Centre Attendants	Cough >2 weeks or Cough <2 weeks + Any symptoms	CXR (AA) if available	Smear microscopy / Clinical Diagnosis	392 Centres
Diabetics	Cough >2 weeks or Cough <2 weeks + Any symptoms	CXR (AA) if available	Smear microscopy / Clinical Diagnosis	12 Centres
PLHIV	Cough <2 weeks + Any symptoms	CXR (AA) if available	Smear microscopy / Gene Xpert	175 ART Clinics
Pregnant Women	Cough >2 weeks or Cough <2 weeks + Any symptoms	CXR (AA) if available	Smear microscopy / Clinical Diagnosis	90 high-incident districts
Household Contacts	Cough >2 weeks or Cough <2 weeks + Any symptoms		Smear microscopy / Clinical Diagnosis	Countrywide
Community Contacts	Cough >2 weeks or Cough <2 weeks + Any symptoms	CXR (AA) if available	Smear microscopy / Clinical Diagnosis	Countrywide
General Outpatients	Cough <2 weeks + Any symptoms / CXR (AA)	CXR (AA) if available	Smear microscopy / Gene Xpert	51 health care facilities
General OPD	Cough >2 weeks or Cough <2 weeks + Any symptoms	CXR	Smear microscopy / Clinical Diagnosis	156 districts
Prisoners	Any symptoms	CXR (AA) + outreach screening programme	Smear microscopy / Gene Xpert	Countrywide
Mining Districts	Any symptoms	CXR (AA) + outreach screening programme	Smear microscopy / Gene Xpert	21 districts

CXR = Chest X-ray; AA = Any Abnormality; CD = Clinical Diagnosis

Table 27: Risk Groups by Any Symptom Screen ➔ CXR ➔ SSM Algorithm by Cost

Screening Algorithm	Risk Group	# People screened	# Cases found	% True cases found	# FPs	TP:FP	NNS per case	Cost for overall screening	Cost per case detected
Any Symptom screen ➔ CXR ➔ SSM	General Pop	7,932,653	9658	46.12%	27,153	0.36	821.4	7,783,219	806
	HH Contacts	10,931	156	46.12%	36	4.30	69.9	11,188	72
	Comm. Contact	12,393	52	46.12%	42	1.22	240.2	12,278	238
	PLHIV	171,187	4168	46.12%	556	7.49	41.1	180,797	43
	Diabetics	753,602	1835	46.12%	2,573	0.71	410.7	742,380	405
	Gen Outpatients	301,441	734	46.12%	1,029	0.71	410.7	296,952	405
	Pregnant Woman	1,546,867	2825	46.12%	5,288	0.53	547.6	1,520,780	538
	Prisoners	132,211	322	46.12%	451	0.71	410.7	130,242	405
	Miners	13,327	49	46.12%	45	1.07	273.8	13,181	271

Any symptom screen ➔ GeneXpert screening algorithm will apply to screening TB among PLHIV when a scale-up plan for GeneXpert is implemented. Pregnant women will not be screened with X-rays. The framework presents guidance for context specific target setting for the programme.

Table 28: Goals, Objectives, Main Strategic Interventions and Priorities

Goals	Objectives	Main Strategic Intervention	Priority
Goal 1: To reduce by 20% the 2013 TB prevalence baseline level of 290 per 100,000 population by 2020 in line with the post-2015 Global TB Control Strategy.	**Objective 1:** To early screen, detect and enrol into treatment all forms of notified (new cases) from 15,606 in 2013 to 37,967 by 2020, while increasing the proportion of bacteriologically confirmed pulmonary TB from 51% in 2013 to 60% by 2020.	1.1 Improve health facility-based TB case finding 1.2 TB screening in key affected populations: i. Household contacts ii. Diabetics (Medical Risk Groups) iii. Children iv. Prisoners v. Miners 1.3 Improve quality of laboratory diagnosis 1.4 Improve HR capacity 1.5 Engage other private care providers 1.6 Communication strategy to reduce stigma	**1**
	Objective 2: To early detect and enrol into treatment at least 85% of confirmed MDR-TB cases among new and previously treated cases by 2020.	2.1 Early diagnosis of drug-resistant TB including universal drug susceptibility testing	
Goal 2: To reduce by 35% the 2012 TB mortality rate baseline of 4 deaths per 100,000 population by 2020.	**Objective 3:** To attain higher treatment success for all forms of TB from 84% in 2012 to at least 91% by 2020 through improved quality clinical care and community TB care.	3.1 Improve quality of clinical care of TB patients 3.2 Provide patient care and support 3.3 Improve treatment and care for DR-TB cases 3.4 Strengthen coordination and collaboration among DR-TB management teams 3.5 Community TB care 3.6 Strengthen community systems to improve TB outcomes 3.7 Timely procurement of drugs and logistics management	**2**
	Objective 4: To reduce death rates of TB/HIV co-infected cases from 20% in 2012 to 10% by 2020 and uptake of ART coverage among co-infected from 5.7% in 2013 to 37% by 2020.	4.1 Intensify TB case finding among PLHIV 4.2 TB infection control in health care facilities and prisons 4.3 Coordination of TB/HIV activities at all levels with NACP	
Goal 3: To end the TB epidemic in Ghana by 2035 without catastrophic cost due to TB-affected families.	**Objective 5:** To improve programme management; coordination, monitoring & evaluation and operations research to support treatment and screening strategies for TB/HIV.	5.1 Programme management and supervision 5.2 Monitoring and evaluation 5.3 Operations research 5.4 Promote infection control in DOTS corners, ART and MDR-TB centres and among health staff 5.5 Implement TB screening interventions in maternal health and NCD programs 5.6 Procure technical assistance	**3**

6.7. Target Populations

The TB epidemic in Ghana is generalized; therefore the target is the whole population of Ghana with special attention to specific key populations. The size of various risk groups as a percentage of the total population and as an absolute number is presented in Table 29 below. Similarly, the prevalence of TB in each risk group, total number to be screen and estimated prevalent cases are presented for each risk group in the same table. The analysis indicates that approximately 60% of the population in need of TB services or at risk of TB are reachable with the proposed screening strategy in the risks groups. The total TB cumulative number in need of services for the period of 2015 to 2020 is estimated at 435,085.

Table 29: Target Population for Various Risk Groups

Screening Site	Risk groups	Size of risk group		{Prevalence of TB in Risk Group				# To be screened	# Cases
		Risk Gp as % of pop	Size of risk group as absolute #	Prevalence of TB per 100k	Relative risk of TB	Reachable % of population	% Population accepting screening		
Community	General pop	100.0%	26442178	264	1	50%	60%	7,932,653	20,942
	Household contacts	0.6%	22307	3100	10.8	70%	70%	10,931	339
	Community contacts	0.8%	41310	902.88	3.42	50%	60%	12,393	112
Hospital and health care settings	PLHIV	0.5%	343748	5280	20	60%	83%	171,187	9,039
	Diabetics	10.0%	2644218	528	2	50%	57%	753,602	3,979
	General outpatients	4.0%	1057687	528	2	50%	57%	301,441	1,592
	Pregnant women	10.0%	2644218	396	1.5	65%	90%	1,546,867	6,126
Residential	Prisoners	0.5%	132211	528	2	100%	100%	132,211	698
Workplaces	Miners and others exposed to Silica	0.1%	26442	792	3	60%	84%	13,327	106

An important TB screening strategy for children and those under 5 years will be implemented as part of household contact investigation. It is projected to screen 489,608 community and household contacts for TB index cases within a six-year period.

Within this period, 1,367 MDR-TB cases are expected to be confirmed of whom at least 1,161 will be enrolled on treatment with available resources and capacity.

7. KEY ACTIVITIES

7.1. Case Detection and Diagnosis

The intention of this plan is to seek early diagnosis of TB, including universal drug susceptibility testing, through systematic screening of contacts and high-risk groups. The plan, therefore, has the patient at the centre and will receive the necessary inputs from case detection to achieving cure in an integrated manner (Strategic Pillar 1).

7.1.1. Improve Health Facility-Based TB Case Finding

Under the previous strategic plan, a new policy for case detection and new case detection tools were universally adopted by all facilities. These included a new case definition for smear positive TB, frontloading of smears and a reduction in the number of smears examined per patient. Algorithms for case detection and SOPs were also developed, forms revised and registers produced. Health services operations at OPDs were modified to allow for frontloading.

Health facilities were recently introduced to a new case definition for bacteriologically-confirmed, clinically-diagnosed cases which is reflected in TB surveillance tools. However, full implementation has been slow. In addition, an accelerated implementation of a provider-initiated TB screening strategy in ten facilities yielded an additional 1,300 TB cases in a year. Assuming a similar rate of detection, it is expected that systematic coverage at 100 facilities will yield approximately 13,000 new TB cases.

Activities to be implemented are listed below.

	Activities	By Whom	Process Indicator	Outcome Indicator
1	Print and disseminate revised OPD/consulting room register	MOH/NTP	Revised register disseminated	Percentage of OPD /consulting rooms using revised registers
2	Revise and print presumed TB /cough register	MOH/NTP	Registers printed	Percentage of OPD /consulting rooms using presumed TB/cough register
3	Orient staff on the use of new registers	MOH/NTP	Staff oriented	Percentage of facilities using new registers
4	Revise, print and distribute SOPs for TB case detection	MOH/NTP	SOPs distributed	Percentage of health facilities with SOPs for TB case detection
5	Orient health facilities on the use of the SOPs for TB case detection with particular emphasis on OPD staff, laboratory and DOTS corner staff	MOH/NTP	Orientation done	Percentage of health facilities using SOPs for TB case detection
6	Orient prescribers to systematically ask all patients about cough	MOH/NTP	Orientation done	Percentage of patients in consulting room register with documented evidence of cough screening
7	Provide stationery and logistics (screening tools, sputum request forms, referral forms)	MOH/NTP	Stationary and logistics provided	Percentage of health facilities without sputum request forms in consulting rooms

8	Quarterly review meetings for hospital-based case detection activities	MOH/NTP	Meetings held	Number of documented review meetings held quarterly for hospital-based case detection activities
9	Monitoring and supervision of hospital-based case detection activities.	MOH/NTP	Planned supervisory visits conducted	Percentage of documented planned supervisory visits conducted
10	Maintain recruited laboratory personnel	MOH/NTP	Contracts renewed	Percentage of laboratory personnel with renewed contracts

7.1.2. TB Screening in Key Affected Populations

i. Household Contacts

This activity has been tested with good results. It will be implemented in a structured and systematic way. Lessons from implementation in the Accra Metropolitan Area using only symptom screening tools (questionnaire) for those household contacts meeting the eligibility criteria of cough of more than two-week duration yielded 9.5% among presumed TB cases. There is evidence that 4-6% of all household contacts investigated will have TB.[23, 24]

A total of approximately 500,000 household and community contacts are expected to be screened including children less than 5 years (21,000) who will be provided with Isoniazid preventive therapy (IPT) in the six-year period of the plan's implementation.

SOPs, recording and reporting forms and contact tracing registers, which are already developed, will be printed and distributed following training of CSO and other partners. (CSOs will be significant partners during implementation.) The phased implementation will be integrated into the multi-year implementation plan of facility-based case detection. Screening will largely be conducted using a symptom screening tool and later be complimented with chest X-ray screening. Activities to be implemented are listed below.

	Activities	**By Whom**	**Process Indicator**	**Outcome Indicator**
1	Print and distribute the national guidelines and SOPs on contact investigation	MOH/NTP	Guidelines and SOPs distributed	Percentage of health facilities using guidelines and SOPs for contact investigation
2	Print and distribute the recording and reporting forms and registers for TB contact investigation activities, including IPT provided through these activities	MOH/NTP	Forms and registers distributed	Percentage of health facilities using recording and reporting forms and registers
3	Develop a multi-year national plan to implement TB contact	MOH/NTP	Plan completed	A multi-year national plan to implement TB contact

[23] S. Ottmani, M. Zignol, N. Bencheikh, L. Laâsri, L. Blanc and J. Mahjour. TB contact investigations: 12 years of experience in the National TB Programme, Morocco 1993–2004. Eastern Mediterranean Health Journal, Vol. 15, No. 3, 2009

[24] Janina Morrison, Madhukar Pai, Philip C Hopewell. Tuberculosis and latent tuberculosis infection in close contacts of people with pulmonary tuberculosis in low-income and middle-income countries: a systematic review and meta-analysis. Lancet Infect Dis 2008; 8:359-68

	investigation activities in a phased manner			investigation activities in a phased manner in place
4	Develop, print and distribute community TB screening forms	MOH/NTP	TB screening forms distributed	Percentage of health facilities using community TB screening forms
5	Develop, print and distribute posters on contact tracing and investigation to be placed in all public areas	MOH/NTP	Posters distributed	Percentage of facilities displaying posters on contact tracing and investigation
6	Conduct baseline assessment in all heath facilities	MOH/NTP	Baseline assessment completed	Percentage of health facilities that have completed their baseline assessment
7	Conduct contact and household investigations among index TB cases	MOH/NTP	Contact investigations conducted	Percentage of contacts diagnosed with TB
8	Train staff of health units, NGOs and treatment supporters according to the training plan on contact investigation	MOH/NTP	Training held	Percentage of health staff, NGOs, and treatment supporters trained
9	Support the implementation /operational costs of TB contact investigation activities in the field in line with the multi-year national plan using the Enablers' Package.	MOH/NTP	Operational costs supported	Percentage of health facilities supported in the implementation of operational costs using the Enablers' Package
10	Provide enablers to ensure the successful treatment of all active TB cases detected through TB contact investigation activities	MOH/NTP	Enablers support provided	Proportion of health facilities implementing contact investigation activities using the Enablers' Package
11	Provide IPT to all children aged <5 years and all PLHIV who are contacts of index cases but without active TB	MOH/NTP	IPT provided	Percentage of children who are TB contacts and provide with IPT
12	Quarterly review meetings for contact tracing activities and contacts who are administered IPT	MOH/NTP	Review meetings held	Number of documented quarterly review meetings held for contact tracing and IPT activities
13	Monitor and evaluate TB contact investigations and IPT completions	MOH/NTP	IPT completion monitored	Percentage of IPT completion

ii. Diabetics (Medical Risk Groups)

This is an opportunity to work with non-communicable disease (NCD) programmes to detect TB among medical risks groups. This was piloted as part of the WHO/CIDA-supported integrated package of hospital-based TB case detection improvements initiative described above as one of the NTP's best practices.

Diabetes is a growing problem in Ghana and is currently estimated to be prevalent among 6%-9% of the general population and projected to reach 15% in the next decade.[25] Among diabetics attending two clinics in the Accra Metropolitan Area, 6,802 were screened for TB. Of these, 499 were presumed TB cases and 4.6% (23) were confirmed. The capacity of all staff in

[25] Agyei-Mensah, S. and A. de-Graft Aikins, Epidemiological transition and the double burden of disease in Accra, Ghana. J Urban Health, 2010. 87(5): p. 879-97.

diabetic clinics in teaching, regional and selected district and other hospitals will be improved to systematically screen attendants for TB at least once a year. The capacity of staff in DOTS Centres will also be built to test for diabetes among TB patients.
All newly registered diabetic patients would be screened for TB likewise all new TB patients tested for diabetes. A national TB screening strategy for diabetes will be used and the surveillance tools, which have already been developed, will be deployed. Anticipated HR constraints for TB screening in busy diabetic clinics will be addressed with deployment of task-shifting officers.

Joint coordination between the NTP, the Reproductive Health Unit and the Non-Communicable Disease Programme has been proposed to ensure oversight of these activities (See 7.5.5). Activities to be implemented are listed below.

	Activities	**By Whom**	**Process Indicator**	**Outcome Indicator**
1	Standardise TB screening at diabetics clinics and provide screening tools	MOH/NTP	Standardise available screening tools in DM clinics	Percentage of diabetics clinics with screening tools
2	Train health care workers to screen for TB among diabetics	MOH/NTP	Health care workers trained	Number of facilities with trained health care workers screening patients for TB
3	Monitor and evaluate TB case finding among diabetic clinics	MOH/NTP	Monitoring reports of diabetics clinics	Percentage of patients of various medical risk groups screened (diabetics, asthmatics, renal, cancer)

iii. Children

Childhood TB has not received the attention it deserves and the capacity required to detect and treat it at the periphery level has not been determined.

The diagnosis of TB in children is not optimal. The proportion of childhood TB notified is low at 5% and declining compared to the NTP's acceptable target of 8-10%. Routine Programme data indicates that there are missed opportunities for case detection among children through outreach activities in household contacts. The treatment success of childhood TB is 62%, much lower than adults. However, a functional childhood working group has developed guidelines and a training manual which must be implemented within the programmatic context. The TB surveillance system currently reflects childhood TB.

The Mantoux/Purified Protein Derivative (PPD) test will be re-introduced to help in the diagnosis of TB in children. Health facilities will be supported with X-ray film and Gene Xpert equipment for use in diagnosing TB in children. Activities to be implemented are listed below.

	Activities	**By Whom**	**Process Indicator**	**Outcome Indicator**
1	Disseminate policy on childhood TB	GHS/NTP	Distribution list	Number of health care managers with knowledge of childhood TB policy
2	Develop a national plan to implement, within the NTP services, childhood TB management in line with the	GHS/NTP	National plan developed	National plan in place to implement, within the NTP services, childhood TB

	national policy and guidelines			management in line with the national policy and guidelines
3	Revise, print and distribute training materials	Teaching Hospital/NTP	Training materials distributed	Percentage of facilities with copies of training materials
4	Conduct training on childhood TB for paediatricians and other prescribers	NTP	Training conducted	Percentage of health staff trained on childhood TB
5	Produce information, education, and communication (IEC) materials for target groups, such as health workers, mothers, and community, on childhood TB	GHS/Stop TB Ghana	IEC materials produced	Number of IEC materials for targeted groups distributed
6	Conduct inventory of facilities' capacity to manage childhood TB	GHS/NTP	Report on inventory study	Percentage of facilities with capacity assessed
7	Integrate the childhood TB component in the implementation of contact investigation activities	NGO/NTP	Childhood TB integrated	Number of childhood TB cases diagnosed during contact investigation activities
8	Procure PPD and X-ray film	NTP	Items procured	Percentage of planned items procured
9	Procure paediatric TB drugs including IPT	GHS/NTP	Procurement done	Percentage of districts with no stock-out of paediatric TB medicines
10	Put eligible children on TB treatment or IPT	NTP	TB treatment provided	Percentage of eligible children put on TB treatment or IPT
11	Conduct outreach and active case detection among childhood contacts of index TB cases from prevalence survey	NTP	Outreach activities among childhood contacts conducted	Percentage of children screened among contacts of index TB cases from prevalence survey
12	Monitor and evaluate the TB care and control activities in children	GHS/NTP	TB care monitored and evaluated	Percentage of planned TB care and control activities in children monitored and evaluated

iv. Prisoners

Active TB screening using digital mobile X-ray will complement routine programme care in prisons. This will be done as part of joint TB/HIV collaborative activities. In this plan, prison inmates, who are cell leaders and peer educators, will be oriented to identify and report presumed TB cases as early as possible.

An SOP for screening and managing TB in prisons is in place. A TB diagnostic algorithm has been developed with the prison high command. Prisons without infirmaries will be supported with periodic mobile TB screening teams. All cases detected will be treated within the programme. All inmates on treatment being discharged will be linked to the programme in accordance with the SOPs. Prison officers who are in contact with TB cases will be screened together with their families.

Periodic review of TB in prisons will be conducted with prison high command. The engagement will be extended to cover the military and the police. Activities to be implemented are listed below.

	Activities	By Whom	Process Indicator	Outcome Indicator
1	Provide symptoms-based screening questionnaire for TB screening	MOH/NTP	Screening tools available at prison reception	Number of inmates screened
2	Engage with prisons and police high command to institutionalise TB screening among prison inmates and remands	MOH/NTP	Sensitisation meetings with prisons and police high command	Number of inmates and remands screened annually
3	Conduct training of police, prison officers and cell and block leaders in active TB case-finding activities	MOH/NTP/ Ghana Police/ Ghana Prisons	Trainings of police and prison officers and inmates conducted	Number of police, prison officers and cell and block leaders trained
4	Conduct baseline assessment of TB prevalence in all prisons	MOH/NTP/Prisons	Baseline assessment conducted	Prevalence of TB among prison populations estimated
5	Monitor and evaluate TB contacts and household investigations	MOH/NTP/Prisons	Contacts and household investigations evaluated	Percentage of contacts of prisoners diagnosed with TB who completed treatment
6	Conduct TB screening for all inmates once a year	MOH/NTP/Prisons	TB screening conducted	Percentage of TB patients diagnosed out of prisoners screened

v. Miners

The mining population was reached with routine programme activities in the previous plan. A pilot active TB screening of this risk group suggests additional cases could be detected. However, the geographical spread and difficult access to some of the population makes it risky, owing to the illegal nature of some of their activities. Lessons from the TB screening among mining population indicate that intense social mobilisation and rapid turnaround time for diagnosis is required.

The approach will be to organise periodic outreach TB screening programmes in 21 well known districts with intense mining activities to supplement routine TB services as earlier described under the NTP. A mobile team equipped with digital x-ray and Gene Xpert machine will be used for screening as follow-up to a symptom-based questionnaire as per the national diagnostic algorithm.

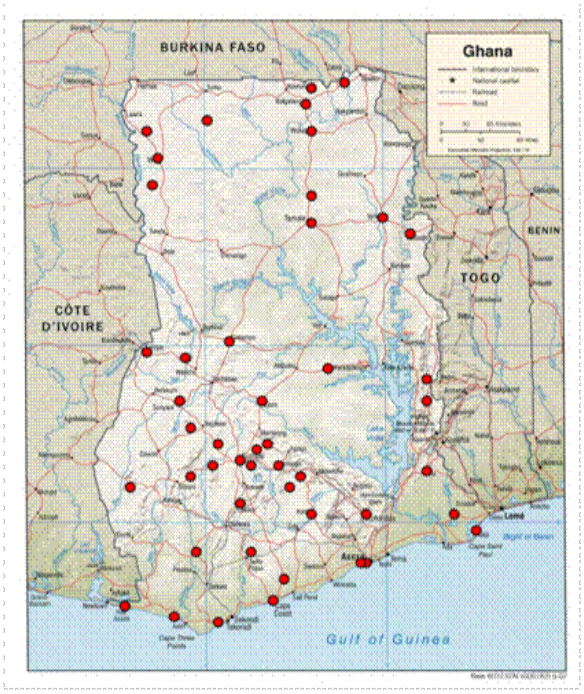
All confirmed TB cases will be referred to the closest facility and treated appropriately under the programme. Appropriate referral mechanism tools are already in place as part of routine community-based TB care activities. Activities to be implemented are listed below.

	Activities	By Whom	Process Indicator	Outcome Indicator
1	Provide TB screening tools (questionnaire)	MOH/NTP	Number of miners screened	Percentage of presumed TB cases diagnosed
2	Make provision for GeneXpert cartridges	MOH/NTP	Cartridges procured	Number of persons screened with Gene Xpert

3	Orient screening teams	MOH/NTP	Screening teams oriented	Number of screening teams oriented
4	Conduct two outreach screening activities for 21 precious minerals mining districts	MOH/NTP	Outreach screening activities conducted	Percentage of planned outreach activities conducted
5	Provide operational cost of screening teams	MOH/NTP	Operational costs provided	Frequency of screening undertaken
7	Conduct central level supervision to risk group screening activities	MOH/NTP	Central level supervision conducted	Percentage of planned supervision conducted

7.1.3. Improve Quality of Laboratory Diagnosis

A laboratory network using light and LED microscopes has been deployed to meet some of the critical gaps in the previous 2009-2013 strategic plan. A system of sputum collection and transportation to diagnostic sites supplements the network of laboratories, but need further strengthening and improvement. Sites for specimen collection will be maintained and provisions made for facilities without the appropriate sputum collection sheds.



An on-going quality assurance programme supports the existing laboratory network of light and LED microscopes already deployed. The laboratory system is linked with WHO Supranational Reference Laboratory in Germany.

Fifteen Gene Xpert machines have been introduced and the quality assurance programme in place is successful. A scale-up plan for countrywide deployment of Gene Xpert machine based on carefully selected high-burden HIV and HIV/ART treatment sites is available and will be implemented.

To further improve the TB screening strategy in facilities, nationwide diagnostic capacity will be improved using digital X-rays that connect 51 hospitals as shown in Figure 50.

Figure 50: Sites for Digital X-ray

The newer generation, low-dose radiation, digital X-ray equipment comes with computer-aided diagnostic (CAD) software that will be useful in areas where there are no radiologists. All regions will benefit from this equipment.

Findings from the recent national prevalence survey indicate that chest X-ray alone identified most of the smear positive culture positive TB cases. (See Table 30 below). Chest X-ray is thus a useful screening tool in the pathway for diagnosing tuberculosis.

Table 30: Screening and Laboratory Results (Combined) from National Prevalence Survey, 2013

Screening Results		No. of Participants Eligible for sputum	No. of Participants who submitted at least one sputum	S+ C+ TB cases	Percentage	B+* TB cases	Percentage
Symptoms	Chest X-ray						
Yes	No	1132	1105	2	3.1	13	6.4
Yes	Yes	771	765	38	59.4	67	33.2
No	Yes	4387	4306	22	34.4	85	42.1
No	Exempt	1942	1886	1	1.6	35	17.3
Yes	Exempt	66	64	1	1.6	2	1.0
Total		**8298**	**8126**	**64**	100.0	**202**	100.0

* The vast majority of those S+ were symptomatic and/or with abnormal chest X-ray. This is consistent with other surveys.
* Chest X-ray identified most of those S+ C+ and this is also consistent with other surveys.

Activities to be implemented are listed below.

	Activities	By Whom	Process Indicator	Outcome Indicator
1	Establish and maintain a technical working group (TWG) to plan and manage the laboratory improvements	MOH/NTP	TWG established	Percentage improvement in EQA performance of TB laboratories
2	Develop and implement a plan to collect, analyse and report data on success of TB lab improvements	TWG/NTP	Data reported using reporting tools	Routine reporting of lab activities
3	Hold quarterly meetings to review implementation	TWG/NTP	Meetings held	Percentage of implementation review meetings held
4	Develop/review, print and disseminate laboratory manuals, SOPs, guidelines, training manuals, recording and registration forms. Coordinate process with training and implementation of ACSM activities	MOH/NTP	Documents disseminated	Percentage of health facilities with laboratory manuals, SOPs, guidelines, training manuals, forms and implementation of ACSM activities
5	Upgrade 50 microscopy sites to meet bio-safety standards	MOH/NTP	Upgrade of sites completed	Percentage of microscopy sites meeting bio-safety standards
6	Procure 100 light microscopes and accessories	MOH/NTP	Microscopes and accessories procured	Percentage of microscopes procured and distributed
7	Provide laboratory reagents	MOH/NTP	Laboratory reagents provided	Percentage of laboratories with no stock-out of reagents
8	Provide sputum containers	MOH/NTP	Sputum containers provided	Percentage of health facilities with no stock-out of sputum containers
9	Provide new LED florescent microscopes and accessories for 200 existing functional microscopy laboratories in the public and private sector	MOH/NTP	LED florescent microscopes provided	Percentage of planned public and private sector laboratories provided with LED florescent microscopes

10	Provide 200 sputum collection sheds or booths near laboratories	MOH/NTP	Sputum booths provided near laboratories	Percentage of planned sputum booths provided near laboratories
11	Provide preventive maintenance cost for microscopes, 20 bio-safety cabinets and other equipment	MOH/NTP	Preventive maintenance conducted	Percentage of planned preventive maintenance performed on microscopes, bio-safety cabinets and other equipment
12	Conduct Supranational Panel Testing for smear microscopy: From Supranational Reference Laboratory to TB Reference Laboratories	MOH/NTP	Panel testing conducted	Percentage of regional laboratories attaining international target
13	Conduct panel testing for smear microscopy: From National Reference Laboratory to regional laboratories	MOH/NTP	Panel testing conducted	Percentage of regional laboratories attaining national target
14	Conduct panel testing: From National Reference Laboratory to district laboratories	MOH/NTP	Panel testing conducted	Percentage of district laboratories attaining national target
15	Transport sputum samples to laboratories for diagnosis	MOH/NTP	Samples transported	Percentage of samples examined which were transported from periphery
16	Train (initial and refresher) laboratory staff in regions and districts (public sector)	NTP/NRL	Training held	Number of districts and regional laboratories with trained staff
17	Train (initial & refresher) laboratory staff in private facilities	NTP/NRL	Training held	Percentage of trained laboratory staff in private sector
18	Conduct on-site evaluation and blinded re-checking of TB slides	NTP/NRL	On-site evaluation and blinded re-checking conducted	Number of facilities meeting national target
19	Implement ACSM activities to promote new technologies for improved TB diagnosis among staff and general public	MOH/NTP	ACSM activities implemented	Percentage of districts implementing ACSM strategies for TB diagnosis
20	Implement quality and safety activities for TB diagnostic services	MOH/NTP	Lab infection control activities implemented	Percentage of laboratories implementing infection control activities
21	Undertake supervisory visits to TB diagnostic centres	NTP/NRL	Planned supervisory visits undertaken	Percentage of planned diagnostic facility visits conducted
22	Implement EQA activities	NTP/NRL	Planned EQA visits undertaken	Percentage of planned EQA activities undertaken
23	Develop operational research in quality improvement of laboratories in including new technologies	NTP/Research Partners	Operational research developed	Number of operational research projects implemented
24	Procure technical assistance (TA) for laboratories	MOH/NTP	TAs Procured	Number of laboratory TA procured
25	Procure Digital X-ray equipment with CAD software	GHS/NTP	X-ray equipment procured	Percentage of planned procurement done

7.1.4. Improve Human Resources Capacity

In order to provide the minimum of optimum services with the right number and mix of staff, the necessary recruitment and competences for the human workforce must be in place. The competing demands of the limited staff, coupled with new, emerging, life-threating infectious

diseases such as Ebola, make the situation critical. This is in addition to the restriction on staff recruitment from the government. The effect is overworked and poorly motivated staff. To address specialised needs for the programme, such as well-trained respiratory physicians and biomedical scientists, the NTP is working in collaboration with the Human Resource Development Division of GHS to improve the overall health sector HR plan.

In the interim, as previously, mitigation of the HR challenge is the essential recruitment and capacity building of the critical mass of personnel using health system structures. A database of essential staff has been maintained to be absorbed into the larger health system on a permanent basis at the opportune time.

Lessons from the interim approach indicate that staff engaged to support the expanded scope of TB case detection activities have anchored and strengthened monitoring and evaluation systems in the regions, laboratories in general hospitals, outpatient departments and the HMIS. Above all, TB activities have been successfully coordinated and the programme well managed. The effect is the quality of the programme described in the situational analysis above.

Further staff capacity-building on the challenges of new technologies and tools, MDR-TB, TB/HIV, infection control, childhood TB and civil societies is required. Activities to be implemented are listed below.

	Activities	**By Whom**	**Process Indicator**	**Outcome Indicator**
1	Maintain programme assistants to meet staff shortages and assist current TB focal points in programme management at all levels	MOH/NTP	Recruitment done	Percentage of programme assistants in position
2	Maintain programme focal persons recruited at the central level: Data manager, TB/HIV, HRD, M&E staff and 2 drivers	MOH/NTP	Recruitment done	Percentage of planned key staff in position
3	Continue operational performance-based incentive for permanent programme staff	MOH/NTP	Operational performance-based incentive for CTU staff continued	Number of staff at CTU receiving operational performance-based incentives
4	Maintain laboratory assistants	MOH/NTP	Recruitment done	Percentage of laboratory assistants at post
5	Recruit task-shifting officers for facility-based case finding	MOH/NTP	Recruitment done	Percentage of officers recruited
6	Support technical assistance (international and local) missions annually to support programme implementation in HRD, M&E, ACSM, TB/HIV, Research, PAL, MDR-TB	MOH/NTP	Technical assistant provided	Percentage of planned technical assistance for various missions provided annually
7	Coordinate trainings with medical, dental & nurses councils and veterinary health services (credited continuous medical education)	MOH/Regulatory bodies	Training coordinated	Number of institutions with Credited Continuous Medical Education providing training in TB

8	Support revision of curriculum for the teaching of TB control in basic training institutions	GHS/NTP/ Medical School	Curriculum revised	Number of revised curriculum in place for the teaching of TB control
9	Conduct refresher training for national trainers and supervisors	MOH/NTP	Training conducted	Percentage of trained national trainers and supervisors that have attended refresher course
10	Revise/review training manuals and print them	GHS/NTP/ Medical School	Reviewed training manuals printed	Number of revised training manuals in place
11	Conduct refresher training for staff of 3 teaching hospitals chest units	Medical School/NTP	Refresher trainings held	Percentage of staff at teaching hospital chest units who received refresher training
12	Conduct initial and refresher training for regional and district TB teams (public health) in supervision and M&E skills	MOH/NTP	Refresher trainings held	Percentage of regional and district TB teams who received refresher training in supervision and M&E skills
13	Conduct refresher training for regional hospital staff on clinical TB and TB/HIV management, care and control	MOH/NTP	Refresher trainings held	Percentage of regional hospital staff who received refresher training on clinical TB and TB/HIV management care and control
14	Conduct refresher training for district hospital staff on clinical TB and TB/HIV management, care and control	NTP	Refresher trainings held	Percentage of district hospital staff who received refresher training on clinical TB and TB/HIV management care and control
15	Conduct initial and refresher training for regional, district and health centre level staff in nutritional assessment of TB patients	GHS/NTP	Training conducted	Percentage of regional, district, and health centre staff who received training in nutritional assessment of TB patients
16	Conduct refresher training for regional and district TB laboratory EQA team (public)	NTP/NRL	Refresher training held	Percentage of regional, and district laboratory team who received refresher training on EQA
17	Sensitise DOTS Corner staff on pharmacovigilance for TB medicines	MOH/NTP	Staff sensitised	Percentage of DOTS Corner staff sensitized on pharmacovigilance for TB medicines
18	Train 2 doctors at the College of Physicians and Surgeons to serve as the referral clinician and paediatrician and to support NTP clinical supervision (provide annual fees)	MOH/NTP	Training held	Number of doctors at the College of Physicians and Surgeons who are trained to serve as the referral clinician and paediatrician and to support NTP clinical supervision
19	Conduct initial and refresher trainings for general medical doctors for TB care in co-morbidities	MOH/NTP	Training held	Percentage of general medical doctors who received refresher trainings for TB care in co-morbidities
20	Train health workers at all levels in the Logistics Management Information System for TB commodities	SSDM/NTP	Training held	Percentage of health workers trained in the Logistics Management Information System for TB commodities
21	Train sub-district staff on use of routine information system	MOH/NTP	Training held	Percentage of sub-district staff trained on the use of routine information system
22	Participate in advanced level training for national and regional programme management including members of TWGs inclusive of study tours, courses and international conferences	MOH/NTP	Training held	Percentage of national, regional and TWG members who participated in advanced level training, study tours, courses and international conferences

23	Train key staff at all levels to use the electronic database system	MOH/NTP	Training held	Percentage of key staff trained to use the electronic database system
24	Incorporate TB treatment guidelines into pre-service institutions training curricula	MOH/NTP	TB treatment guidelines incorporated into curricula of pre-service training institutions	Percentage of pre-service training institutions with TB treatment guidelines incorporated into training curricula

7.1.5. Engage Other Private Care Providers

Since 2003, the NTP has engaged the private health sector in TB control activities ensuring standardized care for TB patients. The motivation for this approach is to extend TB service coverage and improve access to TB services giving the patients the choice of where to receive treatment. So far, 108 faith-based facilities and 40 private laboratories have been engaged. These providers have been integrated into the NTP and adequately receive support by way of TB commodities, supervision and programme stationery for reporting.

Alternate health care providers, such as religious healers, traditional healers, spiritualists, herbalists, etc., also constitute a significant source of health care delivery in Ghana. The private sector contribution to TB case notification is described under the situational analysis above. Existing SOPs to engage the private sector will be revised and updated. The private sector will continue to receive capacity building programme updates and the necessary logistics within the plan period.

The majority of the independent (stand-alone) and private laboratories are located in the urban centres, notably Accra, Kumasi, and other regional capitals, and only 22% (40 out of 325) perform TB microscopy. Activities to be implemented are listed below.

	Activities	**By Whom**	**Process Indicator**	**Outcome Indicator**
1	Revise, print and disseminate SOPs for engaging other providers	GHS/NTP	SOPs disseminated	Percentage of health facilities using SOPs for engaging other providers
2	Sensitisation meetings with private providers including alternate care providers	GHS/Society of Private Practitioners/ Stakeholders	Meetings held	Percentage of private providers that attended sensitisation meetings
3	Preparatory activities and mapping for engagement of other care providers in each district	GHS/Stakeholders	Mapping done	Percentage of districts with mapping of other care providers
4	Initial and refresher training for private providers in TB care and management	GHS/Society of Private Practitioners	Training conducted	Percentage of private providers trained in TB care and management
5	Conduct national level advocacy meeting with pharmacies and chemical sellers	NTP/Pharmaceutical Society of Ghana (PSG)	Meetings held	Percentage of pharmacies and chemical sellers groups represented at national-level advocacy meeting
6	Initial and refresher training for pharmacies and chemical sellers in all regions	GHS/PSG	Training conducted	Percentage of pharmacies and chemical sellers trained

7	Accredit additional private clinics to start diagnosis and treatment of TB patients	GHS/Society of Private Practitioners	Private clinics accredited	Percentage of additional private clinics accredited to start diagnosis and treatment of TB patients
8	Refurbish/repair private laboratories and clinics	GHS	Refurbishment completed	Number of private laboratories and clinics refurbished
9	Provide diagnostic equipment including fluorescent microscopes, logistics and reagents to private sector laboratories	MOH/Society of Private Practitioners/ Stakeholders	Diagnostic equipment provided	Percentage of private sector laboratories provided with diagnostic equipment including fluorescent microscopes, logistics and reagents
10	Provide enablers to TB patients in the private sector	MOH/NTP	Enablers provided	Percentage of TB patients in private sector receiving enablers
11	Provide enablers for private sector providers	MOH/NTP	Enablers provided	Percentage of private facilities receiving enablers
12	Hold quarterly review meetings with private providers	GHS/stakeholders	Meetings held	Percentage of private providers attending review meeting
13	Conduct supervision and monitoring at all levels	GHS	Supervision and monitoring conducted	Percentage of planned activities monitored and evaluated
14	Develop, print and disseminate IEC materials for private providers	GHS	IEC materials disseminated	Percentage of private providers using IEC materials
15	Conduct training for alternate care providers in CBTC and ACSM activities	NTP/Stop TB Partnership	Training held	Percentage of alternate care providers engaged in CBTC and ACSM activities

7.1.6. ACSM: Communication Strategy to Reduce Stigma

A comprehensive national TB strategic communication plan developed by all stakeholders is available. It is based on the situational analysis and on-going operations research, such as knowledge, attitudes and practices (KAP) studies of TB and assessments of client satisfaction of services. This will form the bedrock of the next phase of TB educational activities.

However, the first three years of the plan will focus on supporting TB case detection and treatment adherence strategies and addressing specific stigma issues as priority interventions. This will be supported and emphasized by annual World TB Day (WTBD) activities at all levels of the health delivery system. The strategy is to put TB back on the agenda of health care managers at least once in a year. All activities will be implemented with stakeholders including civil society organisations.

A robust communication strategy will ensure that the TB message is disseminated far and wide to all who need to hear it making use of new technologies of mass communication and social media which have become vital information dissemination tools in this era of low cost and high impact mobile technology. Activities to be implemented are listed below.

	Activities	By Whom	Process Indicator	Outcome Indicator
Advocacy				
1	Build capacity for mass media (journalists) to disseminate TB and TB/HIV messages	GHS/NTP	Capacity built	Percentage of media houses with journalists trained in TB and TB/HIV information dissemination
2	Engage and provide support to professional associations (medical, nursing, laboratory) to organize seminars and continuing medical education for their members and for behaviour change communication outreach activities	GHS/NTP	Professional associations supported and engaged	Number of targeted professional associations supported and engaged to organize seminars and continuing medical education for their members and for behaviour change communication outreach activities
3	Create awareness for chiefs and parliamentarians as TB advocates	Stop TB Ghana/NGO's	Advocates identified and awareness created	Number of chiefs and parliamentarians advocating for TB
4	Organize and support MOH/NTP high profile visits to regions and districts	GHS/NTP	High profile visits supported	Percentage of scheduled high profile visits undertaken
5	Provide support to national TB advocates to champion TB issues	GHS/NTP	Support provided	Number of planned support for TB advocates provided
Communication				
6	Produce advocacy and IEC materials targeted at patients, communities, NGOs, policy makers and health staff to improve TB knowledge and support for TB activities	GHS/NTP/ Stop TB Ghana	Advocacy and IEC materials produced	Percentage of targeted groups provided with advocacy and IEC materials
7	Develop broadcast materials and launch airtime spots for radio and television	GHS/NTP	Broadcast materials developed	Percentage of planned airtime spots for radio and television achieved
8	Launch and commemorate WTBD at national, regional and district levels	GHS/NTP/ NGO's	WTBD commemorated	Number of WTBD commemorations held
9	Organize press conferences	GHS/NTP/ NGO's	Press conferences organised	Percentage of planned press conferences achieved
Social Mobilisation				
10	Undertake community outreach programmes for leaders in all districts	NGO's	Community outreach programmes undertaken	Percentage of planned community outreach programmes for leaders in all districts achieved
11	Mobilise community and civil society to undertake community outreach through contracts with NGOs and civil society	NGOs/CBO /Civil society	Community and civil society mobilised	Percentage of planned community outreach and mobilisation activities achieved
12	Conduct supervision, monitoring and evaluation of ACSM activities	GHS/NTP/ NGO's	ACSM activities supervised, monitored and evaluated	Percentage of planned supervision, monitoring and evaluation of ACSM activities achieved
Other ACSM Activities				
13	Organize ACSM TWG meetings	GHS/NTP	TWG meetings held	Number of planned TWG meetings held
14	Procure TA for ACSM activities	GHS/NTP	TA procured	TA for ACSM conducted

15	Conduct evaluation /assessment of ACSM activities (KAP survey, additional cases from household TB screening)	GHS/Stakeholders	ACSM evaluation conducted	Percentage of planned evaluations of ACSM activities achieved

7.2. Drug-Resistant Tuberculosis

The goal of this intervention is to provide early detection and universal drug susceptibility testing for all patients.
In the previous plan, diagnostic capacity for DR-TB in Ghana was improved with infrastructure, equipment and human resource capacity building. DR-TB diagnostic capacity was fully completed in two laboratories – Korle Bu Teaching Hospital Chest Clinic Laboratory and Koforidua Regional Hospital Laboratory. There are 13 Gene Xpert machines strategically located in regional and selected district hospitals. Two more are located in mobile diagnostic vans for field-related screening activities. A Gene Xpert scale-up plan, developed with the assistance of external consultants, will be implemented. All drug-resistant diagnostic services receive quality assurance support from Borstel Supranational Reference Laboratory. Internal and external quality assurance programmes will continue.

In this plan, the capacity for culture services in all regional hospitals will be improved for early detection of drug-resistant TB for all categories of retreatment cases. Key activities implemented under the previous plan will be enhanced and some maintained. Activities to be implemented are listed below.

	Activities	**By Whom**	**Process Indicators**	**Outcome Indicator**
1	Upgrade 5 laboratories to biosafety level (BSL)-3 status	MOH/NTP	Laboratories upgraded	Percentage of planned laboratories upgraded to BSL-3
2	Ensure BSL-3 certification to conform to WHO guidelines	MOH/NTP	Certification accredited	Percentage of planned laboratories with accredited BSL-3 certification
3	Provide liquid TB culture equipment and accessories for 5 upgraded laboratories	MOH/NTP	Equipment provided	Percentage of planned laboratories provided with liquid TB culture equipment and accessories
4	Provide and distribute laboratory supplies and reagents for 7 culture labs	MOH/NTP	Equipment distributed	Percentage of planned laboratories with lab supplies and reagents for culture
5	Provide standard equipment for 5 new culture sites to perform molecular tests (Line Probe Assay)	MOH/NTP	Laboratory equipment to perform molecular tests provided	Percentage of planned laboratories performing molecular tests
6	Provide and distribute supplies for molecular tests in 7 laboratories	MOH/NTP	Supplies provided	Percentage of planned supplies for molecular tests provided
7	Provide preventive maintenance service for liquid culture equipment, 13 bio-safety cabinets and other equipment	MOH/NTP	Maintenance service provided	Percentage of planned preventive maintenance services executed
8	Conduct calibration of existing equipment	MOH/NTP	Calibration conducted	Percentage of equipment passing calibration tests

9	Conduct Supranational Panel Testing for culture, DST and molecular tests: From Supranational Reference Laboratory to National TB Reference Laboratory	MOH/NTP	Panel testing conducted	Percentage of culture laboratories attaining international target
10	Transport samples (for smear and culture) to laboratories for diagnosis	MOH/NTP	Samples transported	Percentage of labs with links to transport samples for smear and culture
11	Train (initial and refresher) staff of culture and molecular laboratories	MOH/NTP	Training held	Number of culture and molecular laboratories with trained staff
12	Conduct quality assurance assessments of culture and molecular laboratories	MOH/NTP	Quality assessments done	Percentage of culture and molecular laboratories receiving quality assurance visits
13	Implement ACSM activities to promote culture and molecular technologies for improved TB diagnosis among staff and general public	MOH/NTP	ACSM activities implemented	Percentage of regional facilities implementing ACSM strategies for TB culture and molecular services
14	Implement quality and safety activities for culture and molecular diagnostic services	MOH/NTP	Laboratory infection control activities implemented	Percentage of laboratories implementing infection control activities
15	Undertake supervisory visits to TB culture and molecular laboratories	NTP/NRL	Planned supervisory visits undertaken	Percentage of planned culture and molecular laboratories visited
16	Develop operational research in quality improvement of culture and molecular laboratories in including new technologies	NTP/NRL/ Research Partners	Operational research developed	Number of operational research activities implemented
17	Procure TA for culture and molecular laboratories	MOH/NTP	TA procured	Number of laboratory TA conducted
18	Establish additional Gene Xpert sites	MOH/NTP	Gene Xpert machines procured	New Gene Xpert sites functional
19	Procure TA for line probe assay and Gene Xpert	MOH/Partners	TA procured	TA for Gene Xpert conducted

7.3. Treatment

The goal of this intervention is to provide treatment to all people with TB including drug-resistant TB, and to provide patient support to minimise risk of death, as efforts for TB case detection are intensified. The predictable, timely supply of TB commodities, patient care and support is an essential component of care.

High Body Mass Index (BMI) has been shown to be protective against TB among HIV-uninfected as well as against disease progression and mortality among those infected with HIV. Low BMI could crudely be used as a surrogate marker of risk of TB death. Of patients registering for TB treatment, 51% are malnourished.[26]

[26] Dodor E. Evaluation of nutritional status of new tuberculosis patients in the Effia-Nkwanta Regional Hospital. Ghana Med. J. 2008;42(1):22-8

7.3.1. Improve Quality of Clinical Care of TB Patients

In the previous plan, efforts to improve quality of clinical care of TB patients by using BMI as part of risk assessment was started but coverage was low (5% of facilities providing clinical care). The target to train at least one doctor (to be called TB Referral Clinician) in management of TB and its co-morbidities in each of the 216 districts and 10 regions could not be met owing to funding challenges. In addition, clinical supervision and mortality audits were not fully deployed owing to slow response from clinical care services. The health systems barriers were largely overcome when task-shifting officers were proposed to support TB care.

Other care and support, such as providing food by prescription to all patients that were moderately or acutely malnourished including pregnant women and children affected by TB, was effectively implemented in collaboration with the Nutrition Department of the Ghana Health Service.

While all patients detected are put on treatment, accelerated coverage of quality clinical care for TB patients in all facilities is envisaged in the current plan. Activities to be implemented are listed below.

	Activities	By Whom	Process Indicator	Outcome Indicator
1	Build and decentralize the capacity to attend to TB complications in all hospitals	NTP/THs	Capacity built	Percentage of hospitals with capacity to attend to TB complications
2	Train medical officers as referral clinicians in the management of TB co-morbidities and DR-TB	NTP/THs	Referral clinicians trained	Number of regions with trained referral clinicians
3	Train TB physician specialists at the Ghana College of Physicians to support TB clinical care and supervision	MOH/NTP	TB physician specialists trained	Number of clinical supervision visits undertaken by national-level TB physician specialist
4	Conduct initial and refresher trainings of general medical doctors for TB care and management of co-morbidities	NTP/ICD/ THs	General medical officers trained	Percentage of general medical officers trained
5	Support national TB clinician to provide clinical management supervision to regional and district hospitals	NTP/ICD/ THs	Supervision conducted	Percentage of planned supervisory visits conducted
6	Manage other clinical conditions among TB patients	GHS/NTP	Other clinical conditions managed	Percentage of patients with other clinical conditions managed
7	Institute monthly TB mortality audits in institutions	NTP/ICD/ THs	TB mortality audit instituted	Percentage of institutions in which TB mortality audit is conducted
8	Procure diagnostic and other equipment to investigate for TB and other clinical conditions	GHS/NTP	Diagnostic and other equipment procured	Percentage of planned diagnostic and other equipment procured
9	Procure equipment and logistics for the management of complication of TB such as pleural and pericardial effusions	GHS/NTP	Equipment and logistics procured	Percentage of equipment and logistics procured

10	Adopt, print and distribute nutritional guidelines to DOTS Corners	NTP/Nutrition Department	Nutritional guidelines distributed	Percentage of DOTS Corners with nutritional guidelines
11	Procure scales with stadiometers for nutritional measurements	GHS/NTP	Scales procured	Percentage of facilities with procured scales
12	Train health care providers at DOTS on nutritional assessment counselling and support (NACS) skills	NTP/Nutrition Department	Health care providers trained	Percentage of health care providers trained
13	Develop and print nutrition specific education materials	NTP/Nutrition Department	Education materials on nutrition printed	Number of education materials printed
14	Procure high-energy, ready-to-use foods (RUTF) and fortified blended foods (FBF) as per national guidelines	GHS/NTP	RUTF and FBF procured	Number of clients on RUTF and FBF
15	Conduct supervision and monitoring activities	GHS/NTP	Supervision and monitoring activities conducted	Percentage of planned supervisory and monitoring activities conducted
16	Conduct evaluation of NACS impact on patient care	GHS/NTP	Patient care evaluated	Report on evaluation of patient care in place

7.3.2. Provide Patient Care and Support

Patient care and support is an integral and essential component of TB control services. It removes financial and geographic inaccessibility barriers to TB care services since most of the patients are poor and/or live in remote areas. External review report[8] of implementation of the 2009-2013 strategic plan attributed the success of the NTP, in large part, to the care and support component of the programme (referred to above as the Enablers' Package).

Enablers are provided to patients and to those supporting patient care to achieve a cure. Health care workers provide the following additional activities in support of patient care: pre-treatment home verification; defaulter prevention visits at months 2, 5 and 6; and supervision and supervisory support of community volunteers. With the support of the Enablers' Package, community-based volunteers provide daily directly observed therapy, community education and psychosocial support. They also make referrals, accompany suspected TB cases to diagnostic sites and participate in review meetings. The enablers have removed the financial inaccessibility to TB services for patients and reduced operational cost of care of patients for health care providers and institutions. Activities to be implemented are listed below.

	Activities	**By Whom**	**Process Indicator**	**Outcome Indicator**
1	Provide enablers, inclusive of health insurance premiums, to patients	MOH/NTP	Patient enablers provided	Percentage of TB patients with active membership for health insurance
2	Provide enablers to health care providers for additional work in ensuring patient treatment adherence and completion of treatment	MOH/NTP	Health care worker enablers provided	Percentage of facilities receiving health care provider enablers
3	Follow up patients from neighbouring countries who access free TB care in Ghana	NTP/DHMT	Cross-border activities conducted	Number of patients from neighbouring countries followed up

4	Expand DOTS in the public and private sectors	MOH/NTP	DOTS expansion conducted	Number of new facilities from public and private sectors providing TB care

7.3.3. Improve Treatment and Care of Drug-Resistant TB Cases

There is an obvious treatment gap for DR-TB as indicated by the findings of the epidemiological analysis above and by external review of the NTP.[8] While a number of factors contributing to the problem have been resolved, such as the non-availability of second-line drugs, the absence of treatment guidelines and low human resource capacity, the programme is still confronted with the reluctance of personnel to manage DR-TB owing to the associated risk and the absence of incentives.

Notwithstanding, structures have been put in place to enrol patients into treatment programme.

A central clinical DR-TB team located at Korle Bu Teaching Hospital provides continuous supervision, support and mentoring to regional DR-TB management teams. The programme has enrolled 27 persons on treatment since 2013. This is much lower than the total number diagnosed since 2011 which is 96. This plan seeks to accelerate and improve care and support of DR-TB treatment while implementing activities that allay the fears of health personnel.

Care and support of DR-TB will be implemented within the framework of country guidelines which is aligned with the updated WHO guidelines for management of DR-TB. Key activities to be implemented include:

	Activities	**By Whom**	**Process Indicators**	**Outcome Indicator**
1	Review and update national DR-TB guidelines with an international consultant	MOH/NTP	DR-TB guidelines reviewed	Reviewed DR-TB document available
2	Develop case-based medical information system (MIS) for the programmatic management of drug-resistant TB (PMDT) with an international consultant	MOH/NTP/ Partners	Case-based DR-TB MIS developed	Functional case-based MIS for PMDT
3	Deploy case-based MIS for DR-TB in treatment sites	MOH/NTP	MIS for DR-TB deployed	Percentage of treatment sites utilising MIS for DR-TB
4	Rehabilitate regional hospital wards to manage complicated DR-TB cases	MOH/NTP	Hospital wards rehabilitated	Number of regional hospital wards rehabilitated
5	Print DR-TB guidelines and SOPs	MOH/NTP	DR-TB guidelines and SOPs printed	Percentage of DR-TB treatment sites with printed documents
6	Conduct international study tours to DR-TB centres of excellence	MOH/NTP	Study tours conducted	Number of study tours conducted
7	Train medical officers on clinical management of DR-TB patients in international courses	MOH/NTP	Medical officers trained	Percentage of medical officers trained
8	Train medical officers and health staff in PMDT	MOH/NTP	Health providers trained	Number of health providers trained
9	Purchase second-line TB medicines from the Global Drug Facility (GDF)	MOH/NTP	Second-line TB medicines purchased	Percentage of treatment sites reporting no stock-out of second-line TB medicines

10	Green Light Committee support to Ghana for PMDT	MOH/NTP	Assistance obtained	Number of planned GLC missions completed
11	Monitor and evaluate PMDT	MOH/NTP	DR-TB evaluated	Evaluation report available
12	Conduct a drug resistance survey	MOH/NTP	Drug resistance survey conducted	Survey report available
13	Provide enablers to DR-TB patients and providers	MOH/NTP	Enablers provided	Percentage of patients and DR-TB treatment centres provided with enablers
14	Provide incentives for treatment completion	MOH/NTP	Incentives provided	Percentage of DR-TB patients receiving incentives for treatment completion
15	Provide toll-free telephone services at NTP for patient support services	MOH/NTP	Toll-free telephone service established	Number of calls received requesting support
16	Provide enablers to CBTC providers/volunteers for DR-TB care in the community	MOH/NTP	Enablers provided	Number of CBTC providers/volunteers provided with enablers

7.3.4. Strengthen Coordination and Collaboration among Drug-Resistant TB Management Teams

Current models of care for DR-TB patients recommend an ambulatory care approach. A central MDR-TB team exists to coordinate enrolment and treatment across the country from the Korle Bu Teaching Hospital. This team provides continuous supervision, support and mentoring to the regional MDR-TB management teams that report to the Central TB Unit.

Patients are managed in the community by clinical care teams in designated facilities close to the patient. These teams are supervised by regional hospital MDR-TB teams and they collaborate and share knowledge to continually upgrade their skills. Continuous coordination and collaboration between these clinical care teams will improve the quality of care provided to patients. It is important that cross border activities are implemented where needed to support DR-TB patients as well. Key activities to be implemented include:

	Activities	**By Whom**	**Process Indicators**	**Outcome Indicator**
1	Designate a focal person, within the NTP Central Unit, for Programmatic Management of Drug Resistant TB (PMDT)	MOH/NTP	Focal person identified	Designated focal person operational
2	Conduct regular DR-TB panel meetings	GHS/Teaching Hospitals (THs)	Meetings conducted	Percentage of diagnosed MDR-TB patients enrolled on treatment
3	Conduct coordination meetings of MDR-TB care	Stakeholders	Meetings conducted	Percentage of planned meetings conducted
4	Conduct bi-annual DR-TB review meeting	MOH/NTP	Meetings conducted	Percentage of planned meetings conducted

7.3.5. Community TB Care

Community-based care brings TB care services close to the patient's home. A successful operational partnership has been developed between Ghana Health Service and civil society

organisations for TB control. In the previous plan, this was proven particularly relevant in hard to reach areas and contributed to low adverse treatment outcomes.

In this plan, the focus will be to further develop capacity for the Community Health Planning Services (CHPS) in 90 high-incident districts including all mining districts and border districts. CHPS is a concept that places a Community Health Officer within the community, supported by local, community-based volunteers. Community officers and volunteers in a total of 540 CHPS zones from these high-incident districts will receive capacity development to support the TB screening strategy. Activities to be implemented are listed below.

	Activities	By Whom	Process Indicator	Outcome Indicator
1	Revise, print and disseminate CB-DOTS operational guidelines	MOH/NTP	Operational guidelines printed and disseminated	Percentage of CHPS zones with CB DOTS operational guidelines
2	Map all CHPS zones in 90 high incident districts	MOH/NTP	Mapping of CHPS zones completed	Number of CHPS zones per region
3	Initial and refresher training for Community Health Officers (CHOs)	MOH/NTP	CHOs trained	Percentage of CHPS zones with trained CHOs
4	Provide educational materials to community-based organisations	MOH/NTP	Educational materials provided	Percentage of CBOs displaying educational materials in their communities
5	Provide operational support for CHOs to undertake supervision and monitoring of CB-DOTS activities, sputum collection and transportation	MOH/NTP/	Operational cost provided	Number of CB-DOTS supervisory visits undertaken by CHOs
6	Conduct quarterly review meetings	MOH/NTP	Quarterly review meetings held	Percentage of CHPS zones attending quarterly reviews

7.3.6. Strengthen Community Systems to Improve TB Outcomes

Community-based TB care is currently the bedrock of TB control in Ghana. Over 60% of patients are treated in the community with support from community-based organisations, small NGOs and faith-based organisations. These systems will be strengthened to provide better support.

Civil society organisations have specific capacity in TB control and have contributed significantly to case detection in Ghana. Their competencies include reaching out to vulnerable groups, mobilizing communities, channelling information, helping to create demand for care, developing effective service delivery strategies and addressing determinants of the TB epidemic.

Public-private mix DOTS (PPM-DOTS) in Ghana has also improved national coverage of TB services. With the growing strength of the private health sector in Ghana, more private providers will be engaged to provide TB services.

Engagement of and capacity building for these private providers, CBOs and NGOs will be strengthened using the previously developed Operational Guidelines for PPM-DOTS in Ghana

as a tool. This will improve patient access to health providers in the community to ensure better treatment outcomes. Key activities to be implemented include:

	Activities	By Whom	Process Indicator	Outcome Indicator
1	Provide Ghana Stop TB Partnership and Omanhene (Chiefs) with material resources to support activities and services	MOH/NTP	Material resources provided	Number of partners strengthened with material resources
2	Conduct training for project design, management, accountability and accounting for NGOs	MOH/NTP	Training conducted	Percentage of NGOs trained
3	Conduct national consultative meetings for partnerships	Stop TB Partnership	Meetings conducted	Percentage of partners for which consultative meetings are conducted
4	Conduct quarterly coordination linkages sessions between NGOs and regional coordination bodies of health sector	MOH/NTP/ NGOs	Coordination sessions held	Number of coordination sessions held
5	Conduct training for partnerships on community-based activities and services (ACSM, contact tracing, TB screening leadership) for members of NGOs	MOH/NTP/ NGOs	Trainings conducted	Percentage of NGOs supporting TB control activities of those trained
6	Provide enablers (operational costs) to support partnership activities (sputum collection and transportation)	MOH/NTP	Operational costs provided	Percentage of partners provided with operational costs
7	Provide educational materials to NGOs for individuals and community groups	MOH/NTP	Educational materials provided	Number of individuals and groups provided with educational materials
8	Conduct supervision and monitoring of partnerships activities	MOH/NTP	Supervisory and monitoring visits conducted	Percentage of partners monitored and supervised
9	Train partners in information management and monitoring and evaluation	MOH/NTP	Partners trained	Percentage of partners trained in information management and monitoring and evaluation
10	Print and disseminate Operational Guidelines for PPM-DOTS in Ghana	MOH/NTP	Operational Guidelines printed and disseminated	Number of private providers engaged in TB control using Operational Guidelines
11	Engage more civil society organisations and enhance their capacity for TB control	NTP/Stop TB Partnership	More CSOs engaged	Number of new CSOs working in TB control
12	Promote innovative TB case-finding interventions through activities of CSOs	MOH/NTP	Logistics provided	Innovative case-finding interventions implemented through CSOs
13	Develop, print and disseminate operational guidelines for scaling up PPM DOTS	NACP/NTP	Referral systems established	Operational guidelines for PPM DOTS scale up in use
14	Conduct national-level advocacy with private health service providers	NACP/NTP	Rapid diagnostic tools provided	New private sector facilities providing TB care services

15	Build capacity and accredit private health service providers for TB control	NACP/NTP	Monitoring and evaluation conducted	Private health service providers engaged in TB services
16	Engage alternate care providers for TB control	NTP/Traditional Medicine Board	Alternate care providers engaged	Percentage of alternate care providers engaged in TB control
17	Support, monitor and evaluate civil society and private sector activities	NTP/Stop TB Partnership	Monitoring visits to CSOs and private providers	Percentage of planned monitoring and support visits undertaken

7.3.7. Timely Procurement of Drugs and Logistics Management

Medicines are key to the treatment of TB patients. Poor quality medicines put TB patients at great risk and irrational use results in poor treatment outcomes and drug resistance. Proper management of medicines and other TB programme logistics ensures access to services in an uninterrupted manner for the benefit of all.

The MOH/GHS system has a proven track record of procuring TB medicines and storing them for efficient distribution. A Logistics Management Information Systems (LMIS) has been developed for TB medicines and other commodities in collaboration with the USAID-funded John Snow, Inc. DELIVER Project as part of health systems strengthening. Capacity building for all regional supply and logistics teams is currently ongoing to ensure efficient use of this system. In addition, TB medicines pharmacovigilance system has been established with the support of the Ghana Food and Drugs Authority (FDA). Regional pharmacovigilance teams have been trained and reporting tools are in place at the regional level. Further strengthening of this system is required by building the capacity of DOTS Corner staff at the district and sub-district levels. This will ensure early reporting of adverse events associated with TB medicines especially with the introduction of second-line TB medicines for MDR-TB treatment. Key activities to be implemented are:

	Activities	**By Whom**	**Process Indicators**	**Outcome Indicator**
1	Revise, print and disseminate SOPs for the LMIS for TB medicines	MOH/NTP	SOPs disseminated	Percentage of TB drug management facilities reporting use of SOPs for LMIS
2	Assess the logistic system every two years	MOH/NTP	Assessment conducted	Logistics system evaluated and strengthened
3	Train health workers at all levels in LMIS for TB commodities	MOH/NTP	Training conducted	Percentage of health facilities with staff trained in LMIS
4	Sensitise DOTS Corner staff on pharmacovigilance for TB medicines	MOH/NTP	Sensitisation meetings held	Percentage of DOTS Corners with trained staff on TB pharmacovigilance
5	Procure and acquire buffer stock of first-line TB medicines for adult TB patients through GDF	MOH/NTP	First-line TB medicines procured	Number of districts reporting no stock-out of TB medicines
6	Procure first-line medicines for children	MOH/NTP	First-line TB medicines for children procured	Number of districts reporting no stock-out of TB medicines for children

7	Procure and acquire buffer stock of second-line TB medicines for DR-TB patients through GDF	MOH/NTP	Second-line TB medicines procured	Number of treatment sites reporting no stock-out of second-line TB medicines
8	Provide cupboards for drug storage at the facility level	GHS/NTP	Cupboards provided	Percentage of DOTs Corners /health facilities provided with cupboards for drug storage

7.4. TB/HIV Interventions

A joint planning and implementation guidelines document developed by TB, HIV and other partners exists and serves as a framework to implement TB/HIV activities for this plan. The revised document was produced in 2014 following the review of previously implemented TB/HIV activities and gaps from the epidemiological analysis of TB and HIV programmes. It also addresses recommendations of an external TB/HIV review undertaken as part of NTP's 2013 comprehensive review.

The TB and HIV/AIDS programmes are assigned specific activities under TB/HIV collaborative activities in addition to common integrated implementation arrangements. NTP will continue to promote intensified TB case-finding among PLHIV within the context of implementing the three I's (intensified case-finding, Isoniazid preventive therapy, and infection control) using new lessons gained from implementing the previous plan. The coverage of active TB screening in PLHIV is low and not systematically organised. A new diagnostic TB screening algorithm developed to reflect the importance of Gene Xpert MTB/RIF and X-ray as screening tools for TB in PLHIV is not widely circulated and staff are not adequately sensitised.

TB diagnosis among PLHIV will be improved with the scale up of Gene Xpert equipment in all regional hospitals. A scale-up plan to improve access to TB diagnosis for PLHIV has been developed targeting 38 high-burden HIV districts. ART services will be integrated into DOTS Corners, and TB treatment will be provided from ART centres. The TB and HIV reporting systems are already integrated into DHIMS 2.

7.4.1. Intensify TB Case-Finding among PLHIV

Early detection of TB among PLHIV and subsequent management will reduce TB death rates among the co-infected. Scale up of diagnostic capacity for TB diagnosis among PLHIV is planned for 175 ART clinics. SOPs to improve screening of TB among PLHIV have been produced but not widely distributed. Capacity building to improve their use will be enhanced. The FAST concept for TB infection control will be applied to improve case detection (FAST is a concept for implementing TB infection control practices involving **F**inding TB suspects quickly; **A**ctively screening them; **S**eparating them; and promptly enrolling them into **T**reatment). Linkages between ART Centres and DOTS Corners will be improved. Key activities to be implemented include:

	Activities	By Whom	Process Indicators	Outcome Indicator
1	Provide SOPs on intensified TB case detection in PLHIV at ART and health and treatment centres	NTP/NACP	SOPs developed	ART and health and treatment centres with SOPs for case detection
2	Provide resources (sputum smear examination and referral forms and sputum containers) for TB screening to ART and health and treatment centres	MOH/NTP	Resources provided distributed	Percentage of ART and health and treatment centres reporting stock-out of TB resources
3	Establish effective referral system and strong linkages between ART/health and treatment centres, TB laboratories and DOTS Corners	NACP/NTP	Referral system established	Percentage of TB/HIV co-infected persons completing referrals between DOTS and ART/ health and treatment centres
4	Provide ART/ health and treatment centres with rapid diagnostic tools, such as Gene Xpert, for TB diagnosis among PLHIV	/NTP	Rapid diagnostic tools provided	Number of ART/ health and treatment centres with Gene Xpert machines
5	Conduct joint TB/HIV technical support visits to ART/ health and treatment centres and DOTS Corners	NACP/NTP	Joint TB/HIV support visits conducted	Percentage of planned joint technical support visits conducted

7.4.2. Coordination of TB/HIV Activities at All Levels with the National AIDS Control Programme

Coordination of TB/HIV activities from the national to the facility level has been a major challenge of implementing TB/HIV collaboration in Ghana. The revised National TB/HIV Joint Policy addresses coordination weaknesses ensuring better communication between levels of implementation and moving towards integration of services between both programmes. The various coordinating committees will be supported and empowered to improve linkages at service delivery levels. Recording and reporting systems will be better integrated through the DHIMS 2 platform. More resources will be committed to TB/HIV specific activities using the health system strengthening approach. This plan will also increase the role of CSOs in the integrated care approach. Activities to be implemented include:

	Activities	By Whom	Process Indicator	Outcome Indicator
1	Review, print and disseminate TB/HIV Policy and Clinical Guidelines	NTP/NACP	TB/HIV Policy and Clinical Guidelines updated and disseminated	Updated TB/HIV Policy and Clinical Guidelines available in all facilities
2	Establish a national TB/HIV collaborative committee	NTP/NACP	National collaborative committee established	Resources available for joint TB/HIV activities deployed
3	Establish TB/HIV coordinating committees in each region and district	NTP/NACP /all stakeholders	TB/HIV coordinating committees established	Number of regions and districts with functional TB/HIV coordinating committees
4	Hold bi-annual national TB/HIV collaborative committee meetings	NTP/NACP	Bi-annual meetings held	Number of scheduled national TB/HIV collaborative committee meetings held

5	Hold bi-annual regional TB/HIV collaborative committee meetings	NTP/NACP	Bi-annual meetings held	Number of scheduled regional TB/HIV collaborative committee meetings held
6	Hold quarterly district level TB/HIV collaborative committee meetings	NTP/NACP	Quarterly meetings held	Number of meetings per quarter for district level TB/HIV coordinating committees
7	Hold a joint annual national TB/HIV stakeholders review meeting	NTP/NACP	Stakeholders review meeting conducted	Planned annual national TB/HIV stakeholders review meeting conducted
8	Hold joint quarterly regional TB/HIV stakeholders review meetings	NTP/NACP	Quarterly meetings held	Number of planned quarterly regional TB/HIV stakeholders review meetings conducted
9	Hold joint quarterly district TB/HIV stakeholders review meetings	NTP/NACP	Quarterly meetings held	Number of planned quarterly district TB/HIV stakeholders review meetings conducted
10	Integrate the monitoring and supervision of TB control activities into HIV activities	NTP/NACP	Monitoring and supervision integrated	Number of integrated monitoring and supportive supervision visits conducted to TB and HIV sites with reports
11	Harmonise training curricula and materials of NTP and NACP	NTP/NACP	Training harmonised	Training curricula and materials of both programmes harmonised

7.5. Programme Management Activities

In the last five years, the complexity and scope of programme implementation have grown. Reporting demands have increased and accountability requirements have become more rigorous. The operating environment increasingly demands evidence-based innovations and efficient, results-based efforts regardless of financial, human and material resource limitations. To demonstrate success, operations research is required and expected which places additional demands on the time of both health care managers and implementing staff.

This plan will have a poor impact if key programme management activities are not undertaken and supported to meet these changing demands and expectations. These activities include better management and supervision of interventions, increased monitoring and evaluation, more rigorous research and appropriate technical assistance. There will be a strategic focus on these activities to ensure optimum performance in the next six years of implementing the plan.

7.5.1. Programme Management and Supervision

A strong central-level team will continue to harmonise and coordinate implementation of this plan within the overall health system framework of service provision. The central level will work with the existing structures of the TB Advisory Board, technical working groups and technical assistance staff (both external and internal).

The central level will collaborate with clinical care units to increase supportive supervision visits to regions, districts and facilities in an effort to ensure the quick uptake of new strategies and tools. Regional and district health care managers will also be expected to intensify supervisory activities. For the first time, this plan introduces regular feedback and performance assessment for peer review. TB quarterly review meetings will be assessed and scored as part of peer review performance. The central level will advocate for the support of

pharmacovigilance, rationale drug use and insurance for TB patients with other agencies such as the Food and Drugs Authority and the National Health Insurance Authority. Activities to be implemented are listed below.

	Activities	By Whom	Process Indicators	Outcome Indicator
1	Maintain CTU infrastructure and utilities	MOH/GHS	CTU in place	CTU functional and operational
2	Maintain human resource for CTU and recruit additional staff to support programme management	MOH/GHS	Staff recruited and maintained	Number of requisite technical staff needed for CTU in place
3	Procure technical assistance for priority programme intervention areas	NTP/ Partners	Technical assistance procured for priority programme areas	Percentage of planned technical assistance procured
4	Revise and provide all programme stationery	GHS/NTP	Programme stationery provided	Percentage of programme stationery out of stock
5	Maintain technical working groups for strategic programme areas including National TB Advisory Board	GHS/NTP	Technical working groups established	Number of functional technical working groups for strategic programme areas
6	Hold sensitisation meetings for relevant stakeholders in TB control	GHS/NTP	Stakeholders meetings conducted	Percentage of planned stakeholders meetings conducted
7	Conduct supervision and monitoring activities of all areas of implementation including private sector	GHS/NTP	Supervision and monitoring activities conducted	Percentage of planned supervisory and monitoring activities conducted
8	Conduct quarterly review meetings at all levels including private sector to address implementation challenges	GHS/NTP	Quarterly review meetings for TB conducted at all levels	Percentage of planned quarterly review meetings conducted
9	Conduct national strategic review meetings involving all stakeholders	MOH/GHS	Strategic review meetings conducted	Percentage of planned national strategic review meetings conducted
10	Engage other partners to conduct supervisory and M&E activities	NTP/ Partners	Partners supporting supervisory and monitoring activities identified	Percentage of planned supervisory and M&E activities carried out by partners
11	Procure and maintain vehicles and motorcycles	MOH/GHS	Vehicles and motorcycles procured	Percentage of needed vehicles and motorcycles procured
12	Renovate various health infrastructure for TB care services – Laboratory and DOTS Corners	MOH/GHS	Laboratories and DOTS Corners renovated	Percentage of planned renovations conducted
13	Establish an electronic case-based national register for all types of TB	GHS/NTP	Electronic case-based national register established	Functional electronic case-based recording and reporting system linked to DHIMS 2
14	Engage with public and private health care stakeholders to increase access to TB care services	MOH/GHS	SOPs developed for engagement with stakeholders	Increased number of service points for TB services
15	Engage National Health Insurance Authority to enrol TB patients on the NHIS to benefit from comprehensive coverage of services	MOH/GHS	NHIA engaged	Percentage of TB with active NHIS membership
16	Engage regulatory agencies for health worker groups to mandate	MOH/GHS	Regulatory agencies engaged	Number of health professional groups

	annual TB CPD courses as part of professional license renewal			organising mandatory TB CPD course
17	Engage Births and Deaths Registry to capture all deaths as prescribed by law	MOH/MLGRD	Meetings between MOH and the Ministry of Local Government and Rural Development held	Number of advocacy meetings held with Birth and Deaths Registry
18	Collaborate with FDA and the Community Pharmacists Practitioners Association (CPPA) to regulate importation of TB medicines	MOH	Meetings with FDA and CPPA	Number of pharmacies with anti-TB medicines for sale

7.5.2. Monitoring and Evaluation

In this plan, in addition to standard TB programme M&E activities, the TB screening strategy for the various risk groups will be carefully monitored to generate the prioritised data required for future risk groups screening. The numbers needed to be screened (NNS) to detect TB cases in risk groups will be determined. Data to measure case notification in risk groups and relative risks will be collected.

A national TB prevalence survey has just been completed nationwide. This is an important benchmark in the M&E system of the NTP offering the opportunity to set a reference point for TB impact measurement. A case-based, online, electronic recording and reporting application developed during the last strategic plan could not be scaled up due to challenges with training budget and the acquisition of equipment needed to build infrastructure. This application will be integrated into the DHIMS 2 reporting system and will provide a platform for case-based reporting with a backend reporting system in DHIMS 2.

Data management capacity at the Central TB Unit will be improved with extension to regional and district levels as a means of improving system-wide data quality. This will reduce the observed delays in data reporting from the lower levels and expedite the utilisation of the data. M&E activities will be reviewed in the middle of the year at the bi-annual stakeholders review meetings held to disseminate new policy and country direction and feedback from M&E and supervisory visits will be disseminated. Activities to be implemented are listed below.

	Activities	**By Whom**	**Process Indicators**	**Outcome Indicator**
1	Review data management system with experts	NTP/KNCV	Data management system enhanced	Periodic review of data management systems conducted and weaknesses addressed
2	Maintain an electronic, case-based recording and reporting system	GHS/NTP	Electronic, case-based recording and reporting system in use	Percentage of districts reporting through the electronic, case-based recording and reporting system linked to DHIMS 2
3	Train sub-national level staff on use of routine information system	GHS/NTP	Sub-national staff trained	Number of districts with staff trained in using routine information systems at sub-national levels
4	Conduct bi-annual national stakeholders review meetings	GHS/NTP	Bi-annual national stakeholders review meetings conducted	Number of planned bi-annual national stakeholders review meetings conducted to discuss M&E challenges

5	Conduct external mid-term and end-of-programme evaluation of strategic plan implementation	GHS/NTP	Strategic plan evaluated	Comprehensive programme reviews conducted periodically

7.5.3. Operations Research

The NTP will continue to conduct programme-based operations research to improve implementation of interventions and service delivery. In the previous plan, the programme looked at patient cost, patient satisfaction of TB services, and TB knowledge, attitude, and practice in some communities.

The findings from patient cost study helped address bottle necks in the implementation of the pro-poor strategy of enablers. Findings from the patient satisfaction study contributed to the strategic intervention of improving quality clinical care.

With USAID technical assistance, KNCV built implementation research capacity in the regions. Subsequently, NTP held a series of stakeholder engagement meetings with academia and health research institutes and identified priority research needs for the programme. The research list will be further evaluated and priority areas selected for study with research partners. To continue strengthening research capacity, a health system research course for TB coordinators will be developed in collaboration with the Health Research Division of GHS and with external collaborators. Priority research topics identified for implementation in 2015-2020 are provided as Annex 2.

According to this plan, the Central TB Unit will implement at least one research project per year and collaborate to develop the health system infrastructure and human resource capacity for international collaborative multi-centre trials. Activities to be implemented are listed below.

	Activities	**By Whom**	**Process Indicators**	**Outcome Indicator**
1	Identify innovative research areas to assess the deployment of new tools and interventions	GHS/NTP	Innovative research areas identified	Number of planned innovative research studies completed
2	Collaborate with local and international research institutions to conduct innovative research studies	GHS/NTP	Collaboration with local and international research institutions established	Number of new collaborative studies initiated with local and international research institutions
3	Create an enabling environment for collaborative international multi-centre trials	NACP/NTP	Referral systems established	At least one multi-centre international trial conducted
4	Identify and disseminate priority research questions to be answered towards TB elimination	NTP/KNCV	Priority research areas identified	Priority research agenda established
5	Mobilize resources to answer priority research questions	MOH/GHS	Resource mobilisation initiated	Percentage of resource budget available for priority research questions
6	Procure technical assistance for research capacity building	NTP/ Partners	Technical assistance procured	Number of planned technical assistance missions conducted for research capacity building

7	Promote operational research studies across TB services to answer priority questions including evaluation of new interventions	GHS/NTP/ Partners	Conduct operational research studies for TB	Number of operational research studies done
8	Disseminate and implement research findings	GHS/NTP	Research findings disseminated	Number of research study findings disseminated and used to enhance TB control
9	Conduct impact studies such as prevalence survey, drug resistant surveys etc.	MOH/GHS	Impact studies conducted	Number of impact studies conducted

7.5.4. Promote Infection Control in DOTS Corners, ART and MDR-TB Centres and among Health Staff

Infection prevention and control (IPC) is a critical component of TB care. Successful implementation of IPC is important for preventing disease in both HCWs and patients. The NTP has developed SOPs on TB and Airborne Infection Prevention and Control in Ghana (2011) and adopted the principles of the national infection policy and guidelines.[27]

Staff confidence to manage TB patients depend not only on their knowledge of patient management but also on the perceived risk of infection in their work environment. TB transmission in health care and other congregate settings is still a major challenge to TB control efforts. The emerging DR-TB epidemic calls for the scale up of IPC interventions in health care facilities. Therefore, the NTP will promote IPC awareness, knowledge and rational work place practices.

Under this plan, TB surveillance among HCW will be promoted as an essential component of IPC to help reduce TB transmission in health facilities. Results of the infection control assessment of health facilities would guide implementation of the FAST strategy in health facilities, prisons and congregate settings to promote infection control and TB case finding.

Staff involved in DR-TB care will receive personal respirators and trained in proper usage. Treatment facilities will be retro-fitted with the needed infection prevention equipment such as ultra-violet germicidal lamps and extractor fans to improve infection control. Admission facilities would be identified and remodelled to manage MDR-TB patients with severe complications who need hospitalisation. Community-level IPC will be addressed as part of the ambulatory care package to prevent TB disease transmission to family members, community workers and community volunteers acting as treatment supporters. Activities to be implemented are listed below.

	Activities	**By Whom**	**Process Indicators**	**Outcome Indicator**
1	Assess IPC practices in health facilities using TB infection control (TB-IC) checklist	MOH/NTP	Checklist developed	Number of facilities assessed using TB-IC checklist
2	Develop national TB-IC implementation plan with technical assistance	MOH/NTP	Plan developed	TB-IC implementation plan developed with technical assistance

[27] Policy and Guidelines for Infection Prevention and Control in Health Care Facilities (MOH, April 2009).

3	Review, print and disseminate national TB IPC guidelines and SOPs	MOH/NTP/ICD	Guidelines and SOPs reviewed, printed and disseminated	Percentage of health facilities using National TB IPC guidelines and SOPs
4	Develop a TB-IC training programme	MOH/NTP	TB-IC training programme and manual developed	Number of facilities with staff trained in TB-IC
5	Train all the key health workers including managers and administrators in TB-IC	MOH/NTP	Training held	Percentage of key health workers trained in TB IPC
6	Promote FAST TB-IC strategy for health facilities	MOH/NTP	Orientation completed	Percentage of health facilities implementing FAST
7	Develop facility-specific TB-IC implementation plans	NTP/ICD	Plans developed	Number of facilities implementing TB-IC implementation plans
8	Identify a focal person at each facility to ensure implementation of the infection control plan	MOH/GHS	Focal person identified	Percentage of facilities with a TB-IC focal person
9	Develop a supervisory TB infection control checklist for health care facilities to use in monitoring and evaluation of TB-IC status	MOH/NTP	Checklist developed	Percentage of TB focal persons using the checklist to monitor and evaluate TB IC status
10	Promote cough etiquette in all facilities (private and public) and with community volunteers	MOH/NTP/ Association of Private Practitioners	IEC materials promoting cough etiquette developed and disseminated	Percentage of facilities displaying IEC materials on cough etiquette
11	Commission appropriate infection control architects and/or engineers to assess high-risk health care facilities and prisons towards improving ventilation and design to minimize TB transmission	MOH/NTP	High-risk facilities identified	Percentage of high-risk facilities with risk assessment done and recommendations implemented
12	Procure shielded ultraviolet germicidal irradiation devices and ventilation equipment for health facilities to improve IPC	MOH/NTP	Items procured	Number of DOTS Corners and ARV Centres refurbished using ultraviolet germicidal irradiation devices and ventilation equipment
13	Purchase particulate respirators (N95) for health professionals working in the MDR-TB hospital wards	MOH/NTP	Items purchased	Percentage of health professionals working in the MDR-TB hospital wards using particulate respirators
14	Ensure proper training in use and storage of particulate respirators as well as a fit-testing programme.	MOH/NTP	Fit testing and training on care and storage of respirators completed	Percentage of health staff with properly fitted respirators and knowledge of care and storage
15	Develop and use a TB-IC staff risk assessment log for supervisors (per the 2010 SOPs)	MOH/GHS	Assessment log developed	Percentage of facilities using the assessment log
16	Conduct medical screening on all health staff directly attending presumed and confirmed TB patients for TB and other risk factors (e.g. HIV, diabetes, chronic obstructive pulmonary disease, etc.)	MOH/NTP	Medical screening conducted	Percentage of health staff directly attending presumed and confirmed TB patients screened for TB and other risk factors

17	Institute annual TB screening for HCWs using a standard TB screening questionnaire and chest x-ray as part of a countrywide screening system for early detection of TB disease among HCWs	MOH/GHS	Screening tool developed	Percentage of facilities conducting annual TB screening for HCWs
18	HCWs identified with TB counselled, supported and treated for TB disease including managing risk factors and co-morbidities	MOH/GHS	HCW TB register developed	Data on number of health staff with TB recorded and reported to the NTP on an annual basis
19	Monitor and evaluate IPC in health facilities and particularly document annually the number and treatment outcome of HCWs affected by TB	MOH/NTP	IPC monitored and evaluated	IPC M&E in place and percentage of health staff treated for TB reported
20	Produce and distribute TB IEC materials on IPC for patient education	NTP	IEC materials produced and distributed	Percentage of health facilities with IEC materials displayed
21	Develop and disseminate IEC messages regarding TB-IC in the communities and households caring for DR-TB patients, and provide appropriate supplies and equipment	MOH/NTP	IEC messages for communities and households developed and disseminated	Percentage of households caring for DR-TB patients with IPC in place
22	Engage local authorities and regulatory agencies to enforce by-laws and codes related to airborne infection control	MOH/GHS	Local authorities and regulatory agencies engaged	Number of building permits issued by local authorities
23	Organize meetings with decision makers and members of engineers and architects communities to promote infection prevention and control	MOH/NTP	Meetings held	Number of engineers and architects that have attended meetings to promote infection prevention and control
24	Engage regulatory agencies for health worker groups to consider annual screening for TB among HCWs	MOH/GHS	Regulatory agencies engaged	Number of health facilities undergoing annual TB screening of health staff
25	Engage transport companies to promote cough etiquette on mass transportation	GHS/ Partnership	Transport companies engaged	Number of mass transportation vehicles with posters on cough etiquette displayed

7.5.5. Implement TB Screening Interventions in Maternal Health and Non-Communicable Disease Programmes

Females who reported to be pregnant in the 2013 national TB prevalence survey were not screened with X-rays, but were tested for TB using smear microscopy and culture. The survey results revealed that risk of TB among female participants who reported pregnancy was five (5) times higher than other participants.

Pregnant women are screened for HIV at during antenatal care as part of the elimination of mother to child transmission (eMTCT) of HIV intervention. However they are not screened for TB and deemed a missed opportunity.

The NTP will collaborate with the Reproductive Health (RH) Department to institutionalise TB screening as part of antenatal care using a symptom-based TB questionnaire to identify presumed cases for further diagnosis. This would require further engagement with the RH

Department and the establishment of a working group to coordinate and oversee activities. TB screening tools will be provided by the NTP. All detected cases will be managed as per national guidelines.

The working group will also support and monitor TB screening among diabetics and other non-communicable disease conditions such those on chemotherapy for cancer. The working group will also collaborate with other sectors, such as Mining companies, for TB screening when appropriate. Activities to be implemented are listed below.

	Activities	By Whom	Process Indicators	Outcome Indicator
1	Meetings of a working group to collaborate with other programmes and sectors	MOH/NTP	Minutes of meetings	Number of working group meetings with other programs and sectors
2	Institute TB case finding among antenatal clinic (ANC) attendants	MOH/NTP	TB screening at ANC institutionalised	Number of pregnant women diagnosed with TB
3	Institute TB screening among persons with diabetes in clinics and hospitals	NTP/NCD	Screening programme established	Number of TB patients diagnosed among persons with diabetes
4	Provide Isoniazid preventive therapy to people with TB who are on chemotherapy, steroids and other medicines	NTP/NCD	Isoniazid provided	Percentage of people with NCDs receiving Isoniazid preventive therapy.

7.5.6. Procure Technical Assistance

Technical assistance missions have been a critical part of programme management. The NTP has over the years engaged technical missions to provide critical knowledge and capacity building for staff in various programme areas. Programme partner agencies such as WHO, KNCV, USAID, MSH and PIH have ensured the best outcome for technical missions.

External technical assistance will be procured to support programme implementation in the following areas: monitoring and evaluation, laboratory management and logistics, DR-TB, infection prevention and control, programme-based operations research, implementation of the TB screening strategy, and advocacy, communication and social mobilisation.

	Activities	By Whom	Process Indicators	Outcome Indicator
1	Procure technical assistance for priority programme intervention areas	NTP/ Partners	Technical assistance procured for priority programme areas	Percentage of planned technical assistance procured

8. BUDGET

The costing for this national strategic plan is based on activities defined and agreed upon by various stakeholders during the development process. The activities of various stakeholders' complement each other and will be coordinated, monitored, and supported by the Central Programme Management Unit (PMU) of the NTP.

Stakeholders access funds through a common mechanism already established and working extremely well upon submission of activity proposals through the PMU. Submitted proposals are discussed and milestones agreed upon. These are followed by contracts between the PMU and the stakeholder resulting in the release of funds.

Planned activities are monitored during implementation by the PMU or by designated partners, and non-performing stakeholders are disqualified from further request for funds. They are, however, supported to improve their performance and allowed to re-apply at a later date. New entrants are assessed continually to participate in TB control activities in areas where they have a comparative advantage. Mid-term and end-term activity reports are submitted to the PMU.

There are monthly stakeholder meetings bringing together the Ministry of Health and its agencies on one hand and development partners on the other. These meetings are used to inform all stakeholders on performance status and upcoming events. The policy dialogue with health partners culminates in two semi-annual health summits, focusing alternately on review and planning. The review summit is based on an independent assessment of the sector's previous year's performance. These assessments cover all the areas of the sector, including projects funded by the Global Fund. On an annual basis, financial and procurement audits are conducted by an independent institution. These audits cover all sources of funds. The results of these reviews and the audits are discussed at an annual summit meeting of all stakeholders in health. The planning summit is held to agree on priority health interventions to be implemented in the ensuing year. At the end of the summits, an aide memoire reflecting key decisions and actions is signed. The health summits serve as the highest decision-making body of the MOH-partnership arrangement.

8.1. Experience with Funding Agents

The NTP has received funds from various grant-making agents during its lifetime. These agents include DANIDA, JICA, DFID, USAID and the Global Fund. During the implementation of these grants, significant successes have been achieved. This strategic plan will be made available to various funding agents to elicit support for relevant components.

Ghana was the first country ever to sign a grant agreement with the Global Fund. Successful implementation has led to repeated funding under various grants. The MOH/GHS has institutional capacity, financial management, procurement and supply management systems, and monitoring and evaluation capacity to manage and implement grants. The GHS/MOH works closely with NGOs, academic and research institutions, and other agencies to successfully achieve set targets. The Global Fund has recognized Ghana's programmes with MOH/GHS as the principal recipient as some of the best-managed Global Fund grants worldwide.

The MOH/GHS has also successfully managed (earmarked or "pooled") funds provided through bilateral and multilateral agencies over the years. These include the GAVI Alliance to support the introduction of new vaccines, the World Bank Nutrition and Malaria Project, the US President's Malaria Initiative, UNICEF/GHS Accelerated Child Survival and Development and High-Impact Rapid Delivery project.

The budget for this plan was developed using the WHO Planning and Budgeting Tool and covers a six-year period. Funding will come from the Government of Ghana with gaps filled by bilateral and multilateral agencies, particularly the Global Fund. The Central Unit and regions will develop annual costed work plans based on the disease burden and the level of infrastructure development, as well as on human resource needs.

8.2. Summary Budget by Objectives and Implementing Area

Obj.	Implementing Areas	2015	2016	2017	2018	2019	2020	Total
1	Improving diagnosis	22,185,078.72	4,793,003.11	6,772,518.20	4,750,129.28	6,038,604.46	3,567,821.42	48,107,155.19
	High-risk groups	202,300.00	931,100.00	591,100.00	591,100.00	591,100.00	591,100.00	3,497,800.00
	Childhood TB	96,900.00	-	22,000.00	74,900.00	22,000.00	-	215,800.00
	Involving all care providers: PPM/ISTC	84,400.00	84,400.00	84,400.00	84,400.00	84,400.00	84,400.00	506,400.00
	HRD: Staff	2,633,246.72	2,633,246.72	2,633,248.64	2,633,250.72	2,633,250.72	2,633,250.72	15,799,494.24
	HRD: Training	9,629,470.00	8,177,180.00	9,461,670.00	8,177,180.00	9,461,670.00	8,177,180.00	53,084,350.00
2	MDR-TB	1,931,705.34	2,127,892.70	2,033,642.25	2,167,432.12	2,252,898.53	2,344,283.47	12,857,854.42
3	Patient support	11,745,156.75	11,737,017.79	11,639,622.25	11,871,080.32	11,835,682.55	11,861,530.35	70,690,090.01
	First-line drugs procurement and management	11,745,156.75	11,737,017.79	11,639,622.25	11,871,080.32	11,835,682.55	11,861,530.35	70,690,090.01
	Community involvement	2,889,831.23	2,781,951.54	2,724,810.38	2,666,685.54	2,630,416.59	2,534,650.67	16,228,345.95
4	Collaborative TB/HIV activities	1,282,831.69	1,284,642.40	1,286,453.11	1,288,263.83	1,290,074.54	1,293,695.97	7,725,961.54
	Infection control	22,200.00	11,209.27	25,909.27	13,063.91	29,618.55	16,773.18	118,774.18
5	M&E	1,096,550.00	421,500.00	298,500.00	771,750.00	378,500.00	3,955,000.00	6,921,800.00
	Programme management and supervision	12,258,772.81	12,036,093.69	12,499,253.22	11,640,262.25	11,596,916.69	11,832,959.77	71,864,258.42
	Operational research	-	24,000.00	24,000.00	24,000.00	24,000.00	24,000.00	120,000.00
	International technical assistance	127,500.00	127,500.00	127,500.00	127,500.00	157,500.00	127,500.00	795,000.00
	Partnering initiatives	2,706,510.00	2,710,010.00	2,710,010.00	2,710,010.00	2,710,010.00	2,710,010.00	16,256,560.00
	General use of health services	1,453,043.85	1,450,737.75	1,443,796.34	1,454,408.23	1,450,938.90	1,450,791.48	8,703,716.55
	Other	59,900.65	72,704.15	85,577.19	98,446.00	103,052.77	107,695.75	527,376.50
	GRAND TOTAL	**73,344,558.44**	**57,117,321.26**	**57,233,687.37**	**56,622,118.61**	**55,977,289.69**	**58,522,222.88**	**358,817,198.24**

9. TECHNICAL ASSISTANCE PLAN

The objective of the technical assistance plan is to provide expert knowledge, skills and additional hands to support programme implementation. External technical assistance will be required to support key programme implementation, the implementation of the TB screening strategy, laboratory diagnosis, drug-resistant tuberculosis, infection prevention and control, advocacy, communication and social mobilisation, monitoring and evaluation, and programme-based operations research.

Intervention	Expert Profile	Timeframe	Responsible Partner	Cost (USD)	Source of Funds	Funding Gap
Lab Support: TB Culture	Culture & DST	14 days	WHO SRL	15,000	WHO	-
Lab Support: Gene Xpert	Molecular diagnostics	14 days	WHO SRL	15,000	-	-
Lab Support: Quality Management	SRL	14 days	WHO SRL	15,000	WHO	-
Lab Support: DRS	DRS	14 days	WHO SRL	15,000	WHO	-
Programme Management	PPM-DOTS	7 days	WHO	7,500	WHO	-
Programme Management	CBTC	7 days	WHO	7,500	-	7,500
Programme Management	Training	7 days	KNCV	7,500	KNCV	-
TB Screening	ICF	7 days	WHO	7,500	-	7,500
M&E Data Management	M&E	7 days	WHO	7,500	-	7,500
Multidrug-Resistant TB	PMDT	7 days	WHO/KNCV	7,500	-	7,500
Infection Prevention and Control	IPC	7 days	MSH	7,500	-	7,500
TB/HIV Collaborative Activities	TB/HIV	7 days	WHO	7,500	-	7,500
Operations Research	Research	7 days	KNCV	7,500	-	7,500
ACSM	ACSM	7 days	WHO	7,500	-	7,500

10. MONITORING AND EVALUATION PLAN

The plan will be monitored through key inputs, process, output, outcome and impact indicators in the course of implementation. The overall responsibility for monitoring and evaluation will rest with the National TB Control Programme M&E Unit under the leadership of the Programme Manager. At the Central TB Unit, an M&E focal person will be assigned and M&E support staff recruited to support the duties of the day-to-day coordination and monitoring of TB activities in both the public and private sectors.

Each of the 10 regions will be supported with an M&E staff person to enhance monitoring and supervision of operational activities at the periphery on regular basis.

At the regional and district levels, TB coordinators already trained will assume additional skills to extend their monitoring activities to cover other health care providers. They will be assisted by personnel handling and managing data. Regional TB coordinators will work closely with focal persons for TB in the districts and sub-districts. The Regional Health Directorates and District Health Management Teams will support in monitoring activities as part of health systems strengthening.

Monitoring will be carried out monthly at the regional and district levels and quarterly at the national level. This is to ensure that problems are identified quickly and corrective actions taken. The NTP Central Unit in collaboration with the Noguchi Memorial Institute for Medical Research will conduct a repeat TB prevalence survey at the end of the strategic plan period.

Quarterly reports from participating institutions and monthly supervisory reports from TB coordinators or designated M&E focal persons will be submitted to districts, regions, and the Central TB Unit. The Regional Health Directorates will produce and submit biannual reports to the Central TB Unit. The Central Unit will produce a coordinated programme report annually. A feedback system will be established to make the results of the programme clear to all.

A midterm evaluation will be conducted to adjust timetable and implementation strategies by both external and internal evaluators. A process evaluation will assess the efficiency of the project in terms of the quantifiable achievement of the output indicators. Process evaluation will be based on the information received and synthesised from the monitoring system. This will be the responsibility of the Regional and District Health Directorates, with the active involvement of the Regional and District TB Coordinators. The Central TB Unit and other care providers will hold a biannual stakeholders' meeting.

A summary of the Monitoring and Evaluation plan is shown in Table 31 below.

Table 31: Monitoring and Evaluation Plan 2015 – 2020

Item	Indicator	Purpose	Calculation	Source of information	Periodicity	Who will collect the information	Level of information collection	Baseline (Date)	End Point (2020)
Goal 1: To reduce by 20% the 2013 TB prevalence baseline level of 290 per 100,000 population by 2020 in line with the post-2015 Global TB Control Strategy.	TB Prevalence Rate	Impact	Number of bacteriologically confirmed TB cases divided by adult population at risk	Prevalence Survey	Every 5 years	NTP National Level	Countrywide	290 per 100,000 pop. (2013)	232 per 100,000 pop.
Operational Objective 1: To early screen, detect and enrol into treatment all forms of notified (new cases) from 15,606 in 2013 to 37,956 by 2020, while increasing the proportion of bacteriologically confirmed pulmonary TB from 51% in 2013 to 60% by 2020.	Case notification rate of all forms of TB per 100,000 population - bacteriologically confirmed plus clinically diagnosed, new and relapse cases (disaggregated by age <14 and >15, sex and HIV status)	Outcome	Number of new bacteriologically confirmed plus clinically diagnosed TB cases notified	NTP HMIS	Semester and Annually	NTP	Facility & District	15,606 (2013)	37,956

Operational Objective 2: To early detect and enrol into treatment at least 85% of confirmed MDR-TB cases among new and previously treated cases by 2020.	Proportion of MDR-TB patients successfully treated	Outcome	Numerator: MDR TB cases successfully treated Denominator: MDR-TB cases enrolled on second-line treatment	NTP MDR-TB Surveillance Tools	2 yearly	NTP MDR-TB M&E Focal Points	Regional and tertiary facilities	50% (2011)	70%
Goal 2: To reduce by 35% the 2012 TB mortality rate baseline of 4 deaths per 100,000 population by 2020.	TB Mortality Rate	Impact	Number of estimated TB deaths divided by population at risk	Birth and Death Registry or extrapolated from NTP data	Every 6 years	Birth and Death Registry/NTP	Countrywide	4.4 per 100,000 population (2013)	2.9 per 100,000 population
Objective 3: To attain higher treatment success for all forms of TB from 84% in 2012 to at least 91% by 2020 through improved quality clinical care and community TB care.	Percentage of all new TB cases, bacteriologically confirmed plus clinically diagnosed, successfully treated (cured plus treatment completed) among all new TB cases registered for treatment during a specified period	Outcome	Numerator: Susceptible TB cases successfully treated Denominator: Total susceptible TB cases enrolled on treatment	NTP HMIS	Annually	Facility, District, Region & National M&E Focal Points	Facility, District, Region & National	86% (2012)	91%

Objective 4: To reduce death rates of TB/HIV co-infected cases from 20% in 2012 to 10% by 2020 and uptake of ART coverage among co-infected from 5.7% in 2013 to 37% by 2020.	Proportion of TB/HIV co-infected patients successfully treated	Outcome	Numerator: Number of TB/HIV co-infected individuals who were successfully treated Denominator: Total number of TB/HIV co-infected individuals on treatment	NTP HMIS	Annually	Facility, District, Region & National M&E Focal Points	Facility, District, Region & National	5.7% (2013)	37%
Goal 3: To end the TB epidemic in Ghana by 2035 without catastrophic cost due to TB-affected families.	TB/HIV Mortality Rate	Impact	Number of bacteriologically confirmed TB cases divided by adult population at risk	Global TB Report	Every 6 years	NTP	NTP	2 per 100,000 pop. (2013)	1.3 per 100,000 pop.
Objective 5: To improve programme management; coordination, monitoring & evaluation and operations research to support treatment and screening strategies for TB/HIV.	Number of completed TB surveillance reports submitted on time	Output	Numerator: Number of districts submitting complete TB surveillance reports Denominator: Total number of districts implementing TB programme	NTP	Quarterly	NTP	District & Region		90%

11. OPERATIONAL PLAN

Intervention Area	Unit Cost (US$)	Quantity	Implementation Period						Location	Implementer	Total Costs (US$)	Source of Funding	Comments
			Y1	Y2	Y3	Y4	Y5	Y6					
Improving diagnosis	111.07	443,130	X	X	X	X	X	X	Dist./Reg./Nat	MOH/GHS	48,107,155.19	GoG/GF/ Partners	Includes introduction of new tools
High-risk groups	79.73	43,872	X	X	X	X	X	X	Dist./Reg.	NTP/Stop TB	3,497,800.00	GoG/GF/ Partners	Active screening interventions
Childhood TB	6.87	31,407	X		X	X	X		Dist./Reg./Nat	NTP	215,800.00	GoG/GF/ Partners	Improving case finding
Involving all care providers: PPM/ISTC	-	-	X	X	X	X	X	X	Dist./Reg./Nat	NTP/Stop TB/Private	506,400.00	GoG/GF/ Partners	Capacity building for case finding
HRD: Staff	-	-	X	X	X	X	X	X	Dist./Reg./Nat	MOH/GHS	15,799,494.24	GoG/GF	Emoluments
HRD: Training	211.66	250,806	X	X	X	X	X	X	Dist./Reg./Nat	MOH/GHS	53,084,350.00	GoG/ GF	Capacity building local & international
MDR-TB	4,100.08	3,136	X	X	X	X	X	X	Reg./Nat	GHS/NTP	12,857,854.42	GF	Case finding and treatment
Patient support	163.21	433,130	X	X	X	X	X	X	Dist./Reg.	GHS/Stop TB/Private	70,690,090.01	GoG/GF	Enablers/ Living support
First-line drugs procurement and management	163.21	433,130	X	X	X	X	X	X	Nat	MOH/GHS	70,690,090.01	GoG/GF	Cost of medicines
Community involvement	37.47	433,130	X	X	X	X	X	X	Dist.	MOH/GHS	16,228,345.95	GoG/ GF/ Partners	CSO & CHPS activities
Collaborative TB/HIV activities	8.85	873,043	X	X	X	X	X	X	Dist./Reg./Nat	MOH/GHS	7,725,961.54	GoG/GF/ Partners	Capacity building & collaboration
Infection control	-	-	X	X	X	X	X	X	Dist./Reg./Nat	MOH/GHS	118,774.18	GoG/GF/ Partners	HCW protective activities
M&E	-	-	X	X	X	X	X	X	Dist./Reg./Nat	MOH/GHS	6,921,800.00	GoG/GF/ Partners	Routine & periodic surveys
Programme management and supervision	-	-	X	X	X	X	X	X	Dist./Reg./Nat	MOH/GHS	71,864,258.42	GoG/GF/ Partners	Support & supervision
Operational research	-	-	X	X	X	X	X	X	Dist./Reg./Nat	MOH/GHS	120,000.00	GoG/GF/ Partners	Capacity building & operational research
International technical assistance	7500.00	106	X	X	X	X	X	X	Reg./Nat	MOH/GHS	795,000.00	GoG/GF/ Partners	Programme assessment missions
Partnering initiatives	-	-	X	X	X	X	X	X	Dist./Reg./Nat	GHS/Private/ Partners	16,256,560.00	GoG/GF/ Partners	Collaboration with other sectors
General use of health services	-	-	X	X	X	X	X	X	Dist./Reg./Nat	MOH/GHS	8,703,716.55	GoG	Use of health facilities
Other services	-	-	X	X	X	X	X	X	Dist./Reg./Nat	NTP	527,376.50	GoG/GF/ Partners	Supportive treatment for MDR-TB care

* Dist. = District; Reg. = Regional; Nat. = National

12. PROCUREMENT PLAN

The procurement plan covering the implementation period is shown below.

Product	Unit Cost (US$)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Procuring Agency
Pharmaceuticals								
Category I & III (Adults)		1,619,209.00	1,549,603.00	1,493,473.00	1,465,527.00	1,422,207.00	1,388,305.00	GDF
First-line for children		141,956.54	176,165.11	169,889.03	192,584.96	194,932.64	190,246.82	GDF
Category II		526,119.00	510,521.00	492,029.00	488,070.00	473,643.00	462,353.00	GDF
Buffer for first-line		-	2,217,601.80		2,125,656.00		2,021,801.00	GDF
Procurement, management and storage: FLD		594,693.99	832,154.58	580,185.62	812,048.49	573,078.75	789,048.96	GDF
Second-line medicines		1,073,882.00	1,142,326.00	1,197,596.00	1,283,831.00	1,338,919.00	1,397,821.00	GDF
Procurement, management and storage: SLD		282,307.77	300,301.72	314,830.91	337,501.11	351,982.96	367,466.96	
Green Light Committee support for PMDT		50,000.00	50,000.00	50,000.00	50,000.00	50,000.00	50,000.00	
Quality assurance in-country		57,182.11	111,150.43	53,884.76	106,580.86	52,269.56	101,353.70	FDA, Ghana
TOTAL (US$)		**4,596,951.72**	**7,378,885.53**	**4,588,981.25**	**7,330,755.23**	**4,687,018.98**	**7,214,352.72**	
Health Products								
LED florescent microscopes and accessories	1640		82,000.00	82,000.00	82,000.00	82,000.00	82,000.00	GHS/SSDM
Light microscopes and accessories	1190		59,500.00	59,500.00	59,500.00	89,250.00	59,500.00	GHS/SSDM
Procurement, management and storage: microscopes		-	35,375.00	35,375.00	35,375.00	42,450.00	35,375.00	GHS/SSDM
Preventive maintenance for new and existing microscopes		27,177.59	27,177.59	29,427.59	29,427.59	30,677.59	30,677.59	GHS
Cost of lab supplies and consumables for smears	0.61	1,082,767.75	1,050,667.23	1,012,609.39	1,004,462.03	974,770.96	951,534.91	GHS
Consumables for culture and DST		776,642.26	1,195,817.46	445,282.29	662,725.73	523,804.59	574,070.57	
Procurement, management : FLD & SLD Tests	25% of Cost	13,121.02	17,658.49	22,688.16	28,124.36	33,871.73	40,178.51	
Upgrade/repair existing labs to include molecular tests	5000	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	

Gene Xpert with accessories	20912	1,463,840.00	1,045,600.00	1,045,600.00	1,045,600.00	-	-	GHS/SSDM
Procurement, management: GeneXpert and accessories	2353	164,710.00	117,650.00	117,650.00	120,364.80	-	-	
Gene Xpert cartridges	9.98	169,660.00	269,460.00	369,260.00	469,060.00	469,060.00	469,060.00	GHS/SSDM
Gene Xpert - calibration and maintenance	3350	253,250.00	429,750.00	597,250.00	764,750.00	787,250.00	787,250.00	
Panel testing for Gene Xpert: shipment and administration cost		14,054.01	22,321.07	30,588.13	38,855.19	38,855.19	38,855.19	
Procurement, management: Gene Xpert cartridges	2.697	25331.118	37943.391	50635.005	63235.302	63292.188	58417.956	
Chest drainage tubes	2300	40,700.00	40,700.00	40,700.00	40,700.00	40,700.00	40,700.00	GHS/SSDM
Stadiometer	850	85,000.00	85,000.00	85,000.00	85,000.00	85,000.00	85,000.00	GHS/SSDM
Procurement, management and storage: (chest drainage tubes, stadiometer)	25% of Cost	31,425.00	31,425.00	31,425.00	31,425.00	31,425.00	31,425.00	
Sputum containers	0.11	84,892.72	82,375.92	79,392.06	78,753.29	76,425.36	74,603.54	GHS/SSDM
Procurement and management: Sputum containers	0.11	118,849.81	115,326.29	111,148.88	110,254.61	106,995.50	104,444.96	
Panel testing - international, national, regional		33,010.00	33,010.00	33,010.00	33,010.00	33,010.00	33,010.00	
Shipment for DST	2500	10,000.00	10,000.00	10,000.00	10,000.00	35,001.38	10,000.00	
Digital X-Ray	300000	15,300,000	-	-	-	-	-	GHS/SSDM
X-Ray films and developers	8	18,136.00	21,688.00	25,632.00	29,560.00	33,424.00	37,504.00	GHS/SSDM
High-energy, ready-to-use foods (RUTF & FBF)	30	2,315,250.00	2,246,610.00	2,165,250.00	2,147,820.00	2,084,340.00	2,034,630.00	GHS/SSDM
TOTAL (US$)		**2,037,817.27**	**7,067,055.44**	**6,489,423.51**	**6,980,002.91**	**5,671,603.50**	**5,588,237.23**	
Printing of manuals, registers, guidelines etc. and mass media								
Presumed TB/cough register	10	10,000.00	-	10,000.00	-	10,000.00	-	GHS/SSDM
SOPs for TB case detection	12	72,000.00	-	72,000.00	-	72,000.00	-	GHS/SSDM
National guidelines on contact investigation	10	60,000.00	-	60,000.00	-	60,000.00	-	GHS/SSDM
Recording and reporting forms for TB contact investigation activities, including IPT	1	6,000.00	-	6,000.00	-	6,000.00	-	GHS/SSDM
Screening tools (sputum request forms, referral forms, TB client cards, TB07, TB08)	1.5	120,000.00	120,000.00	120,000.00	120,000.00	120,000.00	120,000.00	GHS/SSDM
SOPs on intensified TB case detection in PLHIV at ART and HTC centres	1	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00	GHS/SSDM

Mass media campaigns: Broadcast materials (pub. serv. announcement)	5000	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	GHS/SSDM
Posters on contact tracing and investigation for public areas	1	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	GHS/SSDM
Pharmacovigilance handbook	10	10,000.00	-	10,000.00	-	10,000.00	-	
Data collection tools, patient education, diary and consent sheets	10	-	-	-	-	-	340,000.00	
Infection prevention and control IEC materials for patient education	1	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00	-	
Infection prevention and control guidelines and SOP	10	20,000	-	20,000	-	20,000	-	GHS/SSDM
TB/HIV policy and clinical guidelines	10	10,000.00	-	10,000.00	-	10,000.00	-	GHS/SSDM
LMIS tools (SOP, RRIV, dispensing registers, workbook)	10	20,000.00	-	20,000.00	2,000.00	10,000.00	-	GHS/SSDM
TB IPC staff risk assessment log for supervisors based on 2010 SOP	10	10,000.00	-	10,000.00	-	10,000.00	-	GHS/SSDM
MDR-TB guidelines and SOP	10	10,000.00	-	10,000.00	-	10,000.00	-	GHS/SSDM
Nutrition specific education materials (poster)	1	5,000.00	-	5,000.00	-	5,000.00	-	GHS/SSDM
Nutritional guidelines to DOTS Corners	10	50,000.00	-	50,000.00	-	50,000.00	-	GHS/SSDM
Training manuals	10	30,000.00	-	-	30,000.00	-	-	GHS/SSDM
Revised OPD/consulting room register	10	10,000.00	-	10,000.00	-	10,000.00	-	GHS/SSDM
Newspapers campaigns (total)	5000	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00	GHS/SSDM
Production of broadcast materials: radio	5000	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00	GHS/SSDM
Production of broadcast materials: TV	40000	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	GHS/SSDM
Materials to promote cough etiquette in facilities (private and public) and community volunteers	1	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	GHS/SSDM
IEC materials for target groups (health workers, mothers, and community) on childhood TB	1	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	GHS/SSDM
CB-DOTS operational guidelines	10	10,000.00	-	10,000.00	-	10,000.00	-	GHS/SSDM
Community TB screening forms	0.05	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00	GHS/SSDM
Advocacy and IEC materials for communities, NGOs, policy makers and health staff to improve knowledge and support for TB activities	1	50,000.00	50,000.00	50,000.00	50,000.00	50,000.00	50,000.00	GHS/SSDM

Childhood training materials	12	12,000.00	-	12,000.00	-	12,000.00	-	GHS/SSDM
TOTAL (US$)		**675,000.00**	**330,000.00**	**645,000.00**	**362,000.00**	**635,000.00**	**665,000.00**	
Infrastructure								
Rehabilitate regional hospital wards to manage MDR-TB	90000	180,000.00	180,000.00	-	-	-	-	GHS/EMU
Upgrade 50 microscopy sites to meet bio-safety standards	25000	1,250,000.00	-	1,250,000.00	-	1,250,000.00	-	GHS/EMU
Upgrade laboratories to BSL-3 status	25000	125,000.00	-	-	-	-	-	GHS/EMU
TOTAL (US$)		**1,555,000.00**	**180,000.00**	**1,250,000.00**	**-**	**1,250,000.00**	**-**	
GRAND TOTAL (US$)		**28,864,768.99**	**14,955,940.97**	**12,973,404.76**	**14,672,758.14**	**12,243,622.48**	**13,467,589.94**	

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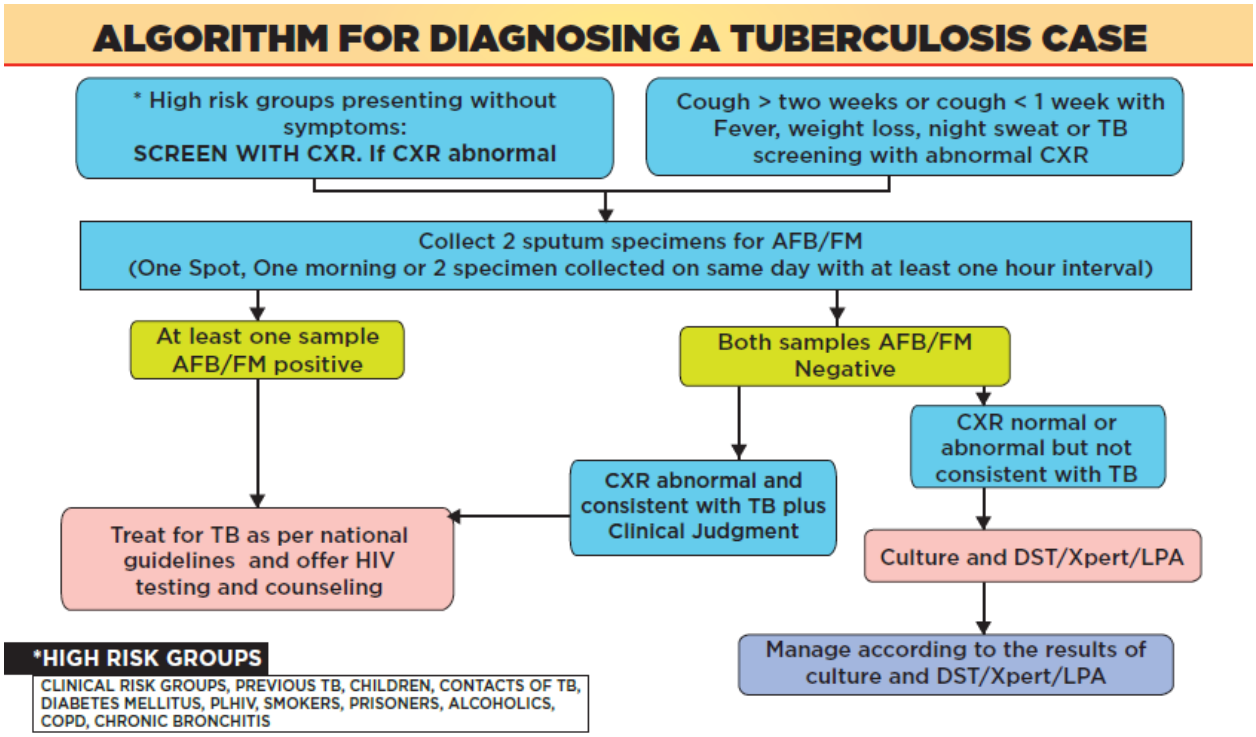
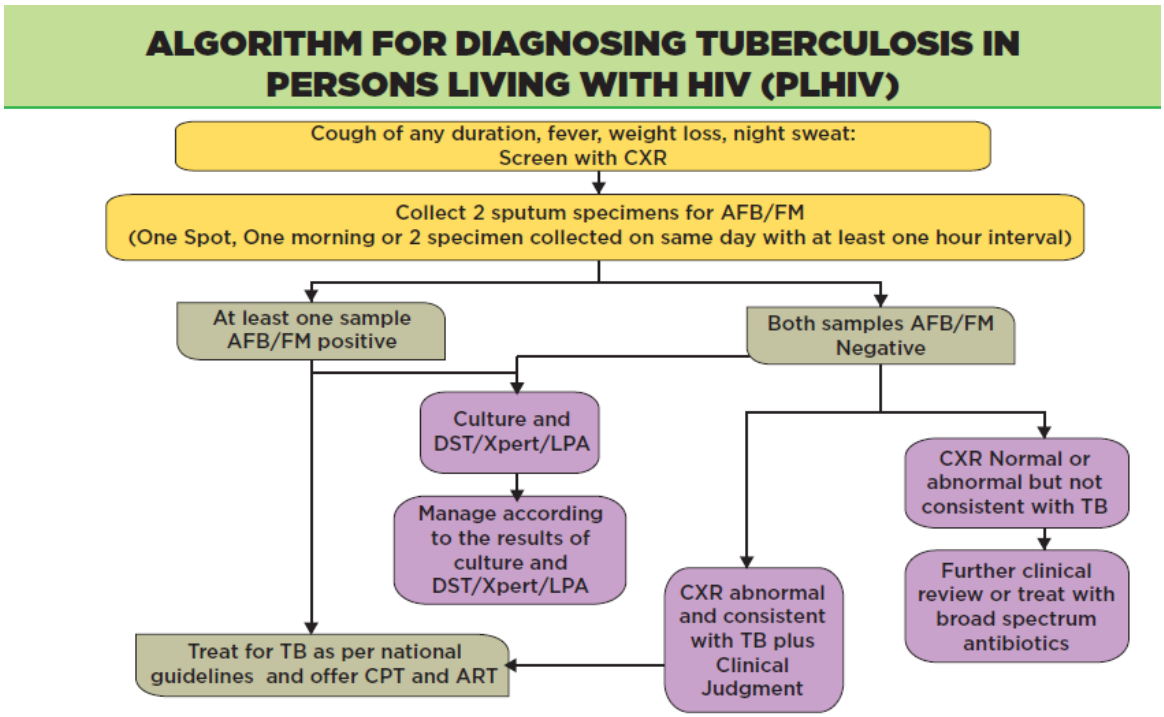
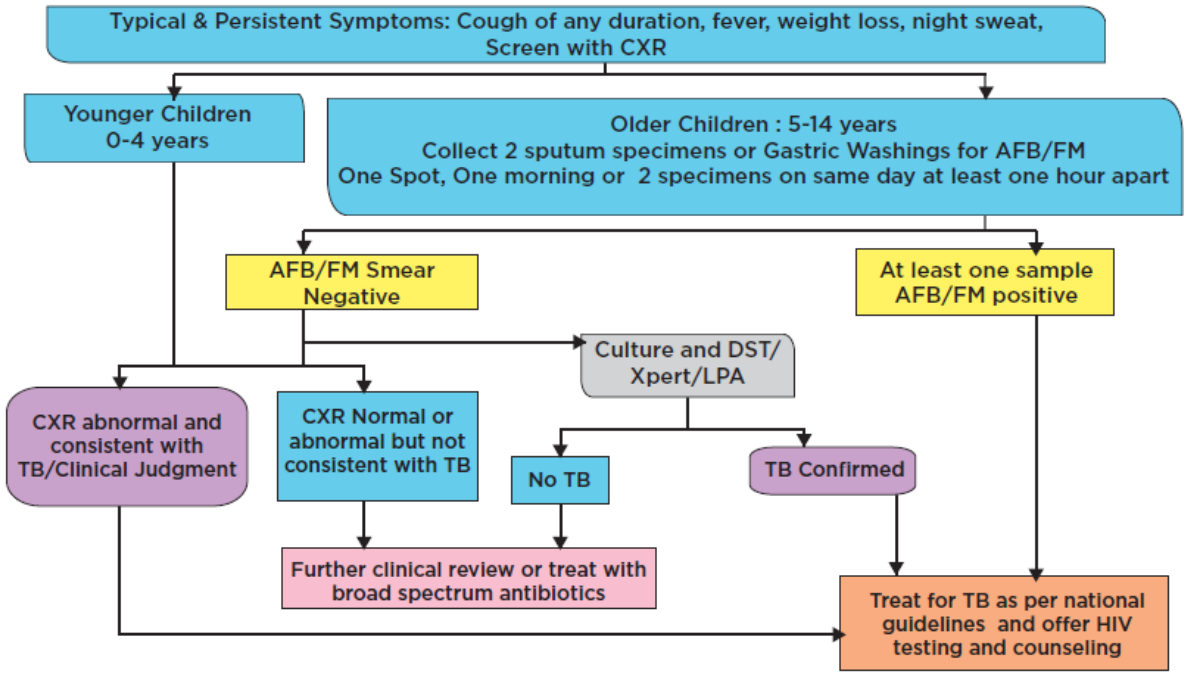
ANNEX

Annex 1: Algorithms for Case Detection

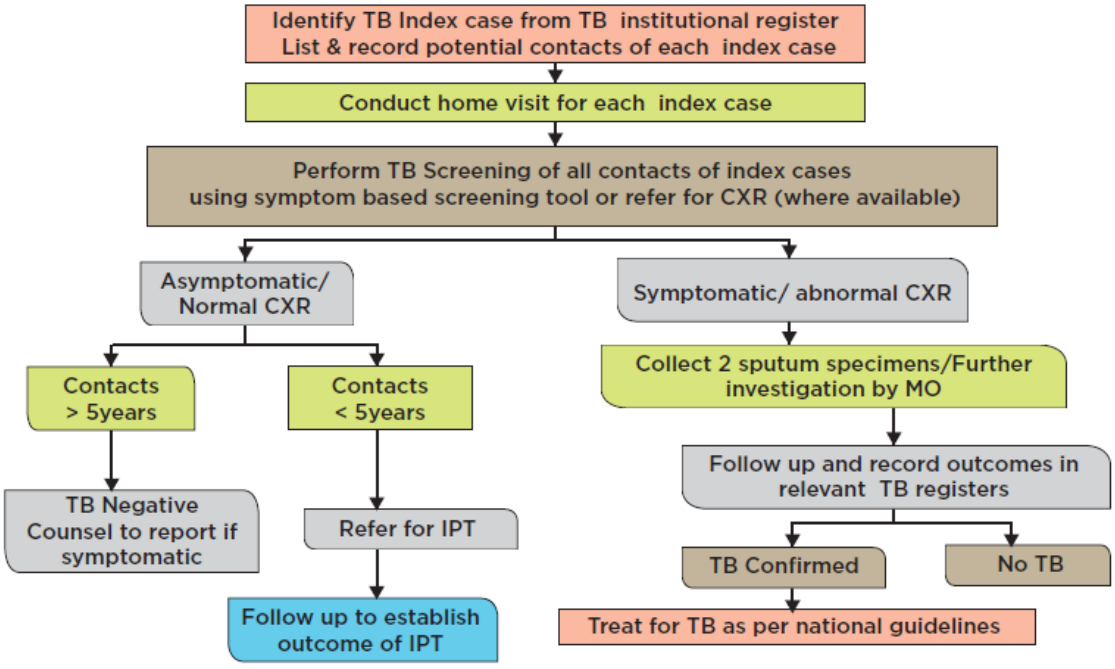




ALGORITHM FOR DIAGNOSING TUBERCULOSIS IN CHILDREN



ALGORITHM FOR TB CONTACT TRACING AND INVESTIGATION



Annex 2: Research Priority Areas

Theme	Research topic/question with background
1. TB case notification (and finding)	**<u>Follow-up studies from prevalence survey</u>:** ***a) Investigate and plan for active case-finding interventions among pregnant women. The preliminary findings of the national TB prevalence survey indicate that there is a high TB burden among pregnant women. Of those exempted from chest X-ray–mainly pregnant women (85% of the group with the rest mainly too ill to attend the field site)–sputum was collected and many TB cases (more than expected) were detected.*** b) Conduct follow-up studies using the TB cases detected during the prevalence survey (174 definite cases). Actively ensure the conduct of contact tracing in the households especially children. The nice random sample provided by the survey would be an easy entry point. c) Perform in-depth analysis of TB surveillance data linked to TB prevalence survey results. A discrepancy is anticipated between the estimates of WHO (92 per 100,000 population) and the preliminary survey results (suggesting prevalence of TB to be around 300 per 100,000 adult population: o What are the observed patterns (geographic, gender, age groups, urban/rural) etc? d) Are the geographic patterns observed in the surveillance data with higher case notification in the southern/coastal region versus the northern regions confirmed? If not why is this the case? Is there a difference in access to care for example? ***e) What are the strategic implications of the higher burden? Were all cases detected during the survey on TB treatment and notified to the program? What was the health seeking behaviour of those detected in the survey but not yet notified? Does TB control need to adapt its focus?*** ***f) Mapping of high burden areas and the high-risk population: can hotspots of transmission be identified?*** **<u>Surveillance data:</u>** ***g) There has been a consistent increase in smear-negative cases over the last year, specifically the last 2 years, while smear-positive and extra-pulmonary cases started to show a decreasing trend. Why is this? Questions to answer are:*** o ***Who are these smear-negative patients (can they be characterized in terms of age, sex, HIV status, geographical distribution etc.)?*** o ***Are all these cases really TB or is there over-diagnosis?*** o ***Does the difference reflect either changes in the performance of the laboratory system or non-compliance with diagnostic algorithms for TB at the different service delivery points in the system?*** h) Usage of surveillance data to guide TB control (are collected data actively used, at what level, who uses them, how are they used, are the activities documented etc.)? i) Evaluate the implementation of routine data quality assessments: has data quality improved? ***j) Investigate observed gender differences in TB burden and risk factors associated with this difference (HIV, other exposure (alcohol, smoking etc.) to better characterize the at-risk population.*** k) Investigate the observed regional variations in the types of cases notified and observe whether this is linked to regional variation in utilisation of the diagnostic algorithms or laboratory capacity or other factors linked to geographical variation in the population and its characteristics (HIV status, tribe etc.). l) Investigate the high HIV sero-prevalence but lower then expect case notification in Brong Ahafo regions with observed high death rates. m) Determine the reason(s) for the lower treatment success rate in the poorer performing regions. n) Investigate best practices in the three most populous regions Ashanti, Greater Accra and Western Region who report the highest treatment success rates (above the national rate) to inform interventions in the other regions, potential reasons could be the effectiveness of the application of the Enablers' Package, human resources strength and/or death rates. **<u>ACSM and knowledge of TB in the community:</u>** o) Knowledge, Attitude and Practice (KAP) for TB: At the start of TB control in Ghana a KAP study was done providing important information to guide TB control. Although the recent DHS included some questions to assess knowledge and prevailing stigma with respect to TB, ***there is***

	need for a follow-up study to better understand the knowledge of TB among the population in order to better guide ACSM activities. p) Impact of patient support by poverty level: patient support is provided throughout, but is the impact bigger in areas with increased poverty (northern regions and central)? ***q) Stigma reduction: impact of NGO activities that have been rolled out (engagement of chiefs, sensitisation, CSO involvement, etc.) – did it reduce stigma? (Is there a baseline? If not, a comparative study could be designed).*** **<u>Financing and funding of TB control:</u>** ***r) What is the process for priority setting of services at the operational level given the limited resources? Do districts prioritise? If yes, how do they do it, what is the process? If not, what are the barriers? Do they have the skills, knowledge and infrastructural needs to do this?*** ***s) Sustainability of financing for TB control and dependency on external donor funding – what activities are most cost-effective?*** **<u>New diagnostics</u>** ***t) What is the impact of the introduction of digital X-ray in terms of increased yield and quality of diagnosis (linked to the anticipated implementation of the ORIO project)?*** u) What is the impact of the introduction of digital X-ray on diagnostic delay and treatment outcomes (linked to the anticipated implementation of the ORIO project)? v) Compare cost-effectiveness of dig chest X-ray and Gene Xpert for PLHIV, children. ***w)*** Evaluate the implementation of the new algorithm and its effect on case finding that was implemented from 2013 onwards following the development of the new national TB manual. ***x) Impact of new diagnostics (Chest X-ray and Gene Xpert) on case finding, treatment outcome and delay.*** **<u>Access to care</u>** ***y) Using the mapping (see above under point d), implement active case finding (ACF) interventions, for example using the four existing digital mobile chest X-ray units, to focus on vulnerable groups:*** o ***Mobile populations (for example farmers in the central region)*** o ***Small mining areas*** o ***Urban slums*** o ***Prayer camps?*** ***z) Evaluate an innovative intervention (to be developed) to provide care for TB to the part of the population seeking care in prayer camps. General health seeking behaviour studies in Ghana indicate that alternative care providers are prioritised to seek care.*** ***aa) Assess involvement of private sector (chemical shop sellers, private clinics, private laboratories) in TB control. (What role do they play in diagnosis? Treatment? Adherence? Conduct a mapping exercise.)*** **<u>Follow up from earlier studies</u>** ***bb) Cost-effectiveness evaluation of the CIDA project approach (SOPs for enhanced finding). Critically evaluate what were the most successful components of the approach, what worked? What did not work not and why? What would be scalable? This could be combined with the results from the enhanced case-finding project in the Eastern Region to provide an image more representative of the country.***
2. Care of patients	***a) Evaluation of the Enabler's Package:*** The Enabler's Package has been identified by the external program review as key driver of treatment success, but it is highly dependent on external funding. Also, a key result of a study on patient satisfaction carried out by the Dodowa Health Research Centre indicates that support, although considered most important, was perceived as poor and the investigators suggest that support for transport, food and money needs to be improved at the various facilities. Both patients and health care workers indicated this is a key area that needs attention. A quote from the report focus group discussion results indicates: "Many of the patients claimed they had received enablers' support only once. They had to pick it at their first point where TB was diagnosed (district hospital) and not the facility where they take their drugs." And "almost all health workers from the CHPS did not know of the enablers' package for their clients until their clients told them, they had received such packages from the district hospital." This issue has also come forward from anecdotal evidence suggesting that the

	package does not always trickle down to the treatment sites. Many patients seem to be registered at the district hospital (who then receives the Enablers' Package) and are then referred to a treatment site (where the package does not reach). Therefore a ***proper impact evaluation of the Enabler's Package is warranted. In the light of decreased resources and high dependency of this package on external funding, alternative options need to be explored; for example, mobile technology. A proposal is being developed to conduct a comparative implementation study between the current implementation of the Enablers' Package and an alternative with mobile phone support from health care workers at randomly assign sites. Would that be feasible? How would that impact on outcome indicators? Would it be cost-effective? Do all types of patients benefit the same? Who benefits most (PLHIV, poor, young-old, male-female etc.)?*** b) Patient dosing during first-line treatment: around 30% of patients have an average weight above 50 kg. For these patients, there are potentially issues with drug dosage. For them, extra pills should be added from a new treatment pack (or the supply box), but anecdotal evidence suggests this might not always be done. A study should be done to investigate prevailing practices: are all patients correctly dosed? Which proportion is not dosed correctly? Does that affect outcome, adherence? Conduct an analysis of BMI and prescribed drug dosage to verify whether dosing is optimal. Also, as it concerns about one third of patients it could be explored whether a "weight plus pack (WPP)" (extra dosage for patients >50kg) would facilitate optimal implementation. c) Conduct an evaluation of nutritional support provided to TB patients: do these patients do better (in terms of outcome, weight gain, adherence etc.)? How cost-effective is it? d) ***Study health care worker motivation for TB work***. For example: are there more vacancies in TB than other areas? Also include the issue of stigmatisation of TB and HCW working in TB. What barriers are perceived to providing services from the HCW perspective. e) Impact of training on TB service provision. Do trained staff perform their TB control tasks differently (use more sputum test as confirmation, prescribe more IPT, provide key information on drug side effects etc.) ***f) Follow-up study from the patient satisfaction study done in 2011 by Dodowa Health Research Centre. Key findings of the study point to issues with support (addressed above under a); stigmatisation of HCW, provision of information on site effects, TB-HIV linkage, ART service availability and poor professional competence. Develop an implementation study to address the listed issues and investigate impact.*** g) Evaluation of "modified DOTS." The DOTS practiced is actually "modified DOTS" whereby patients collected weekly, biweekly or monthly drugs. The question is how does this affect outcome and what are barriers observed on the one hand and conditions that make it work on the other hand. For which patients is it successful? How cost-effective is it? This could be linked to the evaluation of community TB Care – does implementation result in "modified DOTS" and what is the impact of that in terms of treatment outcome. ***h) Investigate the increase in TB deaths among EPTB patients from 7.8% in 2006 to 14% in 2012 as well as the high death rates in smear-negative patients by usage of death audits to explore contributing factors to mortality like quality of service.***
3. Case holding	a) Follow up of 'tool to estimate patient costs study' when initial discussion of health with health insurance agency has been fruitful. Demonstration study to assess the impact of increased insurance coverage of TB costs (transport, food, cost for additional diagnostic tests (i.e. chest X-ray) etc. Have costs been reduced for patients? Have outcomes increased? Do patients still face catastrophic costs? ***b) Evaluate the PPM DOTS expansion initiative that was implemented in six cities: Did it increase access to care? Did it increase case notification? Did it increase treatment success? Was it cost-effective? What were barriers faced and opportunities identified etc.*** c) Investigate the high death rates among TB patient. Questions to answer: o Comparison with previously conducted study (2009) in areas with high and low TB case fatality to investigate whether the pattern has changed: When do people die during treatment? Which people die during treatment? What are their characteristics? What are risk factors for dying during TB treatment? o Could misdiagnosis be a cause of mortality, specifically among smear-negative cases (linked to 1e above)? o Do outcomes differ for the different types of TB? o What are the causes of death for patients dying during TB treatment? Is it TB or other causes? ***d) Linked to point c above, investigate community deaths. Are there many undiagnosed TB cases dying in the community? Such a study could be integrated into verbal autopsy studies at the existing demographic surveillance sites (DSS) in Ghana as has been done in other countries.***

	e) Case holding has improved but there are areas with higher default rates. Action research should be developed to tackle default in these hotspots.
4. TB-HIV	a) Investigate treatment outcomes among TB-HIV co-infected patients to assess the reason for the higher mortality. When do TB-HIV patients die during treatment (early – late)? Who are the patients dying? Do all or specific groups die more often, i.e. old-young, male –female; on ART, CPT etc.? b) Implementation research on the new ART guidelines calling for early ART initiation. The effect of the roll out of these new guidelines should be evaluated. Define clear outcome indicators and assess barriers, opportunities and challenges. c) Implementation research on enhancement of integration of TB-HIV services. Guidelines are under development, and 2-3 years after roll out, implementation should be assessed: What are the barriers? Are there improvements in key TB-HIV indicators etc.? Key challenge – there are only about 200 ART clinics while TB treatment is available at nearly all health facilities. d) Impact of an alternative algorithm for PLHIV: sputum smear as first step versus Gene Xpert. How does this impact on case finding, treatment delay and treatment outcome? What is the cost-effectiveness of each algorithm? ***e) Feasibility of decentralisation of ARV services to the community level (CHPs), impact on key TB-HIV indicators, case finding, outcome and access to care. Could start with some groups; for example, pregnant women.*** f) IPT in low-HIV setting – is this relevant? What is the impact? g) Further investigate the initial, crude analysis that seems to indicate that there may be a correlation between ART coverage and death as regions with higher ART coverage reported lower death rates. Need to investigate this and other potential co-variables.
5. Community support	***a) Implementation research to enhance the involvement of CSOs in TB case finding and holding. Implement the CSO approach, developed under TB-CAP/CARE like done in Nigeria, Ethiopia and evaluate the impact. Ensure full integration with CHPs concept. Investigate other roles the community can play, as currently the community is not optimally involved. The family support system is rolled out nationwide, so difficult to evaluate its effectiveness, but a comparison could be made with mobile support (see also under 2a). What is the added benefit?***
6. Infection Control	***a) Situational assessment of infection control (IC) implementation since the 2010 SOP development (current status, presence and utilisation of IC plan, IC team, HCW screening; barriers to implementation of the SOPs, etc.). The external program review did a quick assessment and concluded it is poor – a thorough evaluation should provide more detailed evidence and guide the way forward. Could be developed as action research.*** Aim is to identify the barriers to implementing TB infection control in health care facilities (DOTS Corners, DT TB and ART centres, prisons). ***b) Demonstration project to implement the FAST strategy. Aim: detect patients earlier, reduce treatment delay and prevent/reduce nosocomial transmission; duration: 6 to 12 months.*** c) Assessment of integration of TB IC within overall IPC within the GHS – show case project: How are the services integrated? What are the win-wins? What are the barriers to implement TB IC at the health facility level? What is working? What is not? What needs improvement etc.? d) Prevalence TB among health care workers (Action research to implement the TB care tool) ***e) Action research on TB IC implementation at the community level: the ambulatory model of care will be the backbone of the PMDT approach. Therefore, the functioning of IC at the community level is key. What is the approach? Is it functioning?***
7. Childhood TB	***a) Inventory of status of childhood TB: What is staff knowledge on childhood TB? Are the guidelines being practiced? Which activities results in detection of cases? What are barriers to the implementation of the guidelines. A study like this can help in guiding further implementation of the roadmap for childhood TB.*** b) Investigation of the sensitivity of childhood TB diagnosis. Does access to chest X-ray enhance case finding? (Conduct a comparative study with Gene Xpert and current situation as comparative arms). c) Investigate the reasons for the declining trends in the proportion of TB cases among children in Ghana.
8. DR-TB	***a) Implement a well-designed DRS survey that is analysed accounting for cluster design of the survey. This study is urgent as at present there are no reliable, nationally representative DR-TB data. Using the survey results, develop a program of DR-TB surveillance via sentinel sites.***

	b) Conduct a retrospective cohort study to investigate what happens to the diagnosed MDR-TB and monoresistant TB cases that are currently not started on DR-TB treatment. ***c) Uptake and appropriate use of new TB diagnostic tools (including Gene Xpert) for improved detection of smear-positive and drug-resistant TB:*** o ***How does the introduction of Gene Xpert testing impact the workload of the laboratory and the number of conventional diagnostic tests performed?*** o ***What are the main indications for requested Gene Xpert testing?*** o ***What are the main logistical and operational issues related to Gene Xpert implementation?*** o ***What is the impact of Gene Xpert on TB and MDR-TB case notification?*** o ***What is the impact of Gene Xpert on TB and MDR-TB treatment initiation rates?*** o ***What is the impact of Gene Xpert on patient delays before TB or MDR-TB treatment initiation?*** o ***How do Gene Xpert results compare to conventional DST results?*** d) Evaluate quality assurance and optimal use of equipment for Gene Xpert/diagnostic tools in general. e) Evaluate the coverage of implementation of screening for DR-TB as per guidelines/diagnostic algorithm: Are all identified high-risk groups tested? If not, what is the coverage in the different risk groups (i.e. HCW with TB; failures to convert at month 2 or beyond; failure on CAT I; failure on CAT II)? f) Clinical impact of Gene Xpert implementation for general TB diagnosis, MDR and HIV patients – are the machines optimally used or is there underused utilisation, and if so, what can be the solution (referral system improvement, transport system etc.)? g) Cost-effectiveness of multidrug-resistant tuberculosis diagnostic and treatment services in Ghana. ***h) Comparative study on the availability of /access to Gene Xpert versus culture and DST and its impact on early treatment of MDR-TB cases? Impact on the waiting list for MDR treatment, impact on patient delay etc.*** i) Evaluation of the impact of Gene Xpert roll out on TB case notification 3-5 years after implementation: How did it affect case finding, delay in starting TB treatment and treatment outcome? j) Risk factors for the development of DR–TB: primary/secondary resistance, which patients develop resistance (characteristics)? Which patients are more prone to MDR (failures, other MDR-TB suspects etc.)? k) Evaluation of support (nutritional, psychosocial) to MDR-TB patients: Do patients that receive support do better (in terms of outcome, weight gain, adherence etc.)? How cost-effective is it? l) Impact evaluation of the roll out of the developed PMDT training curriculum over the regions: Evaluate 2-3 years after roll out whether an impact on PMDT indicators (return on investment, public health impact) can be observed. An individual evaluation is incorporated in the designed curriculum but the impact on TB control should also be assessed.

Annex 3: Categorisation of Reported TB Cases in Ghana, 1996 – 2013

Year	New Cases Positive			Relapses		Treatment Failure		Treatment After Default		Pulmonary Smear Negative TB		Extra Pulmonary TB		Other		TOTAL CASES		Grand Total
	M	F	Total	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
1996	2864	1502	4366	226	114	0	0	0	0	1202	719	233	122	0	0	4525	2457	**7425**
1997	4502	2752	7254	231	125	0	0	0	0	1586	1012	331	210	0	0	6650	4099	**10749**
1998	4835	2922	7757	237	146	0	0	0	0	1620	1001	343	248	0	0	7035	4317	**11352**
1999	4357	2520	6877	288	113	0	0	0	0	1502	941	389	276	0	0	6536	3850	**10386**
2000	4749	2567	7316	334	168	0	0	0	0	1554	946	361	254	0	0	6998	3935	**10933**
2001	4823	2889	7712	385	190	0	0	0	0	1727	1043	452	364	0	0	7387	4486	**11873**
2002	4960	2772	7732	334	170	0	0	0	0	1648	1046	449	344	0	0	7391	4332	**11723**
2003	5023	2691	7714	388	170	0	0	0	0	1732	1132	429	331	0	0	7572	4324	**11896**
2004	4821	2438	7259	375	167	0	0	0	0	1922	1200	523	381	0	0	7641	4186	**11827**
2005	5024	2560	7584	376	164	0	0	0	0	1775	1301	591	429	0	0	7766	4454	**12220**
2006	5177	2609	7786	374	123	12	6	11	11	1974	1165	590	459	0	0	8138	4373	**12511**
2007	4909	2520	7429	331	132	84	43	73	20	2305	1454	581	511	0	0	8283	4680	**12963**
2008	5278	2626	7904	323	123	90	42	86	29	2570	1741	760	635	114	62	9221	5258	**14479**
2009	5556	2699	8255	346	120	86	33	92	40	2735	1766	804	633	205	171	9824	5462	**15286**
2010	5098	2558	7656	354	129	87	49	98	18	2842	1865	826	574	388	259	9693	5452	**15145**
2011	4964	2659	7623	297	130	83	38	72	26	3458	2088	862	604	343	225	10079	5770	**15849**
2012	4806	2291	7097	282	94	70	25	74	19	3512	2156	777	524	341	236	9862	5345	**15207**
2013	4993	2308	7301	320	96	88	30	96	38	3469	2214	794	553	349	258	10109	5497	**15606**