DOMESTIC HEALTH INVESTMENT AND TUBERCULOSIS MORTALITY RATES IN KENYA.

By

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Declaration

This research project is my original work and it has not been presented for a Degree award in any other university or institution.

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X53/64473/2013

Signature:……..Date:……

This paper has been submitted for examination with my approval as the University Supervisor.

Dr. Martine Odhiambo Oleche.

Signature:…….Date:……

Dedication

This work is dedicated to my Parents

Abdulatif Kikanga Makuthu

&

The late Khadija Mwikali Kikanga

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Abbreviations

ADF	Augmented Dickey Fuller
AIDs	Acquired Immune Deficiency Syndrome
AR	Autoregressive
DOTs	Directly Observed Therapy
GDP	Gross Domestic product
GF	Global Fund
HBCs	High Burden Countries
HIV	Human Immunodeficiency Virus
IRS	Indoor residual spraying
ITN	Insecticide-treated bed nets
KHSSP	Kenya Health Sector Strategic Plan
LMICs	Low and Middle Income Countries
MDGs	Millennium Development Goals
MDR TB	Multi Drug Resistant Tuberculosis
NHSSP	National Health Sector Strategic plan
ODA	Official development assistance
OLS	Ordinary Least Square
SDGs	Sustainable Development Goals
TB	Tuberculosis
US	United States
VEC	Vector error correction
WHA	World Health Assembly
WHO	World Health Organization

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Abstract

In Kenya, a huge investment on the National TB program has for decades been made by the international sources even though a larger proportion remains unfunded. However, recently there has been an increase in investment from domestic sources yet the larger proportion remained unfunded. Between the years 2014 and 2015 domestic health investment towards TB control remained constant and the government was able to fund only 23% of the National TB program budget in 2014. Regardless of these investment and international commitments, in the year 2013 alone, an approximated five hundred thousand women lost their dear lives due to TB related complications, where more than a third of them were diagnosed with HIV. In addition, there were eighty thousand deaths resulting from tuberculosis amongst HIV negative infants in the same year. This was however attributed to low political commitment and un-sustained financing to control the epidemic. Based on this, the main objective of this study was to examine and/or investigate the impact of domestic investment on TB mortality in Kenya. The study employed econometric modelling in estimation using time series data for the period 1984-2015 obtained from the various economic surveys. Ordinary Least Squares (OLS) was used as an estimating technique upon testing and addressing various assumptions. Significance was tested at 5 percent and ten percent levels. The empirical results indicated that there is a negative but statistically insignificant effect of domestic investment on TB mortality in Kenya. In conclusion, a review of finance policy is not that necessary in order to control the death resulting from TB. The government through the Ministry of Health needs to evaluate the levels mortalities associated with TB could be tackled given that financing alone doesn't significantly contribute to the effective reduction as established empirically. Based on this finding, the study suggests for a consideration of reviewing other factors that theoretically and empirically are associated to TB mortality.

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

According to World Health Organization (2014), Tuberculosis (TB) is one of the primary causes of mortality and morbidity across the globe. The World Health Organization Statistics Report (2014) accounts that about 1.5 million people losses their lives annually due to TB, and it is thus ranked as the second leading communicable disease after the human immunodeficiency virus (HIV), which causes global human deaths. Nonetheless, health statistics from the World Health Organization (WHO) warns that lack of commitment in financing to control TB will continue to threaten lives of over ten million people, yet it is an avoidable and curable disease (WHO, 2014).

Notwithstanding, the world has undergone some commendable and progressive milestone in its control since the declaration of the infectious disease as a global health burden in 1993. However, there is still a huge demand for global governments to invest in TB control in order to completely end this epidemic, especially in Low to middle income countries, which are highly affected by the disease, (WHO, 2015).

1.1.1 Overview of Tuberculosis

The New England medical journal defines Tuberculosis (TB) as a transferable disease, which is caused by *Mycobacterium tuberculosis bacteria*, whose attack has an adverse effect on the lungs, although it can as well affect and damage other body parts including the brain, kidneys, or spine (Zumla, Richard, Hafner & Fordham, 2013).

Narasimhan, James, Chandini, and Dilip (2013) analyzed the development of TB from the stage of exposure of bacteria to the development of a full-grown disease and they noted a two-stage progression, that is, endogenous and exogenous risk factors. To them, exogenous factors are key in accelerating the progression from exposure to bacteria, depending on the closeness of a person, to an infectious individual case. Narasimhan and his team of researcher affirmed that the endogenous factors could lead to TB progression from infection stage to an active Tuberculosis infection.

Alongside other factors, Narasimhan and his team recognized diabetes, alcohol, and tobacco to play key roles to the development and spread of TB, both the at the micro and meso levels.

Special groups such as indigenous population and health care workers are as well at higher risk of being infected with Tuberculosis (Narasimhan et al., 2013).

Furthermore, Grange (2009) and Gurung (2013) argued that TB affects the most vulnerable people, especially those who live in ultra-poverty, the marginalized, and the socially secluded (Grange, 2009). As Gurung (2013) affirms, TB infection can have a far reaching financial and social consequences for those infected, their households, and the communities at large.

According to the Global Tuberculosis report of 2014 estimates, nine million new TB cases were recorded in 2013 and one million, three hundred thousand deaths related to TB were recorded. Among these deaths, one million occurred among people without HIV whereas three hundred were for HIV- TB related deaths occurred among men (WHO, 2014).

Worrying statistics indicate that in 2013 alone, an estimated three million TB cases and four hundred thousand TB deaths occurred among women. Still in the year 2013, an estimated five hundred thousand cases and seventy thousand deaths occurred among infants under the age of 5 years (World Health Statistics, 2014). Nonetheless, these huge statistics are intolerable given that TB is treatable and preventable, especially when there is clear and sustained financial commitment from the governments (WHO, 2011).

Just to prove how the disease troubles the global prosperity, 75 percent of TB infection occurs during individual's productive years, that is, at the ages between 15 and 54 years (Global TB report, 2014). In such cases, majority of the infected workers are often unable to report to their jobs and the productivity of other members of their family who care for the sick member is as well highly affected (WHO, 2014). In addition, children are also become victims of the TB menace as they are directly or indirectly affected. For instance, parental deaths due to TB lead to more orphaned young population, which consequently contributes to higher rates of school dropout or even destitute living (Jamison, Alok, Lau & Murray, 2007).

1.1.2 TB Mortality in Kenya.

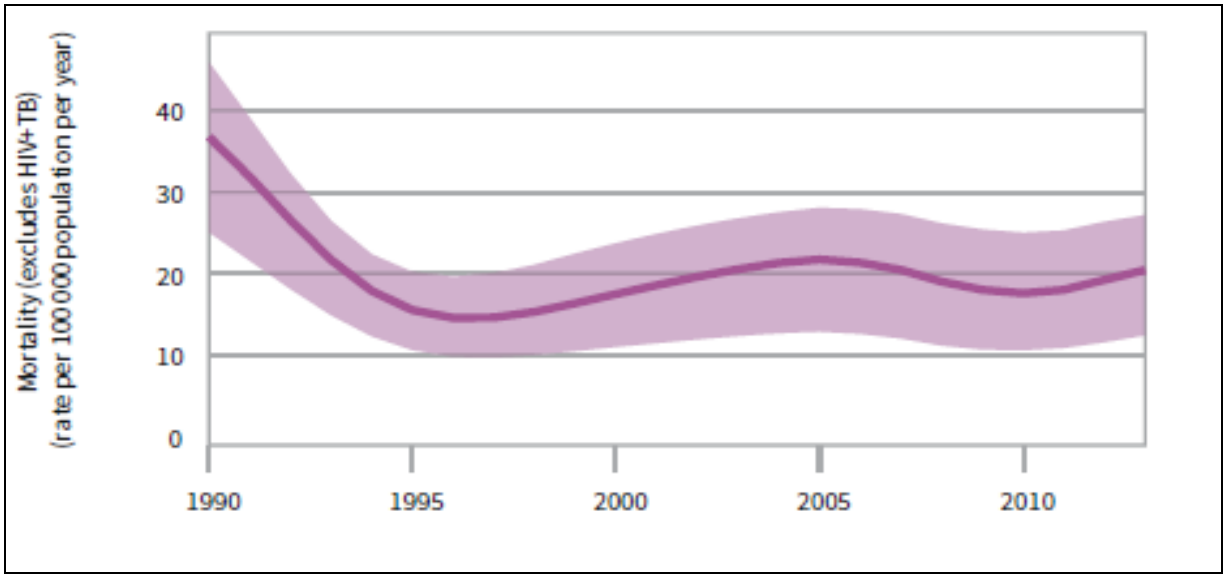
TB mortality refers to the total deaths occurring due to Tuberculosis infection per a hundred thousand populations. Among the twenty-two countries with the highest burden for Tuberculosis worldwide, Kenya is one of them due to reasons associated with increasing population and higher rates of HIV prevalence (Republic of Kenya, 2013). These worrying

deaths caused by Tuberculosis have affected the country's economic performances in the past dozen years. For example, approximately three to four months' work time is lost yearly due to TB sickness, and about twenty to thirty percent of household income is spend to provide improved treatment and care to the sick member. Furthermore, families whose members succumb to the disease lose income of about fifteen years period (Kim, Shakow, Castro, Vande & Farmer, 2003). Based on a thirty per-cent decline in average productivity at the household level due to TB, the country's economic loss will amount to approximately US$1 million per year (Kim et al., 2003). In Kenya, this drop in productivity attributed to tuberculosis can be between 4 to 7 percent of the GDP (WHO, 2014).

Over the years, Kenya, just like other HBCs, has experienced considerable uncertainties in terms of levels and trends in the figures of TB mortalities reported, which have indicated how the country unable to meet the STOP TB partnership targets of reducing TB deaths by 50 percent. Such uncertainties have been attributed to the absence of clear and sustained political commitment especially at the higher levels to increase the funding to control TB burden within the country, and inability to recognize the benefits of the domestic health investments in the control of this infectious disease (Pinet, 2001).

According to WHO (2014), Tuberculosis deaths in Kenya reached 9,723 or 3.06% of the total fatalities caused by communicable diseases (WHO, 2014). In fact, the WHO and the Institute of Health metrics and Evaluation approximate that the mortality rate in Kenya has declined since 2000 by 45% (Global TB, 2014). Furthermore, the world health statistics (2014) estimates TB Mortality to have increased from 19 cases in every 100,000 population to 22 cases in a 100,000 population between the years 2000 and 2012 respectively (World Health Statistics, 2014). This means that there is need to wage war against TB mortality in Kenya. This is data is further expounded in the figure 1.1.

Figure 1.1: Trends in TB Mortality between 1990 and 2010



Source: World Health Organization 2014

1.1.3 Global TB management and Control Policies

The first global attempts to control TB were enacted in 1991, a time when WHA (World Health Assembly) resolution acknowledged tuberculosis as a key concern for the global public health. In this meeting, two critical targets to end Tuberculosis were discussed as part of the resolution: (1) to detect up to 70% of new smear positive cases, and (2) to provide treatment to about 80% of such TB cases by year 2000 (WHO, 2002).

In 1994, the internationally acknowledged control strategy, which was later rebranded as DOTS (Directly Observed Therapy Short course), was solemnized. Its key constituents included to push for government support; case detection, majorly through passive case-finding; standardized short-course chemotherapy to all established sputum smear-positive cases delivered under proper case management conditions; a strong system of steady and sustained drug resource; and a robust monitoring arrangement for program administration and evaluation (Simwaka, Bello, Banda, Chimzizi, Squire & Theobald, 2007). The DOTS system has been successively expanded, further elaborated, and executed in more than 182 countries. Through this framework, the DOTS strategy has been to help nation states to intensify NTPs (National TB control programmes) and has enabled massive improvement towards TB control.

In the year 2004, the first Global Plan to end TB highlighted various key actions which were necessary in control of TB between the years 2001 and 2005. This plan facilitated efforts to control TB globally in that specified period. Even though some of the resolutions were not met in majority of the HIBCs, the approach led to stronger commitments from the government especially in sustaining the financing health-related systems (Raviglione, 2002). Likewise, these experiences led to the expansion of Stop Tuberculosis Plan and the Global Strategy to end TB between the periods 2006 and 2015. The strategy had six basic components that sought to lessen the worldwide TB burden by the year 2015 in accordance to demands of the MDG (Millennium Development Goal) six. The components included to adopt high-quality Directly Observed Therapy Short course growth and development by having a committed governmental will with augmented and sustained financing; address TB and HIV, MDR-TB (Multi drug Resistance TB) and other associated challenges by implementing collaborative HIV and Tuberculosis activities; strengthen health systems by improving health system policies, information systems, management, service delivery, financing, and human resources; involve all care givers by adopting a Public–Public and PPM (Public–Private Mix) frameworks; capacity-build people and their communities about TB; and support as well as promote programme related research (WHO, 2011).

1.1.4 TB Management and Control policies in Kenya

Health development agenda in Kenya is instituted on the Kenya Health policy Framework of 1994 -2012. In this framework, much emphasis is put on the provisions of improved healthcare plan that is acceptable, inexpensive, and reachable to all. The execution of this approach is organized into two broad strategic plans, that is, the NHSSP I, 1999-2004 (National Health Sector Strategic Plan), and the NHSSP II, 2005-2010 (National Health Sector Strategic Plan II), (MOH, 2013).

The Kenya Healthcare Policy 2012-2030 envisions to attain this goal by promoting provisions of affordable, equitable, and quality health as well as its allied services at the utmost possible quality to Kenyan citizens. It also targets to attain a high level as well as delivery of healthcare as those provided in the middle-income countries, through realization of precise healthcare impact targets. The key concerns addressed in the Kenya Healthcare Policy and the current NHSSP III (2012-2017) are designed towards attainment of quality

Service Delivery and strengthening System investment that relate to end tuberculosis and leprosy, and upgrading of lung health centers (MOH, 2013).

Basically, TB management and control in Kenya is majorly steered by the principles of Stop TB. The Stop TB Strategy is a continuous and evolving Tuberculosis care and control approaches that classifies and targets susceptible groups of people for TB care and control actions (Republic of Kenya, 2013). This strategy aims at achieving a world, which is free from TB burden. In 2006, the World Health organization initiated a six-point strategy to end TB, which embarks on the successes of DOTS as well as addressing the key hurdles facing TB control (WHO, 2006). This strategy was to be realized by pursuing a high-level DOTS enlargement and enhanced with a clear and sustained government commitment on quality, and continuous investment by nation states if strategies to end TB were to be implemented efficiently (WHO, 2006).

1.1.5 Current Health Policy response towards TB Control.

The approach to the global TB situation has greatly evolved in reference to countries' situations and needs. From these progress made in combating Tuberculosis, the WHO developed a post end TB strategy that aims at having a world, which has zero cases of tuberculosis, and free from TB fatalities, ailment, and suffering by 2035. In order to attain these goals and strategies proposed, a comprehensive framework was developed based on 4 major principles that include government management and responsibility; robust alliance with civil society organizations and local communities; defending and advancement of fundamental human rights; and adoption of key frameworks at national level, with worldwide partnership. These principles are anchored on three main pillars, that is, bold policies and supportive structures, increased research and innovation, and integrated client-centered care and support. These bold strategies and helpful systems strive to attain full-grown political commitment through adequate and sustained resources for TB care and prevention especially amongst High Burden Countries (HBCs) (Mathers, 2006).

At the country level, the Kenya vision 2030 blue print and the Kenya Health Sector Strategic Plan (KHSSP 2013-2017) also emphasize the importance of safe environment and need to reduce incidences of communicable diseases. Through the social pillar of Kenya's vision 2030, policy makers seek to transfer the bias of the health policy from curative to protective

care and distinctive focus is directed to minimize the burden of malaria, HIV/AIDS, and tuberculosis. Furthermore, one of the crucial strategic objective of KHSSP (2013- 2017) is to eliminate communicable diseases by eradicating and reducing disease burdens of tropical conditions, for instance malaria, to lower levels and manage disease burdens of diarrhea and lower respiratory infections, which could not be eliminated given the prevailing investment strategies (Republic of Kenya, 2013).

1.1.6 Global TB Health Investment.

According to the WHO report of 2012, TB investment was projected to reach $5 billion by 2012. This was an increase from $4 billion in 2011 and around $3 billion in 2010 (WHO, 2014). Out of the 22 HBCs, which contributes to 8% of the global TB cases, investment for TB care and control was estimated to reach $3 billion in 2011(Global TB, 2014). This was a firm increase in TB investment from around $2 billion in 2010 to $3 billion in 2011 (WHO, 2012).

Over the years, there have been some significant variations in investment in TB control across the HBCs. Five countries, which include the Russian Federation, Brazil, India, South Africa, and China lead by about 83% of the investment and sixty percent of all cases that were notified amongst the HBCs (WHO, 2014). TB investment for the remaining seventeen HBCs was expected to amount to approximately $570 million in 2012, which was equivalent to 17 percent of the total expected funding amongst the countries, despite these seventeen countries had recorded forty percent of all notified cases amongst the HBCs. Across the 22 HBCs, home financing from national governments was the only principal source of capital, which accounted for 87 percent of total expected funding in 2012 (WHO, 2014).

The Global Fund, which is the principle campaigner of STOP TB has been the chief source of donor investment as it contributed up to $360 million in 2012, whereas other international sources contributed only $86 million in 2012 (Global TB report, 2014). The Global TB report of 2014 estimated that domestic contributions could cover the bulk (over sixty five percent) of financing required for TB care and control in the one hundred and eighteen countries, which was equivalent to $3 billion (WHO, 2014).

The Lancet Commission on financing health estimated that 86% of the total TB funding for the year 2012 was expected to come from national governments for the TB programs in the

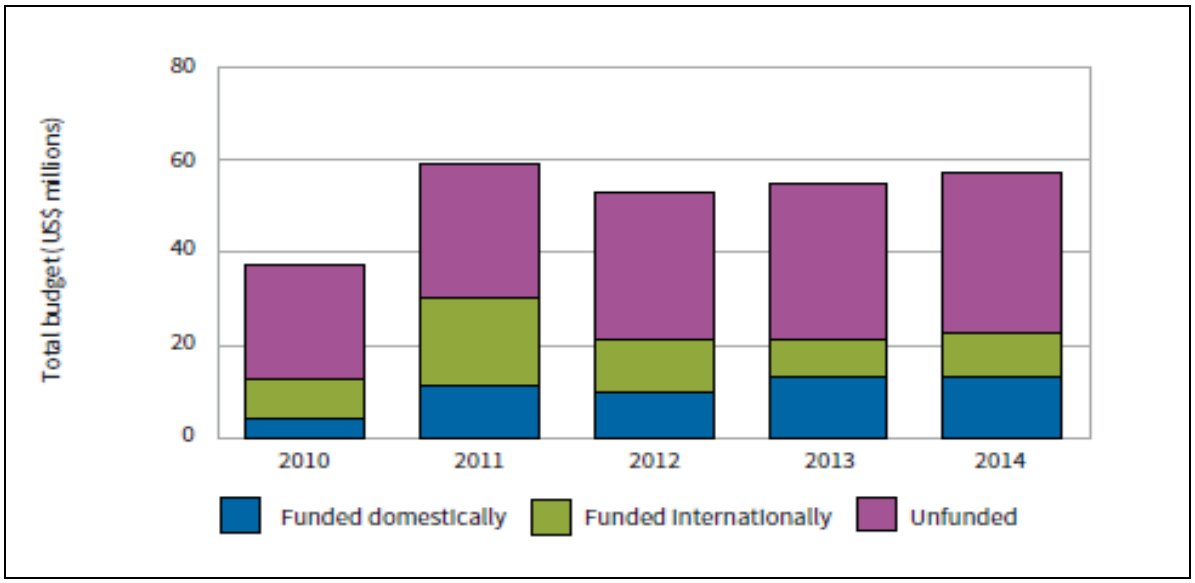
affected countries, and the remaining twelve percent of the budget, which totals to about five hundred million US dollars, was to be sourced from the Global Fund (Global TB report, 2014). In addition, Lancet Commission estimated only 2% of the total funding, or one hundred million US dollars, was expected to come from other donors. Furthermore, the funding that was needed for a complete support to the world's TB endemic in low and mid-income states was projected to amount $8 billions in a year by the year 2015 (Ravishankar, 2011).

1.1.7 TB Investment in Kenya.

Financing of Kenyan health sector is governed by the Kenya Health Sector Strategic Plan (KHSSP 2013-2017) framework. This strategy seeks to realize a wholesome coverage of key services that can lead to a better healthy population (KHSSP, 2013). In addition, this strategy offers the sector for health with medium-term focus on key targets and concerns to allow it to progress towards realization of the Kenya's health policy directions (Republic of Kenya, 2013).

Tuberculosis in Kenya is financed both domestically and internationally (Republic of Kenya, 2011). In the year 2010 for example, a huge investment on the National TB program was made by the international sources even though a larger proportion remained unfunded (Republic of Kenya, 2009). In 2011, there was an increase in investment from domestic sources yet the larger proportion remained unfunded. Between the years 2013 and 2014 (as shown in figure 2), domestic health investment towards TB control remained constant and the government was able to fund only 23% of the National TB program budget in 2014 (WHO, 2013).

Figure 2: TB Financing in Kenya 2010-2014



Source: World Health Organization 2014

1.2 Problem Statement

Tuberculosis is one of the infectious diseases and it is a leading contributor to mortality and ill health in the world (World Health Statistics, 2014). This infectious disease affects everyone irrespective of age and gender, but mostly affects the productive cohort that is aged between 15 and 44 years (Republic of Kenya, 2013). According to Global TB report (2014), about sixty percent of tuberculosis cases and fatalities occur among men, even though the encumbrance of this infectious disease in women is also rising. In the year 2013 alone, an approximated five hundred thousand women lost their dear lives due to TB related complications, where more than a third of them were diagnosed with HIV (Global TB report, 2014). In addition, there were eighty thousand deaths resulting from tuberculosis amongst HIV-ve infants in the same year. Perhaps, this is due to low political commitment and unsustained financing to control the epidemic.

The high death rates arising from tuberculosis has great negative implications in a country's economy. For example, studies have informed that, in Kenya, about 3 to 4 months' working period is wasted in a year due to the disease, and earnings of about twenty to thirty per cent, for an estimated period of about 15 years of income, is lost in families whose a member die due to TB (Kim, Shakow, Castro, Vande & Farmer, 2003).

Based on a thirty per cent average decrease in productivity due to illness and disability arising from TB, an approximated US$1 billion is lost annually (Kim et al., 2003). When computed on an average timeframe of 15 year's income that is lost as a result of TB deaths, the projected annual deaths of about 2, 000, 000 people translates into additional annual loss of about $11 billion, thus totaling to an annual global loss of US$12 billion (Kim et al., 2003).

In some nations, this massive loss of production attributed to tuberculosis can be between four to seven percent of the (GDP) gross domestic product (Global TB, 2013). Businesses are also affected as a result of TB as labor force suffering from TB can fail to report on duty for a quite number of months, and are as well likely to pass on the disease to their workmates (World Economic Forum, 2008).

While most nations with TB burden have made an attempt to increase domestic health investment especially in controlling communicable diseases such as TB and malaria, majority of them still rely greatly on foreign investment to address most of their health related challenges (World Investment report, 2014). This creates insufficiencies to satisfy the massive need of the rising population, which according to Kea (2011), such insufficiencies to meet the health needs due to limited domestic health investment can result to high out-of-pocket expenditure for both the government and households. Consequently, it can lead to a retrogressive form of health financing, which can expose patients to catastrophic expenditures. Recently, with the changing nature of donor priorities in regards to how countries should spend on disease programmes, Kenya is among the nations that have been constantly urged to demonstrate unthawed government commitment to health and disease programs, and also submit regularly, reliable impact reports on disease and health spending data, in relation to spending in those programmes (Jamison,2006). From the imperatives discussed above, the urge to document the impact made in domestic health investment is unquestionable.

Despite existence of several studies that have explored the impact of foreign investments made in controlling communicable diseases in LMICs, their expenditure estimates are based on smaller dataset sample. As a result, this research seeks to extend these studies by utilizing the actual expenses made in controlling TB by adopting a more comprehensive dataset that is

drawn from the Ministry of health and from the national treasury to determine the impacts of the government investment in reducing TB mortality, which unfortunately has not been quantified. The study will therefore fix the existing knowledge gap by informing the government of Kenya on the status of resource allocation to TB disease programmes and the impact of such allocation to health indicators.

1.3 Objectives of the study

The main objective of this academic work is to establish the close relationship between domestic health financing and TB Mortality rate in Kenya. Other specific objectives include:

i) To document the profile of both Domestic Health investment and TB mortality in Kenya;
ii) To determine the effect of domestic health investment on TB Mortality in Kenya.

1.4 Justification of the Study

The government of Kenya has made substantial efforts in reaching the agreed upon Abuja declaration targets of allocating at least fifteen percent of their aggregate government expenditure to health (WHO, 2014). Even though domestic investments made by the government to the health sector have been steady and strong, information remains scanty on the effects of the health investments made by the government and the progressive outcomes.

Thus, this study aims at establishing the strong relationship between domestic health investments and the TB mortality, and further, presents various benefits of increased financing on health to encourage policy makers to allocate adequate resources towards the reduction of TB mortality. Furthermore, apart from contributing to the academic pool of knowledge, the study results may provide useful information to the Kenyan government, private segment, and donor world on various strategies that can be adopted to meet the sustainable growth targets. Indeed, this study has not been fully explored in Kenya and therefore, the findings may contribute to the health financing literature by examining the tangible impacts of domestic investment on TB mortality.

1.5 Organization of the paper

Preceding chapter one, Chapter two of this research project is composed of literature review, which gathers, analyses, and appreciates what other researchers have already accomplished in the same field. Chapter three looks at the research methodology and it provides a wealthy

knowledge on data variables, estimation techniques, and theoretical as well as econometric models that have been employed in the analysis of data. Chapter four presents the study findings and discussions as estimated using the appropriate model and chapter five presents summary, conclusion and policy implications of the study.

CHAPTER TWO : LITERATURE REVIEW

2.1 Introduction

This chapter is organized into three subchapters, that is, the theoretical literature, followed by empirical literature, and a final brief summary of the reviewed literature that touches on health investment and outcomes, especially those specifically related to Tuberculosis control.

2.2 Theoretical Review

The principal reason for discussing the theoretical literature on health investment is to elicit a multi-variance analysis, which will assist in the choice of empirical models that can be adopted to analyze data and inform the study objectives. This paper discusses two main frameworks that allow a broader investigation of the link between health-related behaviors and health outcomes. These frameworks include the Contotannis and Jones analytical framework (2004) and Balia and Jones behavioral model (2005).

2.2.1 Contotannis and Jones analytical framework.

This framework proposes a system of health and health related outcomes that control cases for endogeneity. This framework allows for steady observation of outcomes due to the influences of unobservable heterogeneity, dependence, and relationships in the transitory error component. Moreover, the framework uses a latent variable specification for the various measures of socioeconomic status with inclusion of lagged health output. The study considers this framework for health development function because it relies on systematic comparisons and accounting for methodological complications, such as omitted variable, endogeneity, non-observable heterogeneity. In addition, this study strives to solve the constraints of endogeneity in line with the analytical framework of Contotannis and Jones.

2.2.2 Balia and Jones analytical framework

This framework is a development of Contotannis and Jones analytical framework. Balia and Jones (2005) proposed their behavioral framework for health, which analyses the socioeconomic patterns and the person's related behaviours. They argued that the correlation between individual's socio-economic features and mortality should be investigated through the analysis of lifestyle choices and health investment.

In addition, their framework assumes that non-observable heterogeneity can affect both the health results and health-related behaviors since individuals will always look for the premium levels of health coverage, irrespective of time and financial constraints, even when given

other consumable goods that can satisfy their utility. This study incorporates analyzing the status of individual's health in a household's utility function. While using mortality as a dependent variable and as our main health outcome, the study assumes that investment in health should be endogenous and thus, it can influence longevity.

2.3 Empirical Literature Review.

Akachi (2011) conducted a panel regression study to a panel to examine the associations and relationships amongst the inputs, outputs, and outcomes associated with Global Fund, malaria grants. The dependent variable included the mortality rates for infants below the age of five and the sum of lives saved from malaria-related causes for infants under the age of 5 years. The independent variables included the disbursements of ODA (official development assistance) for the control of malaria between 2002 and 2008, and dissemination and coverage of insecticide-treated bed nets and IRS (indoor residual spraying). The study results revealed that increased ODA disbursement for control of malaria was substantially associated with improved ITN/IRS coverage, and it had consequently led to saving lives of about 240,000 people. The research also revealed that investment that aimed at improving ITN/IRS coverage was basically cost-effective in saving lives (especially in countries with high burden). Thus, external financing for programmes that aim to control malaria ought to be aligned with the global distribution of the malaria disease burden. The limitation in this research is that it describes association between various factors and lacks precise causal pathways.

Floyd, et al., (2010) also conducted a time series study and used panel regression study to assess the investment that was required to meet the set goals for TB control and management. In their study, they utilized data that was reported to World Health Organizations to assess TB financing from both governments and international donors, and compared the improvement in TB control in developing nation-states between the years 2002 and 2011. In the study findings, they established that investment meant for control of tuberculosis had increased steadily between the years 2002 and 2011. In addition, the authors confirmed the vital role of foreign investment for control TB programmes in meeting MDG goal six. This study paper will however provide broader knowledge on the contribution of domestic investment in tuberculosis care and control programmes.

Howard (2008) used the panel regression model to examine public and international donor investment for health in undeveloped nations. In his study, he noted that the availability and efficiency of financing was critical in influencing the outcomes of national health impact indicators in both undeveloped and developed countries. However, the study utilized a small dataset to draw the conclusion. Therefore, this research seeks to use a much larger dataset to examine the association of public sponsoring and health impact indicators on mortality.

Schwartzman, et. al., (2005) used decision analysis to estimate tuberculosis-related mortality, morbidity, and economic burden among legitimate refugees and immigrants, illegal migrants, and short-term aliens from Mexico as they entered into the U.S. They also evaluated the worth of the corporate radiographic screening strategy for authorized visitors and the current TB-control initiative alone against those with addition of either U.S. financed expansion of the direct experimental treatment strategy (DOTS) or tuberculin skin testing used to screen legaly accepted visitors from Mexico.

From their study, they observed that expansion of the DOTS initiative would remain cost saving even if the baseline financing were doubled, if the U.S. paid for all anti-tuberculosis drugs in Mexico, or if the decline in the decrease of TB in Mexico was less than projected.

Mathers and Loncar (2006) used a simplified model to predict health dynamics using three settings, that is, baseline, optimistic, and pessimistic. Their model was majorly based on approximations of social and economic change, and utilized the general perceived relations of these factors with specific causes of mortality rates. In their study, they observed that the prospective trends of mortality rates in underdeveloped nations correlate to both social and economic changes, just as it had occurred in the developed nation states.

Gani (2008) used cross-country statistics from 7 Pacific Island states (Vanuatu, Kiribati, PNG, Fiji, Tonga, Solomon Islands, and Samoa) for selected period between the years 1990 and 2002 to find out whether expenditures of public allocations had a profound impact to the health sector in those nation states. They used empirical methodology that utilizes a fixed effects approximation technique to correct Autoregressive AR (1) errors. The outcomes obtained from this method of assessment indicated that per capita health expenditure together with immunization and income levels were core influences that determine under 5 death rates. In this study, Gani noted that there was robust evidence that individual health spending plays a crucial role in reshaping health outcomes.

Porco, et al., (2006) used a stochastic model for TB transmission, reactivation, and tracking of a group of 1000 persons to establish the cost-benefit of TB assessment and treatment of immigrants on their arrivals in the US. Their study unearthed that household follow-up remained economical because about 0.4 percent of the patients were identified to have contracted the disease, and the hospitalization of cases identified via home follow-ups was not expected to be less than hospitalization of passively identified cases.

Furthermore, Dye, et al., (2008) applied regression analysis to establish whether variations in countrywide rates in TB occurrence were associated to the attainment of variable control initiatives or to socio-economic and biological dynamics in one hundred and thirty four nation states. Their study revealed that the rate of TB incidence was falling sharply in nation states with greater health expenditure, developed nations with less entry of foreigners, and nations with reduced HIV infection and child death rates such as the American and Caribbean states.

Jongh, et al., (2013) piloted a systematic review on the positive impact of international financing for initiatives for HIV/AIDs, tuberculosis, and malaria. Using predefined inclusion principles for studies that associate health impacts or outcomes to improved external funding, they observed a progressive relationship amongst successive steps in the causative series, signifying that donor funding for TB, HIV/AIDs, and malaria initiatives led to better health impacts and outcomes. Also Yumo (2011) used a retrospective study to assess the outcome of executing the Global Fund Grant Round three for control of TB at the rural district in Cameroon for the timeframe between 2003 and 2008. The study revealed that mortality rates fell to zero in 2006 and 2007 from maximum values of 15 and 23 percent in 2004 and 2005, respectively.

2.4 Overview of the literature.

From the above studies reviewed, there was a far-reaching evidence on how financing has impacted health sector. However, these researches do not investigate beyond statistical overtone, other than studying causation or contributing factors. Nevertheless, these studies acknowledge that increased coverage of interventions is directly correlated to improved mortality outcomes. In addition, literature exploring on domestic health investment in Kenya and Africa in general is yet to be documented. There has been no such empirical study conducted in Kenya as well as in the wider African continent, focusing on of the national

investment and its close relation to health outcomes. Thus, this research intends to fill-in this existing knowledge gap.

CHAPTER THREE: METHODOLOGY

3.1 Introduction.

This chapter aims at specifying the model to be used in examining the existing relationship between domestic health investment and TB mortality in Kenya. The study endorses theoretical framework and model specification, hypotheses testing, variable definition, estimation technique and diagnostic testing to unearth this relationship. In addition, the data sources for the variables are presented therafter.

3.2 Analytical Framework.

This study adopts the theory of behavioral model for health, which was conceptualized by Balia and Jones. Following Grossman (1972) theory on demand for health, the study model embarks on key assumptions that health is both a consumption good, which is demanded by humans to improve their well-beings and utilities, and a central commodity that is shaped by health-related behaviors and other inputs. On the other hand, the theory states that health-related behaviors are particular individual investment choices that explain the disparities in the sharing of health performance.

Suppose this model assumes a recursive equation to represent mortality and captures investment in health as a production function, then, the structural equation for mortality to approximate the association between mortality, health investment, and other health-related behaviors, will be *(m)* for mortality, *(h)* for health, and (*c*) for consumption as illustrated below:

$$M = \pi(c, h, x, \mu m)$$
$$h = h(c, x, \mu h) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$
$$c = f(x, \mu)$$

Where:

x represents the vector for all apparent exogenous variables within the model,

μ is the unobservable elements that influence both the health output ***(μh)*** and the mortality ***(μm)***.

3.3 Conceptual Framework.

This study seeks to modify Balia and Jones framework to show how TB mortality indicator (s) which is measured by the total deaths caused and related to TB and how it is influenced by various factors. Very limited studies have presented the correlation between health investment and TB mortality. Nonetheless, the framework to be adopted by this study is :

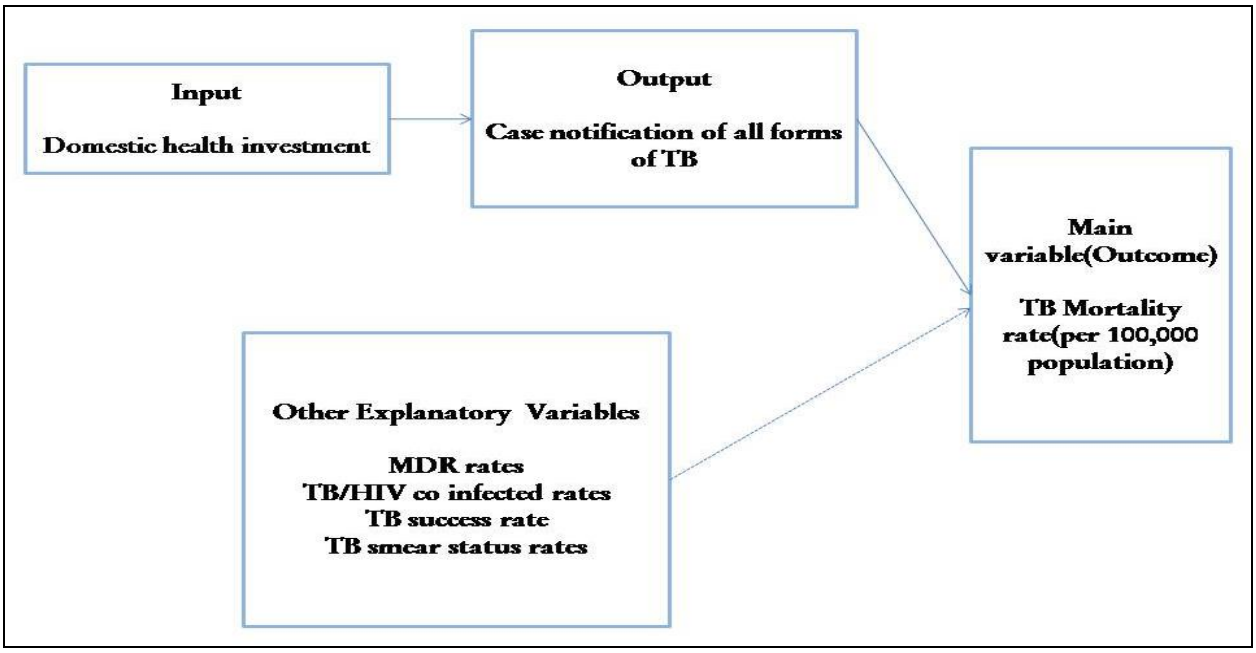
$$TM = f(X)$$

Where TM = TB mortality,

X = vector of health investment and various independent variables.

The relationship between TB mortality and its determinants can thus be represented diagrammatically as represented in figure 3:

Figure 3: Figurative representation of TB mortality in Kenya and other explanatory factors



Source Global TB report 2014

From the above framework, the study shall conduct a path analysis leading to significance of path coefficients.

3.4 Model Specification.

3.2.1 Time Series Model

So as to establish the relationships between health investment and mortality, this study employs the time series model since our data has a time series evidence, which is mirrored in the variations occurring within subjects between the years 1984 and 2015. In addition, this model addresses the central concern by analyzing the link between inputs and the outputs, and the association between outputs and the outcomes.

The study assumes there exist a correlation individual-specific effects $\boldsymbol{\alpha_i}$ such as health output and the regressor $\boldsymbol{x}$ with each individual specific having a different intercept term and the same slope parameters as illustrated below:

$$y_{it} = \alpha_i + x_{it}\beta + u_{it} \quad \ldots\ldots (2)$$

Where:

$\boldsymbol{y_{it}}$ is the time-demeaned dependent variable,

$\boldsymbol{\alpha_i}$ is the intercept term,

$x_{it}\beta$ is the invariant time-demeaned regressor $\boldsymbol{x}$.

In this study, the change on average of the invariant regressor can still be interpreted without putting much emphasis on the assumptions made in relations to the time series effect. Therefore, the individual specific estimates represents an increase in the average change of the regressor. Thus, an increase or decrease in the variables estimated have a spontaneous impact on the mortality if we hold other factors at constant.

3.5 Specification of the Model

This research however, modifies this framework to have TB mortality indicator (s) as the focal variable and how it is influenced by various factors. The developed methodology will be important in leading to a conclusion on a way in which TB mortality in Kenya has been influenced by health investment over time. The multivariate model is as follows:

TM=$f\ (X)$…….. *(3)*

Where TM=TB mortality,

X= vector of health investment and various independent variables.

$$\boldsymbol{Y = \beta 0 + \beta 1 X1 + \beta 2 X2 + \beta 3 X3 + \beta 4 X4 + \beta 5 X5 + \beta 6 X6 + \mu} \ldots\ldots\ldots\ldots\ldots \textit{(4)}$$

Where Y is the dependent variable (TB mortality),

X_1-Health investment

X_2 -TB case notification

X_3 -TB/HIV co-infection

X_4 -TB smear status

X_5 -TB success rate

X_6 -MDR TB status

μ -error term

3.6 Definition, Measurement and Expected sign of Variables

This section defines the variables, which are used to help the study to establish the close relationship existing between public health investment and TB mortality in Kenya. These variables are drawn from the factors that are associated with mortality among TB patients (Alavi-Naini, 2013).

TB Mortality: is a continuous and our central variable used in our study and that indicates the total deaths resulting from TB per 100 000 individuals in a year. Data for TB mortality will be drawn from WHO projection and estimates.

Health Investment: is a continuous variable indicates the government expenditure in controlling and managing TB. Data that will be used will be acquired from the ministry of finance's budget office.

TB Case Notification: is a continuous variable and refers to the aggregate sum of tuberculosis cases (+ve and -ve) reported to the Country's National Tuberculosis programme.

TB/HIV Co-Infection: is a continuous variable that indicates the sum of HIV/AIDs positive and HIV/AIDs negative patients diagnosed with TB. It determines and records the patient's HIV/AIDS status and is very critical in informing treatment decisions, in assessing emerging trends, and in monitoring programme performance. Data will be sourced from WHO estimates and forecasts

TB Smear Status: is a continuous variable and it indicates the result of clinically diagnosed TB bacteria. Smear status can be a smear positive and a smear negative. Data will be sourced from WHO estimates and forecasts

TB Success Rate: is a continuous variable that indicates the total number of TB patients who have been retreated from a TB infection and it is still employed to measure treatment history on whether the patient was treated previous. Data will be sourced from WHO estimates and projections

MDR TB Status: is a continuous variable, which indicates the current cases of anti-resistant TB reported to the National TB programme. Data will be sourced from WHO estimates.

Table 3.1: Variable measurement and Priori Expectations

Variable	Measurement	Expected Sign
TB Mortality	Total deaths resulting from TB per 100, 000 persons in a year	TB Mortality is expected to reduce with increased investment in TB control
TB health expenditures (investment)	Amount in Kenya Shillings the government has allocated to the National TB programme	We expect a negative sign on the disbursements made to the National TB programme
TB case notification	Total number of TB cases recorded at the National TB programme	We expect a positive sign for the number of TB patients recorded in the National TB programme.
TB/HIV co infection	The total number of TB-HIV Co-infection rates recorded at the national TB programme	We expect a positive sign. According to Pawlowsk, Markus, Rothenberg, and Gunilla (2012) TB bacteria and HIV act in synergy since the bacteria accelerates the reduction of immunity thus leading to death whenever left untreated.
Smear Status	The total number of TB positivity rates recorded at the national TB programme	We expect a positive sign. According to (Moosazadeh, 2014), a positive smear influences the patients' survival and this can lead to a decline in their rate of survival in the long run.
Treatment Success rate	The total number of cases fully treated recorded at the national TB programme	We expect a negative sign. Vree (2007) argues that individuals with a history of previous TB treatment had much lower survival rates
MDR status	The total number of MDR TB recorded at the national TB programme	We expect a positive sign for those with MDR (Eker, 2008). It is estimated that those with MDR have a high prevalence of mortality than those without.

3.7 Estimation Technique

The study employed the Ordinary Least Squares (OLS) in establishing the association between TB mortality and health investment, TB case notification, TB/HIV co-infection, TB smear status, TB success rate and MDR TB status (Mukras, 1993). OLS is the preferred estimation technique

since it is efficient and has a minimum variance of linear, unbiased estimators. Despite the fact that OLS is the best model to address omitted variables bias, the expectations of the classical linear regression model must be adhered or considered (Greene, 2012). The study further used Stata version 12.1 as econometric package to run the required regressions as it is easier to estimate a time-demeaned dependent variable on the time-demeaned regressor.

3.8 Estimation Issues.

3.8.1 Testing for Stationarity and Unit Root.

Non-Stationarity of time linear data is shown to be a persistent problem. The failure of the research paper to account for this challenge may lead to spurious output (Greene, 2012). By assuming that the variables specified in the model have a trend and unit root, this paper conducted unit root by using Augmented Dickey Fuller test (ADF), which eliminates the serial correlation. Upon conducting the test, variable(s) are be considered stationary in the first test if they shall be integrated of order Zero, I (0) and un-stationarity if otherwise (Greene , 2012). A variable $\boldsymbol{Xt}$ is said to be integrated of order $\boldsymbol{d}$ (1d) if it becomes stationary especially for the first time after being differenced $\boldsymbol{d}$ times. This shall be addressed by conducting first differences or second differences until they are stationary (Mukras, 1993).

3.8.2 Co integration Test

This is a technique predominantly used to assess existence of long-term relationship of variables in a model. This is conducted first after establishing the sequence of integration of each time series (Greene, 2012). The study therefore tests the data for co integration through use of Engle granger test of co integration. The study tests the presence of sustained association between domestic health investment as dependent variable and TB mortality in Kenya among other control variables. The comparison of $\boldsymbol{p}$ value with the significance level of 5% will then be estimated, so as to provide evidence for co integration or long-term relationship between the variables under study. To address the problem of absence of long-run relationship, the study may estimate error correction model (ECM) (Greene, 2012).

3.8.3 Normality and other tests

Normality test is a technique used to establish whether a particular dataset is well-modeled by a normal distribution. Out of the three normality tests, this study adopt the shapiro wilk test for normality since it's a powerful test that is capable to detect non-normality through prediction of residuals. The study test rejects the hypothesis of normality when the p-value is ≤ 0.05 (Greene, 2012). Other tests include serial correlation, multicollinearity and heteroscedasticity.

3.8.4 Data source and type.

The study uses time sequence data in form of secondary data, which is mostly obtained from the Ministry of finance as it has sufficient information on expenditures on TB. Kenyan Statistical Abstracts and Economic Surveys published annually by the Central Bureau of Statistics and the WHO estimates which has information on TB mortality rates and other related health indicators. The period considered in this research work ranges between years 1984 and 2015, which leads to a better analysis of the impacts of public health investment on TB mortality in Kenya.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1 Introduction.

In this chapter, the study presents descriptive and inferential data analysis. The data analysis helps the study to describe the relevant aspects of TB mortality, domestic health investment and other variables and provide detailed information about each relevant variable. For the inferential analysis, the study used multiple regression analysis which estimates the relationship between TB mortality and tuberculosis mortality rates in Kenya. Tables and figures were largely used in presentation of the findings.

4.2 Descriptive statistics.

The study used the measures of central tendency to describe variables under study. Mean, standard deviation, minimum and maximum were considered. Apart from TB Mortality Rates and Total Health Expenditure to GDP, the characteristics for following variables were checked TB Case Detection Rates, TB HIV coinfection, Smear Status, TB Success Rates and MDR TB Status. From the summary statistics in table 4.1, on average, the TB mortality rate was 16.7 percent per year during the study period that is 1984 and 2015. The minimum mortality experienced was about 13 percent while the maximum was 20 percent over the study period. The domestic health investment was measured through the government expenditure to GDP[1] used in controlling and managing TB. Total health expenditures was approximately 4.28 percent on average with a minimum being 2.89 percent and the highest was 5.89 percent.

Table 4.1: Summary statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
TB Mortality Rates (Y)	32	16.69	1.64	13	20
Total Health Expenditure to GDP (X1)	32	4.28	0.74	2.89	5.85
TB Case Detection Rates (X2)	32	63.28	20.25	29	84
TB HIV coinfection (X3)	32	36.63	35.43	9	97
Smear Status (X4)	32	11387.94	4051.81	6214	18032
TB Success Rates (X5)	32	75.81	8.91	61	87
MDR TB Status (X6)	32	103.94	139.34	25	644

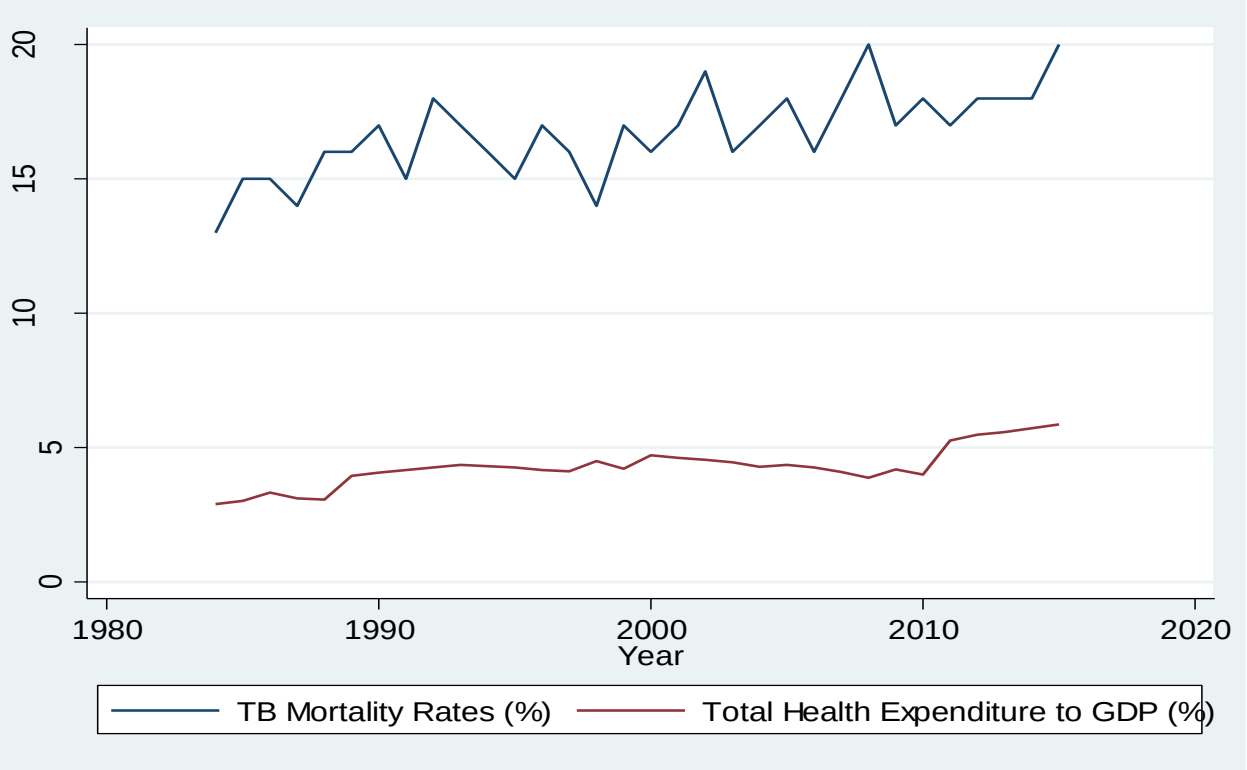
[1] Gross Domestic Product

Further, the study revealed an average of 63.28 TB case detection rate with the lowest being 29 cases and highest being 84 cases detected over the entire period. On the other hand, the average TB HIV coinfection was 36.63 while TB Success Rates was approximately 75.81 cases on average. These are the total number of TB patients who have been retreated from a TB infection. Smear and MDR Status were on average 11387.94 and 103.94 respectively. Other details are indicated in table 4.1 above.

4.3 Trend Analysis of the TB mortality and Domestic health investment.

The study also explored the trends of the major variables. As can be observed from figure 4.1, the TB mortality rates has been growing although with unstable rates from the beginning of the study period oscillating between 13 and 20 percent. This trend was also observed for the domestic health investments as could be measured by government expenditures on health in Kenya. Health investments however grew at a fairly slow but constant rates.

Figure 4.1: TB Mortality and Health Expenditures to GDP in Kenya (1984-2015)



Source :Stata output

To determine the effect of health investment on TB mortality in Kenya, the study undertook a unit root diagnostic test, as a pre estimation test, so as to satisfy the major OLS model assumption as proposed in the methodology section. The following are the results;

4.4 Unit Root Tests.

Upon testing for stationarity, the findings showed that only TB mortality rate was found to be stationary at order zero meaning without any differencing. On the other hand, domestic health investment was found to be stationary at the first order. Other control variables were also stationary only after undergoing the first differencing at lags zero. Stationarity was tested at 5 percent level of significance. The results are as shown in table 4.2.

Table 4.1: Augmented Dickey-Fuller Test for Unit Root

Variables	Test Statistic at lag zero (-2.983)	Test Statistic at lag zero after first differencing (-2.986)	Order of Integration
TB Mortality Rates	-3.734 (0.0037)	-	I(0)
Total Health Expenditure to GDP	-1.071 (0.7264)	-6.212 (0.0000)	I(1)
TB Case Detection Rates	-1.879 (0.3418)	-4.831 (0.0000)	I(1)
TB HIV coinfection	0.179 (0.9710)	-4.261 (0.0005)	I(1)
Smear Status	-1.156 (0.6921)	-3.578 (0.0062)	I(1)
TB Success Rates	-1.398 (0.5832)	-8.396 (0.0000)	I(1)
MDR TB Status	-1.963 (0.3030)	-9.102 (0.0000)	I(1)

*Values in brackets are MacKinnon approximate p-value for Z (t)

4.5 Cointegration Analysis.

The Cointegration analysis was used in the study to depict the type of relationship (short or long run) between the variables under study. Engle granger test was conducted on the regression of the residuals and found that the overall p value of 13.65 percent as indicated in table 4.3, led to failure of rejection of null hypothesis of no cointegration given a p value 5 percent level of

significance. This implies that there was a long run relationship between the dependent variable and other explanatory variables used in the model. Results are as indicated in table 4.3.

Table 4.1: Engle Granger test for Cointegration

Linear regression Number of observations = 29 F(2, 26) = 2.15 Prob > F = 0.1365 R-squared = 0.0808 Root MSE = 0.83993						
Residuals	Coefficients	Std. Err.	T	P>t	[95% Conf.	Interval]
Residuals						
L1.	0.3497	0.2313	1.51	0.143	-0.1258	0.8251
LD.	-0.2879	0.1452	-1.98	0.058	-0.5864	0.0105
_cons	10.9538	3.8158	2.87	0.008	3.1104	18.7972

Having conducted unit root tests where the study variables were integrated of different orders and established the nature of relationship existing through cointegration analysis, the study econometrically estimates the effect of health investment on TB mortality through regression analysis. This proceeds in the next as follows;

4.6 Estimation of the Regression model.

Upon validating the regression model by undertaking various diagnostic tests as suggested in the methodology, the study arrived at the results in the final model as indicated in Table 4.4 below.

Table 4.1: Robust Regression Results for Linear Regression Model

TB Mortality Rates	Coefficients	Std. Err.	t	P>t	95% Confidence Interval	
Health Investments (FD)	-0.9424	0.6050	-1.56	0.132	-2.1910	0.3062
TB Case Detection Rates (FD)	-0.0979	0.0678	-1.45	0.161	-0.2378	0.0419
TB HIV Coinfection (FD)	0.0234	0.0199	1.17	0.252	-0.0178	0.0646
Smear Status (FD)	-0.0008**	0.0003	-2.64	0.014	-0.0014	-0.0002
TB Success Rates (FD)	-0.0837	0.0936	-0.89	0.380	-0.2768	0.1095
MDR TB Status (FD)	0.0010	0.0021	0.46	0.649	-0.0034	0.0053
Constant	17.2209	0.3617	47.61	0.000	16.4744	17.9674
Robust Regressions Model Summary	Linear Regression Number of Observations = 31 F(6, 24) = 2.23 Prob > F = 0.0749 R-squared = 0.2902 Root MSE = 1.4269					
FD	First Differences					
**	Significance at 5 percent level					

From the regression results and in particular model summary; it is found that all explanatory variables are significant in explaining TB mortality in Kenya although at 10 percent since its p value was 7.49 percent above 5 percent but below 10 percent level. Similarly, about 29.02 percent of the proportions explaining TB mortality are as a result of independent variables used while the other proportions are attributed to the error term or unobserved factors. The regression results further revealed that TB mortality is not significantly influenced by domestic health investment at all levels. However, only smear status was shown to have a statistical influence at 5 percent level. The rest of the control variables were not statistically significance. Therefore, in the succeeding discussion (4.7) the study shall consider discussing domestic investment since it had the right sign but insignificant as well as the significant variable that is smear status. To ensure that the estimates are efficient, the study examined the post estimation diagnostic tests and addressed any arising concerns as discussed below;

4.6.1 Multicollinearity Analysis.

Presence of multicollinearity that promotes biasness arising when one or more pairs of independent variables are perfectly correlated to each other. The presence of Multicollinearity inflates the variance of parameter estimates leading to provision of wrong estimates and signs and thus incorrect conclusions. The study undertook Variance Inflation Factors (VIF) test analysis. According to VIF, if a value obtained exceeds ten the multicollinearity is bound to exist and otherwise if VIF is less than ten. As shown in table 4.5, variables used had VIF values of less than ten implying absence of multicollinearity(Greene, 2012).

Table 4.1: VIF test

Order	Variable	VIF	1/VIF
First differences or, Order one	Smear Status (X4)	1.54	0.647816
	TB HIV coinfection (X3)	1.28	0.783090
	TB Case Detection Rates (X2)	1.21	0.824598
	MDR TB Status (X6)	1.11	0.898935
	Total Health Expenditure to GDP (X1)	1.10	0.907052
	TB Success Rates (X5)	1.09	0.918128
	Mean VIF	1.22	

4.6.2 Normality test.

The study undertook a normality test using the Shapiro Wilk test. The null hypothesis in this case was that the stochastic error terms are normally distributed. From the findings in table 4.6, the study fails to reject the null hypothesis since the p-value of 38.7 percent exceeds the significance level of 5 percent indicating that the residuals are normally distributed. This implies that the data was normally distributed(Greene, 2012).

Table 4.1: Shapiro Wilk Test

Variable	Observations	W	V	z	Prob>z
Residuals	31	0.96475	1.148	0.286	0.38733

4.6.3 Heteroscedasticity

Heteroscedasticity test was done using Breusch-Pagan / Cook-Weisberg test. It occurs if the variance of a given data set is infinite. The null (hypothesis Ho) states that there is constant variance or there is homoscedasticity. As shown in table 4.7, the p value of 43.2% is more than significance level of 5%, thus we do not reject the null hypothesis. The results indicate the absence of heteroscedasticity(Greene, 2012).

Table 4.1: Breusch-Pagan / Cook-Weisberg test for heteroscedasticity

Variables: fitted values of TB Mortality (Y)	
chi2(1)	= 0.62
Prob > chi2	= 0.4324
H_o: Constant variance	

4.6.4 Autocorrelation

When a time series is correlated with its own future and past values, it is said to be auto correlated. Autocorrelation was tested using Breusch-Godfrey LM test. The null hypothesis is absence of serial correlation while the alternative hypothesis is presence of autocorrelation(Greene, 2012). From the results indicated in table 4.8, since the P value of 1.7

percent is less than 5 percent, we thus reject the null hypothesis of no autocorrelation. This means that there is serial correlation. To address this, the study used a robust similar to Newey west regressions.

Table 4.1: Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	5.658	1	0.0174
	H_0: no serial correlation		

4.7 Discussion of Robust OLS regression Results.

The objective of this paper was to examine the impact of domestic health investment on TB mortality in Kenya. A linear regression was carried and estimates obtained after regression conform to the expectations except the fact that they turned out to be statistically insignificant to influence policy formulation. As indicated in table 4.4, the constant term value means that when all explanatory and/or independent variables assume a zero value, TB mortality will increase by approximately 18 percent holding other factors constant.

Estimating the effect of domestic health expenditure, it was shown that for a percentage increase in expenditure for health, the TB mortality reduced by 0.94 percent hlding other factors constant. However, the change was found to be statistically insignificant. These results are also consistent with study findings of Akachi (2011) who revealed that increased ODA disbursement for control of malaria was substantially associated with saving lives of about 240,000 people. However, in as much as it agrees with the findings of Gani (2008) on the direction of influence, it differs on significance where the per capita health expenditure together with immunization and income levels were core significant determinants of under 5 death rates. Finally, on health expenditures, Yumo (2011) showed mortality rates falling to zero in 2006 and 2007 from maximum values of 15 and 23 percent in 2004 and 2005, respectively.

Further, the study found Smear status to have a statistically significant influence on TB mortality rates at 5 percent level. It was specifically found that an additional clinically diagnosed TB bacteria led to 0.0008 percent significant decline in TB mortality holding other factors constant.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

5.1 Introduction.

This section highlights summary of the findings as per the study objectives and according to the literature review. Major conclusions are made based on the investigated relationship between domestic health investment and TB mortality in Kenya. Later, policy recommendations are made based on the results of the study.

5.2 Summary and conclusions

Over the years, there have been some significant variations in investment in TB control across the High Burden Countries (HBCs). The Global Fund, which is the principle campaigner of STOP TB has been the chief source of donor investment through huge contributions to a tune of $360 million in 2012 with other international sources contributing only $86 million in 2012. According to Global TB report, of 2014 on financing health, estimated that 86% of the total TB funding is expected to come from national governments for the TB programs in the affected countries, and the remaining twelve percent of the budget, which totals to about five hundred million US dollars, was to be sourced from the Global Fund. Tuberculosis in Kenya is financed both domestically and internationally. In the year 2010 for example, a huge investment on the National TB program was made by the international sources even though a larger proportion remained unfunded in Kenya. In 2011, there was an increase in investment from domestic sources yet the larger proportion remained unfunded. Between the years 2013 and 2014 domestic health investment towards TB control remained constant and the government was able to fund only 23% of the National TB program budget in 2014. Regardless of these investment and international commitments, in the year 2013 alone, an approximated five hundred thousand women lost their dear lives due to TB related complications, where more than a third of them were diagnosed with HIV. In addition, there were eighty thousand deaths resulting from tuberculosis amongst HIV negative infants in the same year. This was further attributed to low political commitment and un-sustained financing to control the epidemic. Based this, the main objective of this study was to examine and/or investigate the impact of domestic investment on TB mortality in Kenya. The study used time series data for the 1984-2015 obtained from the various economic surveys.

The study employed econometric modelling in estimation. Ordinary Least Squares (OLS) was used as an estimating technique upon testing and addressing various assumptions. Significance was tested at 5 percent and ten percent levels. The empirical results indicated that there is a negative but statistically insignificant effect of domestic investment on TB mortality in Kenya. Only smear status was found to have a statistical significant effect as a moderating factor. Similarly, the rest of the control factors were found to be statistically insignificant at all levels.

5.3 Conclusion of the study findings.

In conclusion, a review of finance policy especially the minimum is not that necessary in order to control the death resulting from TB. The government through the Ministry of Health needs to evaluate the levels mortalities associated with TB could be tackled given that financing alone doesn't significantly contribute to the effective reduction as established empirically.

5.4 Policy Recommendations.

Despite the fact that the high death rates arising from tuberculosis has great negative implications in a country's economy, the study established a non-significant negative relationship between domestic health investment and TB mortality in Kenya. Based on this finding, the study suggests for a consideration of reviewing other factors that theoretically and empirically are associated to TB mortality. For example, this study found that smear status to have significant and negative effect. The government in this case need to combine both domestic and foreign health investment in controlling Tuberculosis to enhance control strategy. Thus, there is need to push for government support to step up domestic funding for TB control, and adding in contributions from foreign agencies, this will result to doubling of the number of cases reported each year.

5.5 Areas of further study.

The study has mainly considered establishing the effect of domestic health investment measured by Total Health Expenditure to GDP on TB mortality in Kenya using a time series data collected over a period of time covering between 1984 and 2015. The study utilized the following variables to control the model; TB Case Detection Rates, TB HIV coinfection, Smear Status, TB Success Rates and MDR TB Status. However, other factors such as political and regional inclinations were not considered. This forms a study gap for future studies. Similar study is also necessary in the East Africa in its entirety using a panel data dimension. Therefore there is need

to include these factors in future studies as well as include other datasets over time relating to TB mortality.

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