

*Full Length Research Paper*

# **An analysis of tuberculosis in developing and developed world: Nigeria and UK as a case study**

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**Tuberculosis (TB) is a re-emerging infectious disease of international health priority. It is particularly worrisome in Africa, which informed the declaration of public health emergency by the World Health Organisation in 2005. In this study, inferences were drawn from the literature, secondary data and empirical observations. The results indicated that TB still remains a major public health challenge, particularly in the developing world where the socio-economic indices are quite appalling. Despite these, there seems to be little or no sincere political will, as the health systems in such settings are still weak (infrastructural decay, poor workforce strength and low level of motivation, poor health financing and poor service delivery) and incapable of coping with this challenge. There are also concerns about surveillance data generated from the developing world as this might have undermined TB control strategies. Therefore, if the Millennium Development Goals (MDGs) 6C is to be realised, the socio-economic and political determinants of TB, being the root cause should be given adequate attention while simultaneously addressing the challenges confronting the medical approach. In addition, a countrywide prevalence survey is strongly recommended as a first step in understanding the true epidemiology and combating the scourge of TB in these regions. A well conducted national prevalence survey can serve as a better and more reliable source of data for strategic TB planning and resource allocation in Africa and other developing countries.**

**Keywords:** Tuberculosis (TB), millennium development goals (MDGs), directly observed therapy short-course (DOTS), surveillance, social determinants, prevalence survey, developed and developing countries.

## **INTRODUCTION**

### **UK and Nigeria: Relationships**

Nigeria is the most populated developing country in Africa. Nigeria was previously a British colony that achieved political and economic independence on October 1, 1960. However, there are still a number of bilateral co-operations and mutual interactions across various sectors of both economies, including health services. For instance, the UK government (via Department for International Development, DFID) provides support to tuberculosis control programme in Nigeria (USAID, 2011), while the National Tuberculosis and Leprosy Control Programme co-ordinates all partnership activities in Nigeria (USAID, 2011).

In the last 20 to 30 years, tuberculosis (TB) has been increasing in the UK and Nigeria (USAID, 2011; HPA, 2010). The rise in prevalence in Nigeria has been largely due to increased prevalence of HIV/AIDS (Pennap et al.,

2010; Chaisson and Martinson 2008) - a deadly combo, in view of aetiopathogenesis, morbidity and mortality of both pathological conditions. On the other hand, the rise in the UK has been mainly attributed to non-UK born migrants and refugees from high incidence countries (mainly Africa and Asia), who often live in disadvantaged communities (inner-city social deprivation) with attendant social risk factors (HPA, 2010; Mor, 2008; Story, 2006; Bhatti et al., 1995). These findings are not really surprising because tuberculosis is a social disease (Mor, 2008; Barnes, 2005).

## **METHODS**

The paper aimed at drawing out inferences from the literature and empirical observations regarding TB as a major public health challenge and its epidemiological context in Africa. Descriptive analyses of TB were done using secondary data on socio-

**Table 1.** Comparison of Socio-demographic and Health Indices.

<b>Socio-demographics and health indices</b>	<b>Nigeria</b>	<b>United kingdom (UK)</b>
Population (million)	151, 212	61, 231
Population growth (annual) %	2.4	0.5
Gross national income per capita (\$)	1,940	36,130
Living in Urban (%)	48	90
Total fertility rate	5.3	1.8
Life expectancy	47.9	80
Infant mortality rate (per 1000 live birth)	96	5
Under - 5 mortality rate (per 1000 live birth)	186	6
Maternal mortality (100,000 pregnancies)	800	7
General government expenditure on health in % of government expenditure (2007)	6.5	15.6
Physician workforce (density/ 10,000 population)	4	21
HIV prevalence (% of population aged 15 to 49)	3.1	0.2

Source- World Health Statistics (2010) at [www.who.int/whosis/whostat](http://www.who.int/whosis/whostat).

demographic and health indices, as well as core TB profiles between the UK and Nigeria.

## RESULTS

### Tuberculosis burden

Tuberculosis (TB) is a re-emerging infectious disease throughout the globe (Robert and Buikstra, 2009; Morens et al., 2004). It was declared an emergency in 2005 in Africa because of the alarming rise of new tuberculosis cases (WHO, 2005). The 2009 estimates of the global burden of disease caused by TB showed that there are 9.4 million incident cases, 14 million prevalent cases, 1.3 million deaths among HIV-negatives and 0.38 million deaths among HIV-positives (WHO, 2010). Sadly, the African region accounted for roughly 80% of the 11 to 13% of the incident cases being attributed to HIV infection (WHO, 2010). This statistics suggest the significance and central role of HIV/AIDS in the resurgence and perpetuation of TB. In addition, this underscores the need to further strengthen the integration of TB/HIV programmes globally. However, it is plausible to have underestimated the true burden of the disease in developing countries, given the weak surveillance systems in these (developing) countries where the major burden is occurring.

Given the enormity of disease (TB) burden - being the leading cause of death worldwide with most of the cases and mortality recorded in developing countries, the United Nations via the Millennium Development Goals (MDGs) aimed at stopping the transmission and reversing the 1990 figures of TB by 2015 (WHO, 2010). In addition to this, the Stop TB Partnership has also set more targets which are to halve the prevalence and reduce the mortality rates compared to their levels in 1990 by 2015, as well as to reduce the global incidence

of active TB cases to less than 1 case per 1 million population per year (TB elimination) (WHO, 2010). Furthermore, in response to this imminent catastrophe and in order to achieve these targets, the World Health Organisation (WHO) deployed the Directly Observed Therapy Short-Course (DOTS) to stop the TB scourge (WHO, 2010). However, these efforts/strategies can majorly be facilitated or catalysed by adequate and reliable surveillance data. In fact, data on TB prevalence, incidence and mortality are part of the performance indicators for achieving the MDG 6C (halting the spread and reversing the 1990 figures of TB) and WHO Stop TB partnership programmes (WHO, 2010).

Furthermore, the health systems in most developing countries are weak, crippled by poor funding, grossly inadequate trained manpower, poorly motivated staff, economic and political instability and dearth of infrastructures (Travis et al., 2004). These upstream factors together with downstream factors such as discrimination and social stigma associated with TB, illiteracy, poor living conditions (overcrowding and malnutrition), poor health seeking habits and culture, and of course, HIV/AIDS epidemic have made the realisation of the MDGs 6C unrealistic, particularly in the Africa and Asia (Pennap et al., 2010; Chaisson and Martinson, 2008; Raviglione et al., 1997; Barr et al., 2001; Grange, 1995).

Following the literature review in the context of epidemiology, burden and socio-economic links of TB, the defining variables (socio-demographic and health) between Nigeria and the UK were examined as it relates to TB. Table 1 highlights some of the socio-demographic and health indices closely related to TB for the UK (a developed country) and Nigeria (a developing and strategic country in Africa). It can be deduced from Table 1 that Nigeria has a huge population of over 151 million with an annual growth rate of 2.4%, while the UK has a

**Table 2.** Comparison of TB Profile between Nigeria and UK, 2009.

<b>TB parameters, 2009</b>	<b>Nigeria</b>	<b>United Kingdom (UK)</b>
Mortality (including HIV) per 100,000 population	67	0.57
Prevalence (including HIV) per 100,000 population	497	15
Incidence (including HIV) per 100,000	295	12
Case detection, all forms (%)	94	19
(New Cases) Smear Positive Sputum (%)	52	18
Extra-pulmonary (new cases) %	14	47
Total cases notified	94,114	9,040
% of new TB cases with MDR-TB	1.8	1.0
Treatment success rate (%)	78	78

Source: TB Country Profiles at [www.who.int/tb/data](http://www.who.int/tb/data).

relatively smaller population of over 61 million and an annual growth rate of 0.5%. Moreover, 48% of the Nigerian population is resident in urban area compared to a predominantly (90%) urban British population. The socio-economic and health indices are quite poor in Nigeria as regard per capita income, life expectancy, infant, under-5 and maternal mortality rates, compared to the robust and strong indices obtainable in the UK. Furthermore, the government spending on health is a mere 6.5% of the total government expenditure, while the UK government despite better health indices still expends 15.6% of the total expenditure on health. Expectedly, the health workforce strength (physician) is grossly lower; 4/10,000 population in Nigeria compared to 21/10,000 population observed in the UK. The prevalence of HIV/AIDS in Nigeria is 15.5 times higher than that of the UK.

From Table 2, the prevalence of HIV/TB is grossly higher in Nigeria than the UK (497: 15 per 100, 000 populations). Similarly, the incidence is much higher in Nigeria (295/100,000 population) than the UK rate of 12/100,000 population. Mortality due to the duo is grossly higher in Nigeria (67/100,000 population) than the UK with a much lower rate of 0.57/100,000 population. Case detection for all forms of TB is also higher in Nigeria than the UK- 94% and 19% respectively. Even though, higher percentage of new cases of extra-pulmonary TB is detected in the UK than Nigeria - 47 and 14%, respectively. In consistent with other figures, 52% of new cases are smear positive in Nigeria compared to 18% obtainable in the UK. In addition, 94,114 cases of TB were reported in Nigeria in 2009 while only 9,040 were reported in the UK. There is very slight difference in the percentages of new TB cases with multi-drug resistant TB of 1.8: 1, while there is no difference in the success rate of treatment in both countries. Meanwhile, it should be noted that the aforementioned data may not be accurate, especially that of Nigeria, because of weak reporting system, poor data management and difficulty in accessing health care services, especially in remote part of the country.

### **Tuberculosis surveillance programme in the UK: A worthwhile example**

Surveillance for tuberculosis is dated back to late 19<sup>th</sup> century, which was entirely crude record of deaths. However, data for clinically diagnosed tuberculosis have been available for about a century (1913) in England (HPA, 2010). This surveillance system got strengthened in 1994 when the UK Mycobacterial Network (MycobNet) was instituted - a UK-wide network of reference laboratories and national tuberculosis surveillance team, aimed at monitoring all laboratory confirmed cases of TB in a database (HPA, 2010). This system became more elaborate (containing clinical and demographic details) in 1999 when Enhanced Tuberculosis Surveillance (ETS) was designed to match or link data to MycobNet database yearly (HPA, 2010).

The Chief Medical Officer's Publication of 2004 on the National Tuberculosis Action Plans (DOH, 2004) led to the advent of an (UK-wide) electronic enhanced surveillance system (which incorporates clinical and laboratory surveillance system), though, this had been in existence since 2002 (HPA, 2010). As part of the MycobNet network, information (including specie, drug susceptibility and some clinical and minimal socio-demographic data) on *Mycobacterium tuberculosis* complex isolate is obtained from seven reference laboratories in the UK (HPA, 2010). Data received from reference laboratories are cleaned. The cleaned data are then matched to the ETS data set through a computerised matching process based on patient identifier common to both systems, thereby raising the data quality (HPA, 2010). Unfortunately, this process is only being done at the national level at the moment.

The linkage of reference laboratory data to cases reported via Enhanced Surveillance of Mycobacterium Infections (ESMI) is managed by Health Protection Scotland (HPA, 2010). Treatment can now be reported directly to the web-based ETS or via a form filled by clinicians or nurses (HPA, 2010). The Enhanced Surveillance of Mycobacterium Infections (ESMI) does

clinical surveillance for TB in Scotland in conjunction with each National Health Service Board Public Health Team, which notifies and complete questionnaires that are then forward to Health Protection Scotland. Health Protection Scotland, in turn, collates and updates continuously the information at the national level and then report findings annually (HPA, 2010). The system attributes of evaluating surveillance using the Centre for Disease Control Framework (CDC) (simplicity, flexibility, data quality, acceptability, sensitivity, timeliness, representativeness and stability) suggest relatively strong and efficient system based on reviewed literature (HPA, 2010; Mor et al., 2008). Therefore, this approach can be an operational model worthy of emulation by African countries. However, this working model must be complemented by other factors such as well as trained health work force, better health financing, improved service delivery, appropriate technology as well as good governance and leadership.

## DISCUSSION

### Tuberculosis profile

Nigeria has a huge burden of TB/HIV compared to the much lower burden in the UK. This finding is not unexpected in view of the socio-economic conditions and HIV/AIDS epidemic. This scenario is similar to what is obtainable in many developing countries, even though there are some national variations. There are higher percentages of extra-pulmonary TB cases in the UK than Nigeria - this may be explained by availability of better diagnostic facilities in the UK, hence a reduced likelihood of missed diagnosis and under-reporting. On the other hand, there is higher likelihood of continuous TB transmission in Nigeria, given the high percentage of new sputum smear positive cases, poor case detection rate, poor socio-economic conditions and appalling health indices. This is opposite to the robust economic and health indices, lower sputum smear positive cases and relatively sensitive surveillance system in the UK. This scenario in Nigeria may explain why TB rate has snowballed in many African countries and by extension, the developing world.

### Socio-economic and political determinants

Nigeria is a lower-middle income country with the majority living below poverty line, whereas the UK is a wealthy nation with high per capita income (WHS, 2010). Essentially, TB is an ailment of poverty (Spence, 1993; Barr et al., 2001) and this is evident in both countries with respect to the class of people being affected and also the burden of the disease. Nigeria has enormous ingredients needed for TB transmission compared to the UK. It must

be emphasised at this point that the developing countries can learn from the UK experience (and other developed countries), which is well documented in the literature concerning the decline in the incidence of TB before the advent of effective chemotherapy. The spread of TB can be effectively curtailed by adopting the basic public health strategies which can be complemented by the WHO DOTS strategy (Grange, 1995). In other words, improving the living conditions of the people, (dealing with overcrowding in public places and better housing conditions, improved nutrition), eradicating poverty and education can be a veritable preventive strategy as well as prompt diagnosis and treatment anchored on surveillance and strong health systems.

Significant attention has been focused on chemotherapeutic strategy (bio-medical model of health) at the expense of other health promoting and preventive strategies, particularly in developing countries where there are ample conditions that enhance the spread of TB.

Furthermore, the Nigerian government has not demonstrated serious political will in addressing poverty, unemployment, poor housing, energy crises, educational collapse, environmental challenges and generalised institutional decay. All these aforementioned challenges directly or indirectly encourage the perpetuation of this social disease - TB. It can therefore be argued that the major challenges with the elimination of TB in the developing world lies outside the health care services. It emanates and is sustained by the (adverse) socio-economic determinants of health which are quite appalling in Africa and other developing countries.

### Health care services

The health systems and healthcare financing seem poor in spite of apparent need for improved financing in Nigeria and other developing countries (WHS, 2010). Corruption is not limited to the politicians and leaders in power but extends to other spheres of public services, including the health sector, such that the meagre budgetary allocations to health are not judiciously utilised. The staffs offering the basic medical services are poorly motivated, under pressure from excessive work load, infrequently re-trained, and there are also serious challenges as to geographical access to health care services (WHS, 2010; Grange, 1995), especially in the rural areas- "inverse care law". All these adversely affect the "quality and quantity" of health and health care services in developing countries. Interestingly, the health care service is also an indication of socio-economic development of a country (Grange, 1995; Chudi, 2010), thus further strengthening the explanation for the perpetuation of TB (a disease of poverty) in the developing world.

On the positive side, HIV/AIDS seems to have

strengthened human and laboratory capacities at different levels in both countries as well as increasing the case detection rate (increased screening and clinical suspicion), given the association between the two pathologies and the integrated approach being recently adopted in their management.

### The need for national prevalence surveys

The surveillance system in most African nations, a part of the health system is incapable of capturing the true burden of the disease and invariably cannot be used to monitor the progress (or retrogression) being made in the realisation of the MDGs. Therefore, for the MDGs 6C to be objectively defined and monitored with the hope of its realisation, periodic national prevalence surveys are warranted, particularly in the African region. To date, only two African countries in last 5 decades have been able to complete a nationwide TB prevalence survey- Eritrea in 2005 (Sebhatu et al., 2007) and Ethiopia in 2011 (WHO, 2011).

Furthermore, The Gambia has recently commenced a national survey designed for completion by the end of 2012 (GAMSTEP, 2012). Such national surveys, if well conducted, will provide reliable data on TB impacts unearth undetected TB cases in the community, including spatial distribution of the disease, may inform national TB policy review, TB finance and resource allocation. Other related conditions such as HIV/AIDS and relevant variables depending on national needs can also be investigated using such surveys. However, inadequate technical know-how, very limited experience (high human capacity demand) and high cost are some of the factors that may be hampering the replication and conduct of such survey in many African countries and by extension the developing world (Sebhatu et al., 2007). Furthermore, high level of corruption and poor political will may also be important impediments, as donor agencies tend to be sceptical about judicious use of huge funds needed for such projects.

### Conclusion

The MDGs (1 and 6) is a step in the right direction, given the relationship between poverty and TB. However, more pragmatic effort has to be put in place to alleviate poverty and social exclusion in Africa, as well as ensuring that other upstream factors (political willingness, politico-economic stability, food security, social infrastructures and energy) are co-ordinated and in tandem with DOTS partnership plan. In other words, the DOTS strategy (medical model) should be complemented with other health promoting programmes (social welfarist) as it is well documented in the literature that health care or chemotherapy alone does not make health. Furthermore,

the international community in conjunction with governments of developing countries should aim at improving the living and working conditions (easing overcrowding and better housing), environmental sanitation, good nutrition, as well as addressing the upstream factors, which adversely affect "quality and quantity" of health and health care services.

The literature and empirical observations also suggest that surveillance is weak and ineffective in most African countries (compared to Europe); therefore data generated from this part of the world are unreliable and less useful for strategic TB planning and financing. The surveillance approach in the UK can be understudied and adopted in the African region and other developing regions, as it is performing well amidst challenges. Hence, for the MDGs to be realised particularly in Africa, and given the importance of good surveillance data, a national TB prevalence survey is warranted in these settings. Although difficult, given the circumstance in the developing world, a national prevalence survey will provide better and more reliable data for planning and resource allocation, better understanding of the epidemiology as well as progress monitoring, when done at appropriate intervals and more importantly, if well conducted.

### REFERENCES

- Barnes DS (2005). The making of a social disease - tuberculosis in the nineteenth-century France, University of California Press; Berkeley and Los Angeles.
- Bhatti N, Law MR, Morris JK, Halliday R, Moore-Gillon J (1995). Increasing Incidence of Tuberculosis in England and Wales: A study of the Likely Causes. *BMJ*, 310: 967.
- Barr RG, Diez-Roux AV, Knirsch CA, Pablos-Mendez A (2001). Neighbourhood Poverty and the Resurgence of Tuberculosis in the New York, 1984 – 1992. *Am. J. Pub Health*, 21(9): 1487-1493.
- CDC Update Guidelines for Evaluating Public Health Systems- Recommendation from Guideline Working Group. [www.cdc.gov/mmwr/preview/mmwrhtml/rr5013a1.htm](http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5013a1.htm). Accessed 27th March, 2011.
- Chaisson RE, Martinson NA (2008) Tuberculosis in Africa- Combating an HIV- Driven Crisis. *NEJM*, 358: 1089- 1092
- Chudi IP (2010). Healthcare problems in developing countries. *Med. Pract. Rev.*, 1(1): 9-11.
- Department of Health. Stopping Tuberculosis in England: An Action Plan from the Chief Medical Officer. 2004. London, Dep. of Health.
- Ethiopian National TB Prevalence Survey 2010-2011 Preliminary Results. [http://www.who.int/tb/advisory\\_bodies/impact\\_measurement\\_taskforce/meetings/lille\\_oct11\\_ethiopia.pdf](http://www.who.int/tb/advisory_bodies/impact_measurement_taskforce/meetings/lille_oct11_ethiopia.pdf). Accessed 1st March, 2012
- Grange JM (1995). The Global Burden of Tuberculosis. In: Porter, J.D.H and Grange, J.M., editors. *Tuberculosis: An Interdisciplinary Perspective*. London. Imperial College Press.
- Koo D, Wetterhall SF (1996). History and current status of the National Notifiable Diseases Surveillance System. *J. Pub. Health Manag. Pract.*, 2: 4-10 .
- Mor Z, Migliori GB, Althomsons SP, Loddenkemper R, Trnka L, Iademarco MF (2008). Comparison of tuberculosis surveillance systems in low- incidence industrialised countries. *Eur. Resp. J.*, 32(6): 1616-1624.
- Morens DM, Folkers GK, Fauci AS (2004). The Challenge of Emerging and Re-emerging Infectious Diseases. *Nature*, 430: 242- 249.
- Pennap G, Makpa S, Ogbu S (2010). Sero-prevalence of HIV among

- Tuberculosis Patients in A Rural Tuberculosis Referral Clinic in Northern Nigeria. *PanAfr. Med. J.*, 5(22): 1-4
- Raviglione MC, Harries AD, Msiska R, Wilkinson D, Nunn P (1997). Tuberculosis and HIV: current status in Africa. *Int. J. Tuberc. Lung Dis.* 11 (SupplB): S115-23.
- Robert CA, Buikstra JE (2009). *The Bioarchaeology of Tuberculosis: A Global Perspective on a Re-emerging Disease*. University Press of Florida. Gainesville, FL.
- Sebhatu M, Kiflom B, Seyoum M, Kassim N, Negash T, Tesfazion A, Borgdorff MW, van der Werf MJ (2007). Determining the burden of Tuberculosis in Eritrea: a new approach. *Bull. World H. Org.*, 85: 59-599.
- Spence DPS, Hotchkiss J, Williams CSD, Davies PDO (1993). Tuberculosis and Poverty. *BMJ*, 307: 759- 761.
- Story A., van Hest R, Hayward A (2006). Tuberculosis and Social Exclusion. *BMJ*, 333: 57 doi: 10.1136/bmj.333.7558.57.
- The Gambia Survey of Tuberculosis Prevalence (GAMSTEP). <http://www.mrc.gm/events/the-gambia-survey-of-tuberculosis-prevalence-gamstep>. Accessed 1st March, 2012.
- Travis P, Bennett S, Haines A, Pang T, Bhutta Z, Hyder AA, Pielemeier NR, Mill A, Evans T (2004). Overcoming health-systems constraints to achieve the Millennium Development Goals. *Lancet*, 364(9437): 900-906.
- Tuberculosis Profile for Nigeria- United States Agency for International Development. [www.usaid.gov/our\\_work/global\\_health/id/tuberculosis/countries/africa/nigeria.pdf](http://www.usaid.gov/our_work/global_health/id/tuberculosis/countries/africa/nigeria.pdf). Accessed 25th March, 2011.
- Tuberculosis in the UK: Annual report of tuberculosis surveillance in the UK, 2010. London: Health Protection Agency Centre for Infections, October 2010. [www.hpa.org.uk/web/HPAwebFile/HPAweb\\_C/1287143594275](http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1287143594275). Accessed 25th March, 2011.
- World Health Statistics. [www.who.int/whosis/whostat](http://www.who.int/whosis/whostat). Accessed 27th March, 2011.
- World Health Organisation (2010). Millennium Development Goals (MDGs) [www.who.int/topics/millennium\\_development\\_goals/about/en/index.html](http://www.who.int/topics/millennium_development_goals/about/en/index.html). Accessed 28th March, 2011.
- World Health Organisation. Global Tuberculosis Control: A Short Update to 2009 Report. Geneva, Switzerland.
- World Health Organisation. WHO declares TB and emergency in Africa- Call for "urgent and extra-ordinary actions" to halt worsening epidemic. [www.who.int/mediacentre/news/releases/2005/africa\\_emergency/en/index.html](http://www.who.int/mediacentre/news/releases/2005/africa_emergency/en/index.html). Accessed 26th March, 2011.
- WHO Report 2010 Global Tuberculosis Control. WHO Press; WHO, Geneva, Switzerland 2011; 21(9): 1487-1493.