Are strong general health care systems needed to reach Tuberculosis control targets?

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I. INTRODUCTION

An estimated eight million people develop active tuberculosis (TB) every year, and nearly two million die of TB. 85% of new TB cases are in developing countries (1). TB kills more women than any cause of maternal mortality. The highest incidences of TB are found in Africa and in Southeast Asia. Since the mid-1980’s, in many African countries, annual TB case-notification rates have risen up to fourfold, reaching peaks of more than 400 cases /100,000 population. These escalating rates are largely attributable to the HIV epidemic (2).

TB - a very old disease – had become a 'neglected disease'. In 1993, a World Bank major review of health priorities in developing countries (3) showed that not only was TB responsible for a major burden of disease in developing countries, but that some interventions to control TB in East Africa were extremely cost-effective in terms of cost per disability-adjusted life year saved (DALY). The sentence 'TB control is a very cost effective intervention' must have been among the most quoted in public health circles, reports, and scientific papers ever since. Despite conceptual problems raised by the DALY method, a very positive effect of this report was certainly to bring 'the neglected disease' high on the international agenda. In 1993 WHO declared TB 'a global emergency', and started promoting as a key to TB control its DOTS strategy package (annex). The choice of the acronym DOTS was rather unfortunate because of the confusion between DOT (Directly Observed Therapy : a strategy to insure adherence - the only controversial element of the package) and DOTS (the whole package) – leading many to reduce and assimilate DOTS to DOT. But DOTS has been, and still is, a powerful lobbying tool.

Resources allocated to TB control have increased dramatically. They went from 16M$ in 1990 to 190M$ in the year 2000 (these funds include both grants and bank loans)1. The TB Unit of WHO, in 1989, had only one member of staff; today it has about 35-40 persons. In 2001, a Global Health Fund (GHF) will be launched : this is an unprecedented initiative whereby the United Nations (UN) Secretariat rather than a UN technical agency has taken the leadership to establish wider partnerships and a broader funding base to address three disease control priorities – among which TB.

This paper is essentially meant to stimulate discussion. We will argue that TB control cannot reach its targets without an adequate network of accessible, effective, and comprehensive health services, using a very basic framework: early case detection and treatment of the patients. What we mean by 'health services' is a continuum of care from public services (including private services with a public mandate, like non governmental organisations – NGO’s) in partnership with (regulated) private providers and including the community. We will discuss the evolution of policies aimed at TB control. We will also briefly study the possible positive and negative interactions between TB control programmes and general health services, and propose some research questions, on how TB control programme could be made easier to implement in general health services. The paper also intends to contribute to the debate on the allocation of the GHF.

1 Dr Mario Raviglione, personal communication.
II. LESSONS FROM THE PAST

TB is a very old disease, and as such a wealth of past data and a long experience with various strategies to control the disease is available.

A. **TB control before chemotherapy...**

At its peak, towards the end of the 18th century (related to rapid urbanisation during the industrial revolution), TB mortality rate in England was over 500/100.000 person-years (py). Then it started to decline and had decreased to about 50/100.000 py in 1950, before effective treatment for TB became widely available. In Western Europe, 90% of the decline in TB incidence and mortality occurred in the hundred years before the availability of curative drugs (5). It is clear that improved socio-economic conditions (housing, nutrition), and to some extent the isolation of TB patients in special hospitals (sanatoria) contributed more to the dramatic decline of the disease in industrialised countries than medical interventions. The association between poverty and TB has been demonstrated over and over again. In other words, even the most effective health services will not achieve TB control in a context of overall poverty.

B. **...and after chemotherapy became available**

Since the first anti-TB drug was discovered in 1945, public health strategies for the control of TB can be summarised as 'case-detection and treatment'. There is no other strategy at hand to 'control' TB. BCG vaccination can prevent TB in children, but fails to prevent adult pulmonary disease which constitutes the bulk of infectious cases, and for this reason does not contribute to control the disease. Preventive therapy of infected cases to minimise breakdown to active disease could in principle contribute to the control of the disease but has major operational limitations and should be only considered (as a public health strategy) as secondary to the treatment and cure of the patients.

Control of TB then depends on early detection and cure of the sources of infection, in order to prevent transmission. So what is to be done is 'simply' "treating people who have the disease". No technical breakthrough of public health importance has happened at the diagnosis level since the development of microscopical examination of sputum smears; as regards treatment the last significant progress since the discovery of the first anti TB drug, streptomycin, has been the discovery of the potent rifampicin in 1963, and later the demonstration of the greater efficacy and effectiveness of the so-called 'short-course therapy' a combination of four anti-TB drugs including rifampicin for at least the initial phase of the treatment.

These basic principles of 'early case-detection, and cure' to control TB, still hold true in the era of the HIV epidemic. However, to the extent to which the TB epidemic is fuelled by the HIV epidemic, HIV prevention is complementary to TB control.
III. DOES A CASE-DETECTION AND TREATMENT STRATEGY NEED STRONG HEALTH CARE SYSTEMS?

A. Early case detection "among high risk groups"

Case detection implies the identification of patients with symptoms of active TB followed by diagnosis. The diagnosis of TB among symptomatics versus more active case-finding has been shown by operational research as being more cost-effective, because most TB patients experience symptoms severe enough to seek the help of a health professional early in the course of the disease, and because of the disappointing results of large scale active case-finding campaigns using mass radiography in developed countries in the sixties (6). Not only were the costs of these campaigns extremely high, but it was shown that the great majority of sputum-positive cases develops in a shorter time than the shortest feasible interval between two mass radiography round (6). Case detection among persons presenting with symptoms of TB to health services is one essential component of DOTS. Even if active case finding among clearly identified high-risk groups, i.e. HIV positive patients, has also recently been added to the 'DOTS package' – the fact is that case-detection relies for its main part, on health services.

But if TB case-detection (and even more early case detection) has to rely on health services, the need for general health services is all too obvious. These services need to be accessible (financially, geographically, culturally), and effective.

And there is the problem. In many parts of the developing world, especially where TB incidence is the highest, such services are far from meeting the expected standards, in terms of accessibility and effectiveness.

Because curative consultation is usually the first demand of the population, the number of contacts for a new episode of illness in the health services is a rough indicator incorporating several dimensions, like accessibility, and satisfaction (or perceived quality) of these services. This indicator is extremely low in many developing countries. In Bolivia e.g., there was in 1996 on average 0.3 contact per person and per year with the public health services for a new episode of illness (7). In Mali, this indicator was 0.18 in 1999 (8).

Specific data on financial accessibility to TB treatment do exist. More and more reports are now available on the high economic burden that a diagnosis and a treatment for TB entail for the patient (despite so-called 'free treatment') (9-11).

Unsurprisingly perhaps given such a situation, global TB detection was estimated in 1997 to be only 37% of incident smear-positive cases (1) : these data, compiled by WHO, actually refer to patients detected in the public health sector, or in the private sector reporting to the public sector (like NGO's). Even allowing for the uncertainty of such global estimations, the sad fact is that more than half of smear-positive TB patients in the world are unaccounted for.

Where are the missing patients? An unknown proportion has certainly been attended by the private-for-profit health sector. Unfortunately the management of patients in the private-for-profit health sector is often very poor and cure rather an unlikely outcome, which the terrible prospect of widespread development of multidrug resistance. Now, private practitioners in Bangladesh have started using ofloxacin as a first-line TB drug2. These problems have been recognised for many years, and many descriptive studies are available, but the study of possible interventions to address the problem is much more recent (12).

2 Dr Armand Van Deun, personal communication.
Some indicators tend to show that patients detected might well be detected late in the course of the disease. For instance, in the absence of any other obvious explanations (like HIV co-infection), a high mortality during treatment is usually explained by a poorer prognosis due to advanced disease. In Bangladesh, where HIV-related tuberculosis is virtually non-existent, 15% of TB cases need to be hospitalised, and 6% die during treatment (13). We certainly don’t want to downplay the importance of relieving suffering for individual patients, but if prevention of transmission depends on early case-detection, one can wonder to which extent such programmes play a role in ‘controlling’ TB.

But why are TB patients still not using health services even when a good TB programme is available, like in Bangladesh? The fact is that patients do not know they have TB (even if they suspect it). They know they are coughing for a long time. On the other hand, the majority of patients coughing for a long time, does not have TB. And a service able to adequately meet the problems of only a minority of these so-called ‘TB-suspects’ will not be very attractive to them. TB suspects might use the service only very late – when the symptoms of TB disease become more and more specific. This simple common sense fact has only recently been translated into a strategy, the WHO STOP-TB ‘adult lung health initiative’ (ALHI) (14) - a strategy aiming at improving care of priority respiratory diseases, focusing on the most peripheral services in the health systems.

To summarise it: detection of TB cases relies on effective, comprehensive, health services, but these are not widely available, many patients are improperly attended in the private sector, and at a global level case-detection is largely insufficient. What to do?

One way is to try to optimise the role of the private-for profit health sector in TB control, the rationale being: the patients will go there anyway, so let’s be pragmatic. Leaving aside ideological considerations about the respective role of the public and the private sector in health care delivery, one cannot help wondering about the feasibility, the costs, and the benefits of such interventions on a large scale. Research in the field is in its infancy and only very few success stories on a very small scale have been reported (12). And other disturbing questions arise when considering this approach: TB is a disease of the poor, after all. Will it work if control of the disease relies even partly on for-profit health sector? And what should governments, and indeed the international community do, given the choice in investing in the improvement of private-for-profit health services, or in the improvement of public health services? The choice is not entirely about one or the other, but there is certainly an opportunity cost.

To address this problem of overall low case-detection, some have challenged the strategy of case detection among symptomatic individuals/people presenting to health services. If patients don’t come because services are no good, well, let’s go and find them. Mathematical modelling and cost-effectiveness calculations have recently been used to argue in favour of (non-targeted) active case finding in countries where TB programmes have demonstrated their ability to achieve good cure rates (15;16). Among the assumptions built in the model is a 7 year screening cycle (the problems of the cases developing in the unscreened 6/7 of the population every year are not discussed). In high TB prevalence countries, according to the authors of this study, the low cost per potential disability-adjusted life-years (DALY) averted by repeated mass symptom screening, and mass radiography screening, would make these interventions extremely attractive to decision makers. Anticipated criticism about feasibility of the intervention are dismissed, on the basis that its cost-effectiveness would be such that it deserves the high investments to make it feasible.

Conceptually, cost-effectiveness analysis and priority setting based on DALY’s lead straight to a purely result-oriented approach of any particular health problem, simply because it
would be extremely difficult to use that method for interventions with complex outcomes\(^3\). How could one compute the DALY’s gained, for instance, by an intervention aimed at improving the curriculum in medical schools? or improving general health services? (these interventions, if successful, would achieve health benefits beyond those related to TB control) So opportunity costs of the ‘high investments’ asked for are not even considered. Therefore we disagree with the conclusions of the study, that ‘given that these [active case finding] programmes are likely to be highly cost-effective, both bilateral and multilateral donors and governments should be willing to consider large investments in these extensions of the DOTS strategy’.

Active case finding targeting groups at high risk for TB is also recommended as a strategy to improve case-detection. Active case-detection among close contacts of infectious patients can be done at low cost (for instance asking the patient to bring his symptomatic contacts to the health services) and might help to find a few more patients, but will never contribute significantly to increase case detection because a contagious patient, in absolute numbers, infects more patients outside his close circle, than inside (17). A high risk group where active case-detection could prove very efficient are HIV-infected persons, for instance persons attending voluntary counselling and testing centres (VCT). This could in theory contribute to the identification of a significant number of new cases where HIV-associated TB is important. (VCT could be the opportunity not only for early case-detection but also for identifying candidates for preventive therapy). The ProTest initiative (2) aims to promote HIV voluntary testing as a key to a more coherent response to TB in high HIV prevalence setting. But if proved successful, how long will it be before it reaches an adequate coverage? Could it work if general health services don’t? And the majority of TB patients is still not (fortunately) infected with HIV.

To improve the tragically low case-detection of TB, is there really any alternative than to improve the network of base-line, comprehensive health services?

**B. Treatment and cure**

Once cases have been detected, and diagnosed, they need to be treated and cured (indeed no attempt should be made to improve case-detection where the programme is not able to guarantee proper case holding of the patients). This requires that efficient drugs be available for the patients, and adequate adherence of the patient to the treatment. These elements are incorporated in the DOTS strategy.

A regular supply of efficient TB drugs to first line health services can be insured through a completely vertical channel. The issue here is about the efficiency brought about by integration within the general health services. Past experiences in drug shortages have made TB programmes reluctant to linking their drug supply to the supply of other drugs, but where it could be done safely, there is no reason why it should not be done. Where it could not be made safely, there is a case for separate supply channels. Ensured supply of all the first-line drugs is the key to TB control, and its absence the cause of resistance disasters.

Poor adherence to the (lengthy) TB treatment has always been a major issue in TB control. For this reason, the reporting and recording system used in TB control programmes, (another component of DOTS) was specially designed to allow cohort analysis, and compute the proportion of patients who complete their treatment. This is the very first indicator to look at when evaluating a TB control programme.

TB has been presented as the paradigm of a chronic disease, requiring sustained contacts with the health services. The capacity of baseline health services to insure treatment

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\(^3\) So difficult indeed, that to our knowledge it has never been done.
adherence where TB control strategies are completely integrated has even been proposed as a proxy indicator of the general quality of the services (18). It would certainly be more efficient to integrate TB treatment in general health services, if these are well functioning otherwise, but if they don't, it is perfectly possible to limit defaulting to treatment, making only minimal use of these services (physical infrastructure, existing health staff motivated by earmarked incentives etc.). There are numerous example of small scale TB programmes with a minimal degree of integration priding themselves on a very low defaulter rate, even without the much-advocated community-based DOT.

As opposed to case-detection, can treatment and cure of TB be achieved in the context of poor general health services, given a reasonable input of other resources? This calls for a few comments.

First, outcomes of treatment, in particular death rates, are related to early case detection. The later the detection, the poorer the prognosis. The consequences of delayed case-detection might be even worse for HIV-related TB, by accelerating the decline in immunocompetence (19). And early case-detection, as we have seen, depends completely on the availability of health services. There are striking differences between death rates among TB control programmes. For instance in the city of Kinshasa, death rates among more than 11,000 smear-positive TB patients who started treatment in 1999 was 'only' 3%4, with a prevalence of HIV infection among these cases estimated between 30 and 50% (20). This is a integrated in a well functioning network of mainly private-not-for-profit health services (NGO's, religious organisation). This compares rather well with the data presented above for Bangladesh (6% mortality rate, with almost no contribution of HIV). Both data come from programmes benefiting form external assistance.

Second, the needs of a TB patient are not limited to his TB treatment – the only ones a programme focusing on results on the 'TB front' sets up to meet. The case is the strongest for HIV-associated TB, but could be made for other associated health problems (for instance, child malnutrition). In Africa, it is estimated that 32% of TB cases are HIV-positive (1). Especially where prevalence of HIV-associated TB is high, treatment of patients with TB can simply not be limited to treatment of TB. And HIV care cannot be done without strong health systems, as argued elsewhere in this colloquium (21).

From this analysis of the basics of TB control, early case-detection and treatment, we conclude that, although a 'disease oriented approach' given the adequate resources, would certainly allow to make some progress in terms of the number of cases treated and cured, these progress could only be partial at best. Accessible, and effective health services are a necessary (but not sufficient) condition to achieve targets set for TB control. This is not only about efficiency: it is also about efficacy.

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4 Patients cured: 66%, treatment completed: 4%, failure:1%, lost: 5%, transferred out: 21%. 
IV. POLICIES : PRIMARY HEALTH CARE AND INTEGRATION

DOTS is no more – and no less - than a technical package (complemented by 'political commitment'), absolutely necessary, but far from sufficient. The package and the lobbying are new – the techniques promoted are old. Why have we failed TB control, where so powerful technical tools have been around for more than 30 years? The fact is that most problems of TB control are operational, not technical (22).

WHO formulated in the early 1960s, the concept of a comprehensive TB control programme implemented on a country-wide scale through the network of existing health services. The main principles were that a TB programme should be country-wide, permanent, and adapted to the expressed demand of the population, so as to be both acceptable and accessible to them. This was reaffirmed at the Alma-Ata conference in 1981.

All TB control policy documents, be it with variable intensity, acknowledge the importance of integration of service delivery into the Primary Health Care. 'Effective management of TB is an integral part of primary health care and a positive contributor to the overall development of national health systems' (23). 'TB programmes will not work - or much less efficient - in countries that lack a decent level of basic health care. Their success depends strongly on the strength of the health care system as a whole' (24). The new strategic framework proposed by WHO and UNAIDS to decrease the burden of TB/HIV repeatedly stresses the importance of integration of the activities within general health services (2).

Is this commitment to primary health care and integration more than lip service? A WHO TB programme review over the period 1990-95 found that in 10 out of 12 programmes examined, the participation of primary health structures in case finding was minimal, as diagnosis and treatment were almost entirely carried out by chest clinics in major towns (25). To what extent do policymakers realise that the success of this policy of integration in primary health care entirely depends on an extensive network of accessible and effective first line health services? The general degradation of the health services in developing countries makes one wonder how well integration of TB control can succeed in the field. Lack of political and financial commitment to primary care in many countries meant that primary health care was unsuccessful – and therefore integration was unsuccessful. A fourfold increase in TB incidence in Kenya, occurred while, during the same period, government expenditure on health dropped from US$ 9.5 to 3.5 (26).

In a recent working paper by a WHO commission on macro-economics and health, looking in particular at 'constraints to scaling up DOTS' (27) constraints are analysed from a purely 'TB' perspective, whether organisational - secure supply of anti-TB drugs - , financial - financial shortages [for TB programmes] -, or political - weak political will [for TB control]. These are true constraints indeed. This reveals the tendency among some TB experts to look at 'their' disease in isolation of its overall context, to ignore that the weaknesses of the general health services are the major constraints to scaling up'.

Whereas there is a consensus about integrated service delivery at peripheral level, the importance of a specialised national planning unit at central level has been recognised after painful experiences in the wake of health sector reform (28) and is now advocated by the DOTS strategy as part of its "political commitment" component. Actually the word 'integration' can conveniently describe a wide range of situations – with integration possibly starting at any point down the health service's pyramid - from a specialised unit found only at central level, to a specialised unit, or dedicated staff, found at each level down to the peripheral services. E.g in the Ethiopia's eastern region, one can observe within a rural hospital a small island of almost autonomously functioning TB unit, sharply contrasting with the rest of the hospital by its staffing level, drug supply and attendance rate. The TB
programme is assisted by an NGO's and co-ordinates with the National TB Programme, which has a policy of integration in primary health care. So this programme could be seen as 'integrated'.

V. TB CONTROL PROGRAMMES AND HEALTH SERVICES

A. Dangers and benefits

Is there any risk that additional support for 'integrated' TB control programmes will weaken health services? Or could they strengthen them?

Elsewhere in this colloquium, the possible detrimental effects of disease control programmes for general health care systems in developing countries are explored at length (29). TB control programmes in that sense are not different from any other disease-control programmes. 'Disease-specific programmes can produce rapid results by bypassing bottlenecks in public healthcare systems, but such approaches often rely upon the continued provision of incentives to attract and retain high-callibre staff and ensure that key activities are carried out properly at all levels. Although this kind of approach may be effective in improving TB control, it does not help to strengthen the health system as a whole, and can even undermine it' (30). For instance exaggerated emphasis on specialised training by many programmes means that 'health staff are always in a training session'.

But there could be also some positive effects. In theory at least, additional resources provided by well funded programmes could be used in a polyvalent way (like vehicles). Some new experiences seem promising. For instance, the Adult Lung Health Initiative is primarily a strategy designed to attract and identify TB patients better, but to reach this goal it enlarges the scopes of the TB control activities to meet the needs of a larger group of patients than simply those with TB. If the strategy proves successful, this "expanded" DOTS programme could be seen as improving health services in general. (Some critics argue that it is simply another programme to be added to the list and that it will not improve the capacity of health services to offer comprehensive care).

Another example of DOTS strengthening health systems is from the experience acquired in the community TB care project in Africa (31). Numerous examples are available from Africa (Uganda, Zambia, South Africa, Malawi, Botswana, Kenya) where community TB care has resulted in markedly increased cure rates and a cost-effective approach to TB treatment. The Ugandan Ministry of Health has recently adopted community TB care as a standard based on pilot projects demonstrating effectiveness, feasibility and cost-effectiveness. It has also expanded the concept of community care to other priority diseases.

B. Adapt DOTS? research questions

The DOTS strategy may be too demanding for implementation by the general health services without substantial support by specialised teams. Could it be simplified? Actually we do not know exactly what are the key components of DOTS.

The strategy advocated by WHO to insure adherence, DOT, might be heavy for health services and for patients, but community-based approaches can minimise these constraints. But what is the most important – DOT or the regimen used? Well-known, effective and safe regimens are now being abandoned to make DOT easier. For instance, the revised DOTS programme in India uses fully intermittent treatment for which strict DOT is essential. The effects of this treatment in terms of creation of multidrug resistance with its mass application in the field are not yet known, but the regimen is already gaining fast in global popularity. What to think about the long-term sustainability of a treatment which depends so much on
perfect DOT? We don't want to revive here the bitter controversy between partisans and adversaries of DOT, but we believe that the long term effects of such regimens should be at least closely monitored.

General laboratories, especially in HIV-ridden countries, find TB sputum microscopy a heavy burden. But do we really need three sputa for case detection among suspects? Evidence is accumulating for the efficiency of the two-sputum approach for suspects, but not enough supportive studies exist either for maintenance, or change of most other details regarding sputum smear examination. This concerns not only the strategies, but also the technical procedures of smear examination (e.g. 100 fields to be read, vs 300), its interpretation and quality control. If we want to be able to define essential requirements for efficient Acid Fast Bacilla microscopy, more studies in this field are badly needed.

Programme monitoring constitutes another hurdle for full integration of a TB programme. Do TB programmes really need it as it is now, or is some simplification possible? For instance, is a quarterly report really necessary, as opposed to an annual report? Does reporting of case-detection really need to be so detailed? Recommended forms at the moment include 7 age groups, and total, with breakdown by sex: that is 16 cases to be filled each quarter, only for case detection, only for tuberculosis by polyvalent health workers. Is that really collecting 'data for decision-making'? Analysis of age trends among patients have epidemiological purposes, but if this is the objective trends could also be evaluated by some regular, intermittent surveys, for instance every 3 or 4 years.

More advanced types of monitoring, like TB drug resistance monitoring, also badly need operational research. Of course one might see this as a specialised activity, which could be kept separate from the integrated programme as such. However, collaboration by the health personnel from all centres remains essential for drug resistance surveillance, and it remains a costly affair, so that questions about its utility and most efficient organisation seem to be justified.

A guaranteed drug supply is probably the most essential of all technical components, and maybe for this reason it has been kept under direct control by many programmes. The negative consequences of the health sector reform have been felt most on this side (28;32). Decentralisation and integration of TB drug procurement and supply will put more emphasis on the needs to simplify treatment regimens. There is more urgency to adopt the policy of a common regimen for new cases, irrespective of smear-results (33).
CONCLUSIONS

HOW COULD GLOBAL HEALTH FUND THEN BEST HELP TB CONTROL?

It is clear from previous experience that parachuting drugs or money to certain settings will not necessarily results in improvement of tuberculosis outcomes. Many countries need competent international assistance in planning and implementing effective control of TB and other priority health problems. A Fund therefore is truly complete if it can mobilise resources to fill country gaps - and to allow technical assistance for the external partners to be established.

At the same time the Fund must also avoid the stove-piping of efforts and targeted investments that is often the common result of technical assistance strategies. While TB is a priority disease and improving cure rates a matter of considerable urgency in most high prevalence countries, the GHF should be seen as an opportunity of investing in both the short-term needs and the network of general health services that alone will make TB control a sustainable activity.

Lessons learnt from past TB control efforts point to one major conclusion: effective - as opposed to efficient but not effective enough - TB control depends on accessible, and effective health services and systems.

Concerns raised about the possible negative effects of some "global" public-private partnerships established in the last decade theoretically carry over to the new GHF. Notwithstanding, the latter takes a broader development perspective and explicitly recognises the need for strengthening health systems.

Provide health care commodities in reaction to the developing world’s calls for assistance in combating ill health does, indeed, not constitute a sufficient response. Ample funds have to be earmarked for supporting the operations of national institutions responsible for planning and implementing control of TB and other important health problems. Above all, it is mandatory that the majority of available resources be allocated to the general functioning of health services and systems. Past policy statements, "majority" means over 50%.

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ANNEX:

*WHO revised framework for TB control*
(this is a consensus document among major TB agencies, to be published soon):

**The 5 elements of DOTS**

a. Sustained political commitment to increase human and financial resources and make TB control a nation-wide activity integral to national health system;

b. Access to quality-assured TB sputum microscopy for case detection among persons presenting with symptoms of TB, screening of individuals with prolonged cough by sputum microscopy and special attention to case detection among high-risk groups including HIV infected and institutionalised individuals;

c. Standardised short-course chemotherapy to all cases of TB under proper case-management conditions including direct observation of treatment – proper case management conditions imply technically sound and socially supportive treatment services;

d. Uninterrupted supply of quality-assured drugs with reliable drug procurement and distribution systems and,

e. Assessment of the overall programme performance
Bibliography


(17) Rieder HL. Epidemiologic basis of Tuberculosis Control. 1999.

(18) Impact of primary and secondary levels of health care on the activities of the campaign against tuberculosis in Kasongo (Zaire). Bull Int Union Tuberc 1982; 57(2):153-159.


