Economics Bulletin

Volume 37, Issue 2

An analysis of the efficiency of the National Programme for the Fight against HIV/AIDs in Cameroon.

Nguenda anya Saturnin bertrand
Douala university

Abstract

This study evaluates the efficiency of the National Program for the Fight against HIV/AIDS (NPFA) in Cameroon. Use is made of the Data Envelopment Approach (DEA) to analysis dated collected from the National Committee for the Fight against HIV/AIDS, notably from the National Strategic Plans for the periods 2005-2010 and 2011-2015. The results show that the three services of the NPFA: the service prevention, the treatment service and the service in load of orphans and vulnerable children are inefficient. The NPFA edge therefore increase the output of the prevention service by 1.9% while maintaining the same level of inputs. For the treatment service, its output edge be increased by 22% using the same level of inputs. Also, the service in load of orphans and vulnerable children edge increase its output by 23.5% with the same level of inputs.

Citation: Nguenda anya Saturnin bertrand, (2017) "An analysis of the efficiency of the National Programme for the Fight against HIV/AIDs in Cameroon.", *Economics Bulletin*, Volume 37, Issue 2, pages 1068-1076
Contact: Nguenda anya Saturnin bertrand - nguenduz_144@yahoo.fr.
Submitted: May 08, 2017. **Published:** May 08, 2017.

1. Introduction

The national programme for the fight against HIV/AIDS can be seen as a form of institutional organisation with a public vocation that aims at reducing the costs of transaction in the treatment of this disease. However, the allocation of scarce resources by a public institution can be inefficient. In the case of public programmes for the fight against HIV/AIDS, inefficiency can for example arise from the choice of the target population, the selection of the cost-benefit ratio of the public interventions in each target population and the technical efficiency of the interventions in the various target populations (Bautista-Arredondo and al, 2008). In addition, several billion dollars are spent today in the fight against the HIV/AIDS but the difference between the resources available and the needs persists for the prevention and treatment of this disease (Bertozzi et al., 2004; UNAIDS, 2009). The 2008 financial crisis worsened the insufficiency of resources available for the fight against HIV/AIDS (World Bank, 2009). These financial constraints amplify the need to improve the efficiency of the campaigns against HIV/AIDS (UNAIDS, 2007).

The empirical literature reveals that the evaluation of the efficiency of the campaigns against HIV/AIDS is absent in countries of Sub-Saharan Africa. In fact, the literature on the level and determinants of technical efficiency of HIV-related interventions is almost non–existent, but suggests room from improvement in HIV programme efficiency. The efficiency of the National Programme for the Fight against HIV/AIDS refers for example to the capacity of this program to produce a given quantity of preventive and curative services (distribute condoms, hold screening sessions, counseling and antiretroviral treatment) at a minimum cost. Efficiency thus implies not only the optimal combination of inputs (labour, condoms, information materials, publicity campaigns.) but also their optimal use with a minimum of wastage and corruption (Bautista-Arredondo and al, 2008). In spite of the significant increases in investments in favour of the prevention of HIV/AIDS in the world (World Bank, 2005), there remains a significant gap between the needs and resources available. Although more resources will undoubtedly be invested in the prevention of HIV/AIDS in the next years (World Bank., 2005), uncertainty remains on the way in which the additional resources can be allocated in an efficient way to maximize the number of prevented infections. In fact, the sustainability of treatment and prevention programs remains dubious since the current interventions are financed by external funds which cannot be guaranteed on the long run. The local financing of the interventions related to treatment and prevention remains a challenge for African economies who are confronted with a shortage of financial resources (Mwabu, 2012). A study on 52 low income countries reveals that the technical efficiency of the services of prevention of HIV/AIDS transmission from mother to child was 62.5% in 2008, and that there is a strong variability between countries (Santos et al., 2012). Zeng et al., (2012) study the determinants of the technical efficiency of the services of the fight against HIV/AIDS in counselling, voluntary screening, the prevention of mother to child transmission and antiretroviral treatment. They find a strong disparity between the levels of efficiency of low income countries and that on average, the countries studied could increase their output by 50% given their inputs. In China, Cheng et al., (2009) measure the technical efficiency of the provinces covered by the World Fund for China which provides counselling and voluntary screening of HIV. They find that on average, the efficiency did not increase much with time and that, in the last year of the project, the level of inputs could still be reduced by 2,17 times to attain the same quantity of output. Lepine et al., (2015) within the framework of the Avahan project in India, one of the greatest projects of HIV prevention in the world find that in four years, the project reduced its consumption of inputs by 43% while maintaining its level of output. Zeng et al., (2014) evaluate the efficiency of the rural centers specialized in the supply of three services in the fight against HIV/AIDS in Rwanda: antiretroviral

treatment, prevention of mother to child transmission and counselling and screening by using the DEA method. They find that the average efficiency of these three services is 78%.

In Cameroon, the National Programme for the fight against HIV/AIDS primarily aims at reducing the propagation of the epidemic through the prevention of new infections and caring for a greater number of infected people. A particular emphasis is laid on the prevention of the transmission of HIV from mother to child, the promotion of voluntary screening and the promotion of the use of condoms by vulnerable populations (CNLS, 2010). However, the country remains in a situation generalized epidemic, i.e. with a prevalence rate of 5.1% in the general population and high rates in certain specific groups, particularly pregnant women (7,6%), sex workers (36.8%), uniformed officers (11.2%) (ONUSIDA, 2009). Also, many requirements in services remain unmet. For example as regards prevention, only 13% of the population (15-49 years) know their HIV status, 31% and 13% of the needs in condoms and tested blood respectively are met (CNLS, 2010). For the young aged 15-24 years, the rate of utilisation of condoms during sexual relations remains weak for the men (58.5%) and women (45.8%), the antenatal consultation coverage is also low (35%), as well as the coverage in prophylactic anti-retrovirals (ARV) for HIV positive pregnant women (19%). As regards treatment, less than 20% of children and less than 50% of the eligible adult patients have access to ARV treatment (CNLS, 2010).

The main objective of this paper is to evaluate the efficiency of the National Programme for the Fight against HIV/AIDS in Cameroon.

The importance of this paper is justified by at least two reasons: Firstly, to attain the millennium development objective for HIV/AIDS, Cameroon, like other low income countries needs to increase its services essential in the fight against HIV/AIDS. Given the low level of available resources and the priorities of the funders, the quest for efficiency by the national programme for the fight against HIV/AIDS is a priority (Creese et al., 2002; Galárraga et al., 2009). On a world scale, Stover et al.. (2006) estimate that an investment of approximately 122 billion $ during the period 2005-2015 could prevent 28 million infections at a cost of 3900 US $ per infection avoided while enabling a saving of 4770 US $ in costs of treatment. Secondly, the problem of inefficiency in the provision of public services in low income countries is a reality which engages the responsibility of the government and reinforces the need to monitor the supply of public services (World Bank, 2004). In this context, the analysis of the efficiency of the national programme for the fight against HIV/AIDS addresses a concern for the evaluation of the interventions of the government as regards the fight against HIV/AIDS. The rest of this study is organized as follows. Section 2 presents the methodology. Section 3 comments on the results and section 4 concludes the study.

2. Methodology

This methodology is based on three elements: the method of evaluation, the justification of the choice of the variables and sources of the data.

2.1 Method of evaluation

The method of *Data Envelopment Analysis* (DEA) is used in this study to evaluate the efficiency of the National Programme for the Fight against HIV/AIDS in Cameroon. The choice of this non-parametric method compared to the stochastic frontier approach is based on the fact that the nonparametric approach does not impose any restrictive hypotheses on the nature of the form of the production function. It can simultaneously accommodate several inputs and outputs. Lastly, the DEA method consumes less data than the econometric methods because it does not require a relatively large sample size (Charnes et al., 1978). Let us consider, following Coelli (1996), J services of the National Programme for the Fight against HIV/AIDS (PNLS), that can be evaluated, each one uses quantity X_{IJ} of different inputs I, in

order to produce several quantities Y_{ij}, of different outputs. Also, given u_k and v_i, the respective weights of the k th output and i^{th} input. The efficiency score of service K(E_J) is measured using the following linear maximization programme:

$$Maximiser\ E_0 = \left(\frac{\sum_{s=1}^{S} u_k Y_O}{\sum_{m=1}^{M} v_i X_o}\right)$$

s.t.

$$\frac{\sum_{s=1}^{S} u_k Y_{sj}}{\sum_{m=1}^{M} v_i X_{ij}} \leq 1$$

$$u_k\ , v_i \geq 0$$

With j=1, 2,…, J

k=1,2,…, K; i=1,2,…,I

The program is interpreted thus: the efficiency of a service of the PNLS is obtained as a ratio between outputs and inputs under the condition that this same ratio is equal to or less than 1 for the whole of the other services. The weighting coefficients u_k and v_i , for each service of the PNLS, are entirely determined by the inputs and outputs of the set of data on all the services of the PNLS. However, the weighting coefficients used for each service of the PNLS are those which maximize the efficiency score of the service of the PNLS. The value obtained of the efficiency score for service J of the PNLS is defined such that it is lower than one. One is the value indicating the point on the reference frontier expressing the position of the technically efficient production unit according to Farrell (1957). Each score is thus a relative measurement ranging between 0 and 1. A score equal to 1 means that the service unit of is located on the production frontier.

2.2 Justification of the choice of the variables of the study

Zeng et al., (2012) choose three outputs and one input. The outputs are the number of people voluntarily receiving counsel and HIV screening, the number of pregnant women infected by HIV/AIDS receiving a treatment for the prevention of the transmission of mother to child, the number of patients receiving anti retroviral treatment. The only input is the expenditure of the national programmes for the fight against HIV/AIDS. These three indicators are selected as outputs because they are the services for which the data is available. Lepine et al., (2015) consider as outputs the visiting of the services of HIV/AIDS measured by the number of people at risk obtaining HIV/AIDS services, the treatment of sexually transmissible infections measured by the number of sexually transmissible infections treated, community mobilisation measured by the number of people who are members of support groups. The inputs relate to labour measured by the number of administrators and doctors, capital measured by the number of community centers, the number of private clinics for the treatment of sexually transmitted infections. The inputs are the percentage of adults living with HIV/AIDS, the average number of cases of HIV/AIDS per member of the population, the rate of deaths due to HIV/AIDS. Santos et al., (2012), analyze the efficiency of the programme for the prevention of the transmission from the mother to the child in low income countries. They use as inputs: The public and international expenditure on prevention of the transmission from mother to child, the number of people of more than 15 years who are able to read and write a simple text, the number of people living in urban zones, the total health expenditure, stability and the absence of violence or terrorism. The outputs, for their part, refer to the number of HIV tested pregnancies, the number of pregnant women living with HIV who receive anti-retroviral drugs to prevent transmission from mother to child, the number of children born of women living with HIV aids and receiving cotrimoxazole in the first two months following birth.

Zanakis et al., (2006) consider as inputs, the health expenditure of households, expenditure on public health, the number of doctors per inhabitant, the number of male nurses per inhabitant, the rate of literacy of adults, gross domestic product per capita, the average number of radios per inhabitant. The choice of the inputs and outputs of this study is justified by the empirical literature and the availability of data. For the service of *Prevention*, we retain 5 outputs and 4 inputs. Regarding the *Care and Treatment* service, we retain 5 outputs and 5 inputs. Lastly, for the service for *taking care of orphans and vulnerable children*, we consider 4 outputs and one input. The various inputs and outputs used are summarized in table 1.

Table I: Outputs and Inputs

	Prevention	**Care and treatment**	**Caring for orphans and vulnerable children (OVC)**
Outputs	- Cumulated population benefitting from prevention actions - Number of identified patients -Number of women benefitting from the prevention of transmission from mother to child - Packets of risk free blood produced - Number of teachers trained (primary, secondary and other)	- Number of adults under ARV -Number of children under ARV - Number patients cared for and non ARV prophylaxie - Number of HIV+ patients needing INH disease prevention - Number of patients undergoing an ARV treatment and benefitting from the food aid	-Number of OVC: 0-4 years -Number of OVC: 5-9 years -Number OVC:10-11 years - Number of OEV: 15-17 years
TOTL	05	05	04

	Prevention	**Care and Treatment**	**Caring for orphans and vulnerable children (OVC)**
Inputs	- Expenditure on priority population [1] - Expenditure on vulnerable population[2] -Expenditure on the supply of services[3] - Expenditure on blood treatment[4]	- Cost of 1st and 2nd line ARV - Cost of INH disease prevention for TB/HIV patients - Cost of laboratory tests -Cost of non ARV care and disease prevention - Cost of supplying services	Resources necessary for OVC
TOTAL	04	05	01

Notes: [1]Interventions based on the youth, sex workers and their customers, mobile Populations introduction education, PVVIH, Men who have sexual relations with other men;
[2] Prisoners, hard drug consumers, uniformed officers, Mobilization of the community;
[3] Supply of condoms, counsel on screening, Treatment of STI, PTME, mass media;
[4] Blood safety, Post exposure disease prevention, universal precautions;
2 PTME: prevention of transmission from mother to child;
3 INH disease prevention,: isoniazid disease prevention
Source: CNLS, 2015.

2.3 Source of the data

The data for this study comes from the National Committee for the Fight against HIV/AIDS (CNLS) that is controlled by the National Programme for the Fight against HIV/AIDS. The data used is for two time periods, 2005-2010 and 2011- 2015. These two periods respectively represent the last two National Strategic Plans for the Fight Against HIV/AIDS.

3. Empirical results

The DEA model is estimated for the three services of the PNLS taken individually. The adopted model is estimated under the hypotheses of variable returns to scale oriented to output (maximization of output). In the absence of information on the prices of inputs of the National Program for the Fight Against HIV/AIDS in Cameroon, we focus on the technical efficiency of this program. Version 21 of the *DEAP (Coelli, 1996)* software is used to calculate the technical efficiency of the three services of the PNLS. Table II presents the means and standard deviations of the outputs and inputs used while table III shows the technical efficiency scores of the three services of the PNLS.

Table II: Means and standard deviations of the Outputs and Inputs (per 10 thousand population)

Outputs	**Means**	**Standard deviation**
prevention		
Cumulated population benefitting from prevention activities	192.66	26.072
Number of identified patients	45.18	0.5650
Number of women benefitting from PTME	76.118	3.3234
Units of safe blood produced	7.246	0.2368
Number of trained teachers (primary education, secondary and others.)	0.528	0.1490
Care and treatment		
Number of adults under ARV	18.692	3.6676
Number of children under ARV	17.142	2.8960
Number of tratment and non ARV disease treatment	1.69	1.0685
A number of HIV+ patients needing INH disease prevention	32 .966	1.2993
Number undergoing an ARV therapy and benefitting from food aid	5.162	0.2210
Care for orphans and vulnerable children (OEV)		
Number of OVC:0-4 years	11.217	0.3970
Number of OVC:5-9 years	9.52	0.3369
Number of OVC:10-14 years	8.215	0.2901
Number of OVC:15-17 years	4.602	0.1628
Inputs		
Prevention		
Expenditure on the prioritised populations	518.425	44.5660
Expenditure on vulnerable population	147.228	198.486
Expenditure on the supply of services	495.492	20.8385
Expenditure on counselling and screening	541.704	51.3645
Expenditure on blood treatment	630.126	2.0262
Care and treatment		
Cost of ARV (1st and 2nd lines)	3535.627	477.2630
Cost of disease prevention INH for TB/VIH patients	363.013	261.18554
Cost of laboratory tests	616.812	103.0620
Cost of non ARV care and disease prevention	636.282	88.9250
Cost of provision of services	596.358	32.1131
Caring for orphans and vulnerable children		
Resources necessary for OVC	161.107	714.3969

Source: From CNLS, 2015

Table III: Technical efficiency scores of the services of the National Programme for the Fight against AIDS in Cameroon

Year	prevention	Care and treatment	Care for orphans and vulnerable children
2005	0.958	1.000	0.498
2006	0.890	0.765	0.841
2007	0.953	0.979	0.862
2008	0.980	0.647	0.541
2009	0.952	1.000	0.893
2010	0.906	1.000	0.670
2011	1.000	0.768	1.000
2012	0.993	0.753	0.775
2013	1.000	0.891	0.652
2014	1.000	1.000	0.619
2015	0.977	0.752	0.895
Mean	**0.981**	**0.780**	**0.765**

Source: Author using data from the CNLS, 2015

From the results in table 3, the three services of the PNLS are fairly inefficient since for the three services, the average score of efficiency are lower than one. However, the service of *Prevention* seems relatively more efficient compared to the two other services. Infact, the PNLS can increase the outputs of the service of Prevention by 1.9% while keeping the same level of inputs. The service for Care and Treatments can, for its part, increase its output by 22 % without a modification of the inputs. The service for *caring for orphans and vulnerable children* occupies the last place since this service must increase its outputs by 23.5% while keeping the same level of inputs. This result is identical to that found in the majority of existing studies (Cheng et al., 2009; Zeng et al., 2012; Zeng et al., 2014). However, a minority of studies find a contrary result. Lépine et al. (2015) find that the services of the National Aids Programmes are efficient while Santos et al. (2012) find a strong variation in the levels of efficiency of these programmes between countries. The low level of efficiency of the *Orphans and vulnerable children* unit compared to *the Prevention* unit can be explained by a low level of field activities and their follow-up. The children sometimes both parents and are the responsibility of a member of the family who is often very poor and uneducated. In this context, the recourse to the healthcare units is irregular or sometimes inexistent. The low performance of the *Orphans and vulnerable children* unit can also be due to its late creation compared to the other two units. It thus accumulated work which was not done since priority was given, until a recently to adults.

To improve prevention, priority measures are essential. Firstly, it is important to eliminate the transmission of HIV from mother to child. For the moment, this objective is not yet achieved since, according to the last of Demographic Health Survey (DHS) carried out in 2011, only 43% of child births take place in medical centers, 58.9% of births are practiced by unqualified

personnel and only 48% of the women know that HIV can be transmitted while nursing and that the risk of transmission of HIV from mother to child can be reduced by the taking of special drugs during pregnancy. Secondly, the screening and counseling approach initiated in hospitals and the mobile strategy (mobile caravans and units) must be intensified near the priority and vulnerable populations. In fact, according to the same DHS survey, 46 % of women and 58% of men never undertook an HIV test. Thirdly, it is important to improve the distribution of female and male condoms. In spite of an improvement in the distribution of the female and male condoms, their need is only met at 31% at the national level (CNLS, 2010). Moreover, the problem of ensuring the quality of condoms marketed in the country is crucial since certain supply and distribution structures systematically do not use the services of the body in charge of the control of the quality of pharmaceutical products. Fourthly, the protection of transfused blood is essential. Globally, if the number of units of transfused blood having been screened for HIV increased, it accounts for only13.3% of the total needs during the 2006-2009 period (CNLS, 2010).

To improve care and treatment, essential measures relate to a universal access to treatment and care in for children and adults living with HIV. This universal access to treatment necessarily passes through the creation of Treatment Units (TU) throughout the national territory. For the moment, only 100 health districts have an operational TU on the 178 envisaged, giving a coverage rate of 56.2% (WHO, 2012).
Concerning the protection and support for orphans and vulnerable children (OVC), the protection of the OVCs necessarily passes through the reinforcement of the caretaking and the follow-up of sick children. A better access to ARVs is thus essential for the efficient protection of this population. Also, it is important to reinforce vocational training in order to facilitate the creation of income generating activities.

4. Conclusion

The main objective of this paper is to evaluate the efficiency of the National Program for the Fight Against HIV/AIDS in Cameroon. The empirical results show that the relatively more efficient service is the service of *Prevention* while the services of *Care and Treatments* as well as that for *Caring for orphans and vulnerable children* occupy the second and third place respectively. More efforts should be done in the management of resources by the three services of the PNLS. These efforts amount to 1.9%; 22% and 23.5% respectively. The National Aids Programme (PNLS) has three strategic axes which correspond to three services: prevention, treatment and care, and finally, the caretaking of orphans and vulnerable children. The PNLS is coordinated at the top by the Minister of Public Health. But at the operational level, the PNLS utilizes several actors for the implementation and the follow-up of its actions. For reasons of efficiency, the PNLS imposes a permanent follow-up of the actions undertaken at the level of all the actors. For example, the task of the follow-up of the patients by Community Relay Agents of (CRA) deployed in all treatment and care units should be intensified on the field. In fact, the activities of these CRAs allow the people living with the disease to benefit from a minimum support package. This support includes psycho-social care, the supply of information booklets on life with HIV and the localization of treatment and care units, home treatment, visits to the residences in quest of those having abandoned treatment, nutritional support, the realization income generating activities and the provision of legal support. Currently, the activities of CRAs remain very low on the field. Furthermore, the improvement of treatment also passes through the reduction of loopholes in the caretaking of patients due to the many inventory shortages in ARVs.

5. References

Bautista-Arredondo,S.,Gadsden, P., Harris, J. and S.M, Bertozzi.(2008) **"**Optimizing resource allocation for HIV/AIDS prevention programmes: an analytical framework". *AIDS* **22**, 67-74

Bertozzi, S., Gutierrez, J-P., Opuni, M., Walker, N. and B, Schwartländer.(2004) "Estimating resource needs for HIV/AIDS health care services in low-income and middle-income countries" *Health Policy* **69(2)**,189-200.

Brandeau, M.L., Zaric, G.S. and V, De Angelis.(2005) "Improved Allocation of HIV Prevention Resources:Using Information About Prevention Program Production Functions" *Health Care Management Science* **8,** 19-28

Charnes, A., Cooper, W. and E, Rhodes. (1978) "Measuring the efficiency of decision making units" *European Journal of Operational Research* **2(6),** 429–44.

Cheng,G.,Qian, Z.and J, Hu.(2009)"Longitudinal analysis of technical efficiency of voluntary counseling and testing of HIV in China"*Journal of Peking University* **41(2),**135-146.

CNLS.(2015)**.** Comité National de Lutte contre le Sida. Plans stratégiques de lutte contre le Sida 2005-2010, 2011-2015. Cameroun.

CNLS.(2010) Comité National de Lutte contre le Sida. Rapport d'activités. Cameroun

CNLS.(2010) Comité National de Lutte contre le Sida. Rapport d'activités. Cameroun

CNLS.(2013) Comité National de Lutte contre le Sida. Rapport d'activités. Cameroun

Coelli , T.J.(1996) "A guide to DEAP, version 2.1: A data envelopment analysis (computer) Program" CEPA Working Paper 96/08.

Creese, A., Floyd, K., Alban, A. and L, Guinness .(2002) "Cost-efectiveness of HIV/AIDS interventions in Africa: a systematic review of the evidence" *Lancet* **359**, 1635-1643.

DSCE.(2009) Document de Stratégie pour la Croissance et l'Emploi Cameroun

Earnshaw, S., Hicks, K., Richter, A. and A, Honeycutt .(2007) "A linear programming model for allocating HIV prevention funds with state agencies: a pilot study" *Health Care Management Science* 10, 239-252.

Farrell, M.J.(1957) "The Measurement of Productive Efficiency" *Journal of The Royal Statistical Society* 120(3),253-281

Galárraga, O., Colchero, M., Wamai, R. and S, Bertozzi.(2009) "HIV prevention cost-efFectiveness: a systematic review". *BMC Public Health* 9 (Suppl 1)

Lasry, A., Sansom, S.L., Hicks, K.A. and V, Uzunangelov.(2011) "A model for allocating CDC's HIV prevention resources in the United States" *Health Care Management Science* **14**, 115-124.

Lepine, A., Vassall, A. and S, Chandrashekar.(2015) "The determinants of technical efficiency of a large scale HIV prevention project: application of the DEA double bootstrap using panel data from the Indian Avahan" *Cost Effectiveness and Resource Allocation* **13(5)**

Mwabu,G.(2012)"HIV/SIDA" in *The Oxford Companion to the Economics of Africa* by E, Aryeetey.,S,Devarajan., R,Kanbur. and L, Kasekende*, Eds.,*Oxford university press, 258-265

ONUSIDA.(2009) UNGASS Country Progress Report, January 2008–December 2009. Cameroon.

Santos, S.P., Amado, C.A. and M.F, Santos.(2012) "Assessing the efficiency of mother-to-child HIV prevention in low-and middle-income countries using data envelopment analysis" *Health Care Management Science* **15 (3)**, 206-222.

Stover, J.,Bertozzi, S.,Gutierrez ,JP.and al .(2006)"The global impact of scaling up HIV/AIDS prevention programs in low- and middle-income countries" *Science* **311**,1474-1476.

UNAIDS.(2007) Annual Report. Making the money work Geneva

UNAIDS.(2005) Resource needs for an expanded response to AIDS in low-and middle-income countries.Geneva.

UNAIDS.(2010) What countries need: Investments needed for 2010 targets. Geneva

WHO.(2012) WHO contry office. Annual Report. Cameroon

World Bank.(2009) In Health financing revisited: A practioner's guide. Edited by: Gotteret P, Schieber G. Washington DC

World Bank.(2004) Making services work for poor people Washington DC.

World Bank.(2005) The World Bank's global HIV/AIDS program of action. Washington, DC

Zanakis,S.,Alvarez,C. and V,Li.(2007)"Socio-economic determinants of HIV/AIDS pandemic and nations efficiencies" *European Journal of Operational Research* **176,** 1811-1838.

Zeng,W., Rwiyereka, A.K.,Amico, P.R., Ávila-Figueroa, C. and D.S, Shepard.(2014) "Efficiency of HIV/AIDS Health Centers and Effect of Community-Based Health Insurance and Performance-Based Financing on HIV/AIDS Service Delivery in Rwanda" *The American Society of Tropical Medicine and Hygiene* **90(4),**740-746.

Zeng, W., Shepard, D., Chilingerian, J. and C, Avila-Figueroa .(2012) "How much can we gain from improved efficiency? An examination of performance of national HIV/AIDS programs and its determinants in low- and middle-income countries" *BMC Health Service Research* **12(1)**.