COST ANALYSIS OF AN HIV/AIDS PREVENTION PROJECT: A CASE STUDY OF THE AIDS 3 PROJECT IN BENIN

by

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DEDICATION

To Ashi, Blewa, and all those women who have not lived their lives.

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ABSTRACT

The objective of this thesis is to undertake a cost analysis of an HIV/AIDS prevention programme targeting vulnerable groups in Benin. The AIDS-3 project (*Projet Sida 3*), a project targeting Female Sex Workers (FSWs), which was implemented from 2001 to 2005, is used as a case study to see how costs vary with location, volume of activities, and HIV prevalence rate.

Activities and delivery modes were documented, and cost data have been collected both retrospectively (data on previous "*Projet Sida 3*" costs already available) and prospectively, using an ingredients-based costing methodology to consider both the financial and economic costs. Output measures were compiled directly from the intervention, and are related to the efficient delivery of different components of the intervention. Average cost per output or per outcome was estimated and cost variation within and between health centres over time was assessed.

Results reveal that only the volume of activity is a prominent factor that affects the average cost. The location of the project and the experience of the staff also affect costs as well, but their significance is low. Field work activities that are more efficient in urban areas than in rural communities appear to be paramount in the fight against HIV as far as costs are concerned.

LIST OF ABBREVIATIONS USED

AIDS	Acquired Immunodeficiency Syndrome
AIDS3	West Africa Aids Program (phase 3)
AZT	Azitromicine
BCEAO	Banque Centrale des Etats de l'Afrique de l'Ouest
CSC	Centre de Sante Communale
CSCOM	Centre de Sante Communautaire
DALY	Disability Adjusted Life Year
DIST	Dispensaire des Infections Sexuellement Transmisibles
FCFA	Franc de la Communauté Financière Africaine
FE	Fixed Effect estimator
FSW	Female Sex Workers
FW	Field Workers
HIV	Human Immunodeficiency Virus
IDU	Injecting Drug Users
LSDV	Least Squares Dummy Variables
NVP	Nevirapine
OLS	Ordinary Least Squares
ONG	Organisation Non Gouvernementale
OSV	Organisation pour le Service et la Vie
QALY	Quality Adjusted Life Year
RCT	Randomized Controlled Trial
STI	Sexually Transmitted Infections
UNAIDS	The Joint United Nations Programme on HIV/AIDS
VCT	Voluntary Counselling and Testing
WDI	World Development Indicator
WHO	World Health Organization
WTP	Willingness to Pay

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CHAPTER 1 INTRODUCTION

The world has been impacted by numerous diseases which, during a specific period and within a given geographical area, have decimated countless human lives and threatened the very viability of whole economic regions. Many diseases, among which is HIV/AIDS, are still shaping the destiny of many human beings. It was estimated that in 2007 alone, 2.1 million people died of AIDS while 2.5 million were newly infected; an estimated total of some 33.2 million people were living with AIDS at the end of that same year (WHO and UNAIDS, 2007, p.7).

To curb the spread of this infection, many prevention programs have been implemented, mostly in developing countries. Sub-Saharan Africa alone, accounted for some 71% of all new HIV infections and AIDS-related deaths in 2007 (WHO and UNAIDS, 2007, p.7). Strategies behind these programs range from concentrating activities on whole populations to targeting particular vulnerable groups. Among such HIV/AIDS prevention programs is The West Africa Aids Program (AIDS3). This has now been implemented in nine West African countries, including BENIN. This program focuses on providing adequate services to Female Sex Workers (FSWs), their clients and their surrounding communities.

1.1 MOTIVATION FOR THE RESEARCH

To face the HIV/AIDS epidemic, great importance was given by this project to community participation, in order to promote and support activities aimed at improving health. This was one of the two main components of the West Africa Aids Program in which specific national programs were designed using an approach that combined different degrees of community support and adapted services related to the sex-work environment (Morin et al., 2008). In Benin, various types of activities, stretching from primary health care (mainly STI testing and treatment) to community-based and empowerment activities, were part of the national program and were provided for cities with different sizes and with different levels of prevalence. Resources allocated to the program were mainly directed to activities targeting Female Sex Workers (FSWs) and neighboring communities.

According to the development challenge arising from the HIV/AIDS epidemic, global resources allocated to this epidemic have increased during recent years more than ever before (Kumaranayake, 2008). Yet concerns are rising about how efficiently these resources are being used with respect to the wide range of preventive activities involved. Obviously, in the setting of resource scarcity, efficient allocation must be paramount in order to make sure that resources are not wasted. Thus effectiveness of each activity of the national program has to be ascertained. Unfortunately, in most of the countries where the West Africa Aids Program has been carried out, few evaluations have been done to appraise the impact of undertaken activities on the whole society in general, and particularly on the target group. In the case of Benin, much remains to be known about activities that have yielded the best outcomes with respect to resources devoted to them.

The rationale for this research is to assess all prevention activities realized within the framework of the AIDS3 national program in BENIN by taking into account costs and outcomes and intermediate effects of each activity. This will not only help in decision-making concerning HIV/AIDS prevention activities targeting FSW but also in the resource allocation to them. In other words, the preventive program manager will have better tools to make an informed decision about resource allocation.

1.2 Aims and Objectives of the Thesis

The purpose of this thesis is to provide a cost analysis of all preventive activities carried out under the AIDS3 national program in BENIN in order to help in the programming and efficient allocation of resources within HIV/AIDS preventive strategies. In specific terms, this thesis estimates the cost per outcome of services provided to Female Sex Workers (FSWs) and their immediate neighborhood. The following three objectives will help us reach the goal:

i- Document the specific activities of the project, including the nature, range and method of delivery of all activities in different sites, reflecting variations in delivery of activities

ii- Undertake a cost analysis to estimate the average cost of different activities at each study site using process and outcome indicators for intervention activities in each site

iii- Analyse cost variations within and between health centres

1.3 Statement of Hypothesis

Many cost studies have revealed variations in average costs across health centres and with funding agencies (Cresse and Parker, 1994; Hutton, Fox-Rushby et al., 2004; Mansley, Dunet et al., 2002; Guiness et al., 2005). Delivery mode has seemed to be standardized in each site with respect to social and cultural practices and habits in place.

Harmonization of services provided in each programme takes into account only clinical practices which concern most of the time the way diseases are treated. Quantity of tablets needed to cure an STI in one site is assumed to be the same in another site. Hence, variation in delivery mode will basically be observed in non-clinical practices such as the prevalence rate, the scale, and the location.

Average costs are expected to vary with the scale of service provided. Unlike fixed costs, average variable costs will decrease not only with the level of activities, but also with time. We are expecting experience to have a positive effect on productivity which, in turn, will increase outputs or outcome production per labor. The settlement of the health centre (rural or urban), as well as the prevalence rate, will also contribute to the variation in average costs per output or outcome.

1.4 DELIVERABLES

Economic analysis done in this thesis draws on costs and outcome data of the AIDS3 program in Benin and provides HIV/AIDS preventive activities planners with useful decision tools, as far as priority setting is concerned. However, as some of the data used in this analysis are estimated, the results should be taken with great caution owing to uncertainty surrounding the assumptions made. Comparison can only be made between similar preventive activities and among regions or cities that likely have the same HIV/AIDS prevalence level.

The following chapter describes the theoretical framework that underlies this thesis and explores the existing literature on costs of HIV/AIDS prevention. Chapter 3 provides first a summary of activities implemented in the AIDS3 national program and later, describes the method used to compute the cost of each activity with respect to outcomes. Then Chapter 4 presents the results of the cost analysis per activity while Chapter 5 concludes the thesis.

CHAPTER 2 THEORETICAL FRAMEWORK AND LITERATURE REVIEW

The purpose of this chapter is to describe first, the theoretical framework within which health care preventions are to be evaluated; and second, to present a critical literature review of economic evaluation of HIV/AIDS prevention programs. In specific terms, the theoretical framework highlights different key concepts that underlie cost analysis of health care program evaluation. A description of modeling in economic evaluation is also presented with a particular stress on health-related evaluations. The critical literature review gives an updated overview of recent evaluations done for HIV/AIDS prevention. All different prevention activities (from fieldwork to clinical trials) targeting especially vulnerable groups are presented; and some cost research on cost analysis is reviewed.

2.1 Theoretical Framework of Cost of HIV/AIDS Interventions

Evaluation of a health care program, from an economic point of view, requires the ability to identify, to measure and then to analyse the costs and consequences of alternative health interventions (Drummond et al. 2005, p.9). The effect of an intervention can be either direct or indiect. But when it comes to STI/HIV prevention programs, the evaluation of an intervention demands the identification of the effect of that intervention, whether it is an outcome or an output, and the calculation of its costs. With economic evaluation of health care programs, comparison of inputs (which is most of the time referred to as costs) to consequences (also appraised by outputs) helps in resource allocation amongst alternative preventive activities.

In health programs evaluation, four types of analysis are usually considered: cost-benefit analysis, cost-effectiveness analysis, cost-minimizing analysis; and cost-utility analysis. Drummond et al. provide in detail a description of each type and the context in which they can be used. Thus, the review here will not present all the idea behind each type of analysis nor all the literature related to evaluation, but will isolate the main features characteristic to infectious diseases.

2.1.1 Assessment and Evaluation of HIV/AIDS Prevention interventions

In broad terms, two characteristics of economic analysis are especially used to evaluate health care programs. The first deals with the inputs (costs) and outputs (consequences) of the the particular program. The second is about the availability of alternative choices. Drummond et al. (2005) provide the type of evaluation depending on the combination of these two characteristics. They summarize their results in Table 2.1.

Table 2.1: Distinguishing Characteristics of Health Care Evaluation

<table>
<tr><td colspan="2"></td><td colspan="3">Are both costs (inputs) and consequences (outputs) of the alternatives examined?</td></tr>
<tr><td rowspan="6">Is there comparison of two or more alternatives?</td><td rowspan="4">NO</td><td colspan="2">NO</td><td>YES</td></tr>
<tr><td>Examines only consequences</td><td>Examines only costs</td><td></td></tr>
<tr><td colspan="2">1A Partial Evaluation 1B</td><td rowspan="2">2 Partial Evaluation
Cost-outcome Description</td></tr>
<tr><td>Outcome Description</td><td>Cost Description</td></tr>
<tr><td rowspan="2">YES</td><td colspan="2">3A Partial Evaluation 3B</td><td rowspan="2">4 Full Economic Evaluation
Cost-Effectiveness Analysis
Cost-Utility Analysis
Cost-Benefit Analysis</td></tr>
<tr><td>Efficacy or Effectiveness Evaluation</td><td>Cost Analysis</td></tr>
</table>

Source: Drummond et al., 2005

When assessing infectious disease interventions, many researchers do not necessarily consider alternative interventions. However, as efficiency in resource allocation is paramount, inputs and outputs must both been analyzed. Thus, full economic evaluation (Cost-Benefit Analysis, Cost-Effectiveness Analysis and Cost Utility Analysis) and cost-outcome descriptions are being more widely seen in the contemporary literature.

2.1.1.1 Cost-Benefit Analysis

Cost-Benefit analysis is used to compare two alternative programmes when it comes to make a decision. Basically, the matter in Cost-Benefit analysis is to "compare the discounted future streams of incremental programme benefits with incremental programme costs" (Drummond et al, 2005, p. 211). Brent (1998, p. 6) identifies the following four interrelated questions as important: 'What are the relevant constraints?', 'Which cost and benefits are to be included?', 'How are they to be valued?', and 'At what interest rate are they to be discounted?'. The decision rule, however, depends on several factors. In fact, the economic and political environment in which the programme is to be implemented affect the answers to the above questions. A detailed explanation of Cost-Benefit analysis is provided elsewhere (*ibid*); thus we will limit our discussion to health programmes alone.

In health programme evaluation, the main question Cost-Benefit analysis tries to answer is whether the rate of return of the prevention programme is at least equal to that which could be earned in another sector of the economy (Roberts, 2006). Even though this analysis is based on the necessity to make use of resources in the most efficient way possible, it does encounter some problems in health care evaluations. On one the hand, it has to face the difficulty not only to identify all health inputs and outputs but also to give them monetary values. On the other hand, some aspects of health (infection control for instance) may present some features of public goods, and thus may be under-produced as their benefits are widely scattered.

Most of the time economists prefer to use willingness to pay (WTP) to address the problem. With WTP, it is possible to evaluate benefits in money terms and thus, to find the return on investment in order to compare different programmes. However, not only is constructing a WTP study difficult but also its results depend on the information available (such as the prevalence level), and on the perceptions of the respondents (depending on whether they are risk averse or not). Moreover as respondents are uncertain about what their answers will lead to as policy, their Willingness To Pay (WTP) may not reflect the exact value they are willing to forgo for a service.

2.1.1.2 Cost-Effectiveness Analysis

According to Drummond et al. (2003, p. 103), Cost-Effectiveness analysis refers to a "form of full economic evaluation where both the costs and the consequences of health programmes or treatments are examined". It has been the most important in assessing HIV/STI prevention intervention. In Cost-Effectiveness analysis, the focus is put on the economically efficient way to provide a program and not on its economic return (Roberts, 2006). With this technique of evaluation, it is important that the alternative projects should have the same effect or output; that may be the reason why it is widely used to assess projects related to HIV/AIDS prevention where the output is either the number of HIV infections avoided or STI treated. Even though alternatives projects may have the same outputs, their side effects on the targeted population may be totally different.

Quality adjusted life years (QALY) and disability adjusted life years (DALY) are the most common indicators that have been developed to assess the health impacts of projects on a population. Yet opinions on these measures are often contradictory. Whilst some support the relevance of their use arguing that they are based on both moral and economic values (Williams, 1985), others think QALY and DALY cannot apprehend all aspects of health being valued. To circumvent this divergence, another approach is the so-called cost-consequences approach. Despite its attempts to indentify and quantify additional features, neither the cost-consequences approach nor QALY and DALY help to compare health returns to other goods (*ibid*) in order to find the optimal level or resources necessary for a health project.

2.1.1.3 Cost-Utility Analysis

Utility is an important notion in economics. When applied to health economics, utility in economic evaluation refers to different valuations that people may give to the same outcome of a health intervention. For example, a screening for Sexual Transmitted Infection will not have the same utility for a sex-worker and a married woman nor will a kidney transplant have the same utility for a retired senior and a young student who has just graduated. Thus, Cost Utility analysis is very useful when it comes to set priorities among populations that a health program may target. Moreover, for a given set of treatment outcomes, Cost-Utility analysis provides outcome measures for comparison of costs and outcomes in different programs (Drummond et al., 2005).

Despite its importance, Cost-Utility is very difficult to use to assess programs, as there is not a single, standard way to measure utility. DALY, Healthy Year Equivalent (Mehrez and Gafti, 1989) and Saved-Young Life Equivalent (Nord, 1995) are proposed as generic outcomes measures; yet it is QALY that is commonly used.

2.1.1.4 Cost Analysis

In cost analysis many challenges can arise not only about how the outcome is measured but mainly about how input costs should be measured. If agreement can be found about the outcome measurement, it is however difficult to get a consensus about how to value the cost of inputs. Three considerations usually come into play: the perspective of the analysis, the institutional framework and the practical measurement. Complete detail on each of these aspects is fully provided elsewhere (Drummond et al., 2005, p.5).

In cost analysis, all inputs and outputs must be indentified and the production function that describes the strict relation between resources and outcomes should be specified. Alternative production processes should be explored for possible economies of scale. No input should be used if it will not lead to an increase in output. Thus the production function will not only be technically efficient but also will yield economies of scale. But in practice, little consideration is given to scale and scope efficiencies. Studies mainly rely on a top-down approach where total costs are allocated to activities (Roberts, 2006). However, this approach, as stated by Whunes and Walker (1995), may not provide sufficient information about the inter-relationship between inputs and scale or scope, and thus may lead to inaccurate estimates.

Where possible, the cost of all inputs that contributed to a given output will be estimated using either an accounting or unit cost approach. In an accounting approach, both financial and economic costs can be evaluated from the perspective of the service provider or of society in general. In the latter case, additional cost will be included taking into account all resources required to achieve a given level of output (Jan et al., 2005). Two problems are related to the accounting approach as average costs are used as a proxy for marginal cost. While the first is due to the lack of cost information about incremental increases in output, the second deals with the quality of services being provided (Jan et al., 2005).

A unit cost approach requires mathematical modeling and some specific conditions to design the cost function which will yield to the estimation of both the average and the marginal costs. By allowing the computation of marginal and average costs, this approach makes discussion of economies of scale and of scope possible. However, it still has to face some difficulties such as the need for a large amount of data, as well as a control for the type and quality of services provided; and the choice of the right output measure of the cost function (Jan et al., 2005).

2.1.2 Performance Indicators of HIV/AIDS Prevention Programs

Process indicators, output indicators and impact indicators are the three types of performance indicators used to assess the failure or the success of health care interventions. The choice of the performance indicator is closely related to the type of economic evaluation.

2.1.2.1 Process Indicators

Easy to compile, process indicators of an intervention provide a measurement of all activities done under the given intervention. Generally, process indicators are visible and are also referred to as output indicators. In HIV/AIDS preventions programs for instance, the number of people screened for HIV, the amount of voluntary counseling done, the number of condoms distributed and the number of STI treated are among the common process indicators. Though process indicators yield a high level or accuracy in their measurement, they do not provide much information on the impact of the intervention on the target group.

2.1.2.2 Outcomes Indicators

Unlike process indicators, outcome indicators point out the direct effect of a program on a target population. They inform on how an intervention has helped to reach a specific objective by providing the consequences of the program on the population. Outcome indicators in HIV/AIDS prevention programs include, for example, the increase in the rate of use of condoms. Outcome indicators are of great interest as they can reflect all aspects of health care being evaluated. However, they are difficult to measure and require social and behavioral studies to assess the real effect of the intervention.

2.1.2.3 Impact Indicator

Impact indicators require either a randomized controlled trial (RCT) or a mathematical model to estimate the exact impact an intervention has on the target population. Difficult to measure, impact indicators, however, have the advantage of revealing the precise effect of a given program on the beneficiary group. In HIV/AIDS-related prevention program evaluation, the number of QALY gained or DALY averted, and the number of HIV infections prevented, are the most common impact indicators. Like outcome indicators, impact indicators are subject to uncertainty as they rely on the prevailing epidemiological information which may have changed over time.

2.2 Critical Review of HIV/AIDS Prevention Interventions

In order to seek to curb the progression of HIV/AIDS disease, many prevention strategies have been developed, targeting in priority different vulnerable groups and then the whole population. Thus, Walker (2003) identified the following HIV preventions strategies:

- Screening blood and promotion of blood safety;
- Mass media campaigns;
- Projects working with youth;
- Social marketing of condoms;
- Treatments of STDs;
- Projects working with sex workers and their clients;
- Harm reduction strategies among injecting drug users (IDUs);
- Voluntary counselling and testing;
- Prevention of mother-to-child transmission;
- Microbicides and female-controlled methods;
- Vaccines.

Though his research was focused on interventions in developing countries, Walker did not include preventive activities targeting homosexual communities, since this seems to be less common. Male circumcision can be seen as another strategy as recent research has tried to prove that this practice may have a positive impact on HIV/AIDS prevention. The cost-effectiveness evaluations of these interventions have been the aim of many research papers and since the variance of their effectiveness is so large, we would like to examine them one after another in respect of their importance. In the penultimate section, other economic analyses that have tried to assess costs and cost functions will be briefly discussed.

2.2.1 Prevention of mother-to-child transmission

The major part of the literature review available on cost and cost-effectiveness is about research done in developing countries, especially in Sub-Saharan Africa, owing to the high level of HIV prevalence in that part of the world. Much of this research is concerned with the cost-effectiveness analysis of interventions implemented to prevent vertical transmission of HIV infection (transmission from mother to baby). Comment on the literature is limited to those published after 1997. Marseille et al. (1998) evaluated the cost-effectiveness of three different combinations of antiretroviral therapy (using a cohort of 100 women for each regime: A, B, C) as compared to no prevention intervention. The outcomes are measured in terms of cost per vertical HIV case averted and cost per DALY gained. While the estimated cost per vertical HIV averted ranged from US$ 1129 to US$ 5134, the cost per QALY was only US$ 60, US$ 143 and US$ 274 respectively for regimens A, B and C. The results showed that regimen C was the most cost-effective; however, they commented that regimen A was the most effective but not the most cost-effective owing to its high cost. Their estimations seem to be higher than those of Creese et al. (2002) who, in their study, assessed the cost-effectiveness of HIV/AIDS interventions in Africa. They used data of 24 other studies (from 1984-2000 including unpublished studies) that have met their requirements and calculated the standardised estimates of the costs per HIV infection prevented and per Disability-Adjusted Life-Year

(DALY) gained for 31 interventions, all in 2000 $US. In their study, they found that a single dose of nevirapine intervention to reduce mother-to-child HIV infection cost between $20 and $341 per infection prevented and less than $10 for DALY gained. However, it is worth mentioning that they measured output either in QALY or in DALY.

Another study carried out by Soderlund et al. (1999) analysed the cost-effectiveness of prevention of vertical transmission of HIV. But the paper is focused on strategies available in South Africa and uses a Markov chain model to estimate the cost-effectiveness of four formula feeding strategies, three antiretroviral interventions, and a combination of formula feeding and antiretroviral intervention on a cohort of 20,000 pregnant women. Unlike other studies, they measure their outcomes in terms of death averted and life-years saved. Their results show a big gap between the costs of the different interventions. While the cost per death averted ranges from $ 252 to $ 5967, that of life saved is between $ 11 and $ 33, except that of "breast feed to 6 months" which is far above the others. Among all the interventions, PETRA arm B regimen (zidovudine plus lamivudine, during and after birth) is the most cost-effective. Their mathematical model and the sensitivity analysis illustrated the generalisability of their results. However, country specific conditions must be taken into consideration. In 1999, Marseille et al. (1999) worked again on cost-effectiveness of mother-to-baby infection prevention. Nevertheless, here, they worked on a single-dose of nevirapine regimen as an intervention to decrease vertical HIV-1 transmission in Sub-Saharan Africa and the cohort was composed of 20,000 pregnant women. They used program cost, paediatric HIV-1 cases averted, cost per case averted, and disability-adjusted life-year (DALY) to measure their outcomes; the intervention is compared to other short-cost antiretroviral regimens. In their analysis, the estimated cost-effectiveness ratios are $ 138 per case averted and $ 5.25 per DALY. However, since these costs were positively correlated to the level of sero-prevalence, nevirapine therapy will be cost-effective only in lower sero-prevalence regions. However, when using Markov modeling to analyse cost-effectiveness of different vertical prevention interventions in Sub-Saharan Africa, Maclean et al. (2005) realised that breast-feeding for 6 months cost as little as $ 1.8 per QALY.

Many other works focus on vertical HIV transmission, but their results cannot be ranged between those mentioned above. The divergence of the results, maybe due to different measurement of outcomes and different prevalence levels, reveals the need to harmonise the cost-effectiveness analysis of this particular HIV prevention intervention in order to gain efficiency in actions. Another intervention, which seems to be the cornerstone of HIV prevention, is the social marketing of condoms.

2.2.2 Social marketing of condoms

The promotion of male condoms is one of the most efficient prevention programs in the world and many studies reveal that consistent use of condoms may reduce the incidence of HIV by 95% per act (Dowdy et al., 2006). In his article review, Walker (2003) reported from other studies that social marketing of condoms cost $ 1.22 per life-year saved and $ 20 per HIV infection averted in East Africa. But in the context of South-East Asia, these costs are respectively $ 0.83 and $ 9.60. However, these results are far to be generalised. Creese et al. (2002) found that through condom distribution, each case of HIV infection prevented cost between $ 11 and $ 2000 and the cost of each DALY gained is just $1. As these results are widely accepted, cost-effectiveness of male condoms has been the aim of few researches.

More recently, Dowdy et al. (2006) came back to this assessment. Their study analysed the cost-effectiveness of female condoms distribution at different coverage levels in Brazil and South Africa. Using a model based on several assumptions, their results predicted that the expansion of female condoms (FC2) at moderate volume in South Africa would be expected to cost a donor or government $ 18 per DALY saved, ignoring any cost-savings from averted HIV treatment. However, they recognized in the paper that their perspective analysis ignored both important societal costs (e.g., marketing and promotion) and savings (e.g., averted productivity losses from HIV disease) of expanded FC2 distribution. From their results, we realize that though the expanded FC2 distribution may be cost saving, there is no evidence to compare its cost-effectiveness to other interventions. It may not be cost-effective as compared to male condoms and that may be the reason why the promotion of female condoms has been put backward in many prevention programs, especially the prevention of sexual transmitted diseases (STDs).

2.2.3 Treatments of STDs

Treatments of STDs have been assessed to have a positive impact on the prevention of HIV infection. As explained by Walker (2003, p.7), “HIV infection, through its effect on the immune system, can increase susceptibility to STDs and also inhibit the effectiveness of any STD treatment. In turn, STDs can facilitate transmission of HIV, particularly in infections where there is genital ulceration”. This statement suggests that STDs treatments must be a component of HIV prevention programs regardless of their cost-effectiveness. However, some researchers have tried to find out to what extent SDT treatments should be preferred to other interventions. Freedberg et al. (1998) analysed the cost-effectiveness of preventing AIDS-related opportunistic infections. They developed a

Markov simulation model to compare different strategies and estimated the outcomes in terms of projected life expectancy, quality-adjusted life expectancy, total lifetime direct medical costs, and cost-effectiveness in dollars per quality-adjusted life-year (QALY) saved. Their results estimated the cost per QALY between $ 39.9 and $ 42.56 and noted that opportunistic infections remain a common cause of morbidity, mortality, and cost for patients with advanced HIV disease. These estimated costs are far greater than those mentioned by Walker (2003), which were $ 2.51 per SDT treated, $ 12.31 per DALY averted and $ 259.33 per HIV infection averted. He highlighted in the same study that other research, focused on Asia and Africa, predicted these costs to be $ 9.60 and $20 per HIV infection averted, and $ 0.83 and $1.22 per life year saved in Asia and Africa respectively. Another result he related is from the World Bank, which estimated the cost-effectiveness of an STD intervention in India to be $ 2.43 per DALY averted and $ 48.6 per HIV infection averted. However, most of the time, STD treatment interventions targeting vulnerable groups have deserved particular programs in many societies.

2.2.4 Projects targeting sex workers and their clients

As mentioned above, sex workers are one of the vulnerable groups for which specific interventions are implemented. Most of the time, the interventions include their clients and their surrounding areas. The cost of such activities varies from one region to another and Walker (2003) pointed out that the World Bank estimated the costs of an intervention targeting sex workers to be $ 56 per HIV infection averted and $ 2.81 per DALY averted in India. These results are similar to those of Kumaranayake et al. (1998) who, using a mathematical modelling approach, found that a peer educator program in Cameroon cost about $ 55 per HIV infection averted. They examined also the cost of relative activities such as training of peer educators. They obtained the cost of $ 1479 per trained peer health educator, $ 125 per education section and $ 5.60 per person educated in group sessions. Despite the importance of such activities, little research has been focused on their evaluation and their results are almost the same as those mentioned above.

2.2.5 Voluntary counselling and testing

Voluntary counselling and testing (VCT) are also among the HIV prevention strategies widespread in every community. However, few researchers have tried to analyse their cost-effectiveness, maybe because it seems to be a necessary condition in every program. In fact, without counselling and testing, it will be difficult to appraise the real level of sero-prevalence. Creese et al. (2002) noted that the voluntary counselling and testing is higher and is around $ 400-500 per HIV infection prevented. In another study, the World Bank estimated the impact and cost-effectiveness of voluntary counselling and testing. The result, as mentioned by Walker (2003), showed that this intervention cost $ 206 per HIV infection averted and $ 10.32 per DALY averted. In another study, also reported by Walker (2003), researchers have analysed the cost-effectiveness of voluntary counselling and testing based on a hypothetical cohort of 10,000 people in Kenya and Tanzania. Their analysis reveals that the cost per HIV infection averted is $ 264 and $ 367 and that of DALY averted is $ 12.77 and $ 17.78, respectively, for Kenya and Tanzania. Though these results are quite similar to those of the World Bank, it is important to avoid generalisation since they comport many country-specific realities. However, their methodology can be applied in many other countries. More recently, Teerawattananon et al. (2005), focused their work on cost-effectiveness of voluntary counselling and testing, but here, they analysed its cost-effectiveness in combination with other interventions (especially drugs). Using a cohort of 100 000 pregnancies as a decision model, he measured their outcomes in terms of each case of infection averted. The results showed that one section of voluntary counselling and testing with AZT+NVP[1] cost $556 per case of HIV-infection averted and two voluntary counselling and testing with the same drugs cost $1266 per infection averted. Here the incremental analysis shows that trying to increase the amount of voluntary counselling and testing may increase output but is less cost-effective.

Many other HIV prevention strategies have been implemented all around the world. Among them, screening blood and promotion of blood safety, mass media campaigns and projects working with youth, have been the subject of many cost-effectiveness analyses. The remaining strategies such as harm reduction strategies among injecting drug users (IDUs), microbicides and female-controlled methods, vaccines and male circumcision lag behind, even though some have been implemented or are under clinical trial.

2.2.6 Harm reduction strategies among injecting drug users (IDUs)

Walker (2003) found a harm reduction project will cost $1.18 per person reached and $0.39 per disposable syringe distributed. He used a mathematical model to estimate the cost effectiveness of the project and realized that it will cost $71 per HIV infection averted. Kumaranayake et al. (2004) carried out another work focused on drug users in Belarus. In this study, they used a dynamic mathematical model to estimate HIV infection averted among IDU's and their sexual partners. Their results reflect that the cost per HIV infection averted within that community is $359. Moreover, their analysis shows that harm reduction activity among IDUs could be cost effective even in the case of

[1] Names of drugs

higher prevalence. Yet, little research of this kind is focused on Africa where the prevalence level is the highest in the world. The need for future research targeting vulnerable communities in Africa will then is obvious.

2.2.7 Microbicides and female-controlled methods

It is believed that preventive methods under control of women would lead to higher efficiency. Thus, microbicides and female condoms have been developed and their cost effectiveness is analyzed. Walker (2003) mentions that if female condoms were used during 12% of vaginal intercourse, it would cost $678 per HIV infection averted. He points out that another study showed that this cost may vary according to the level of risk of the woman. Using model techniques', the cost per HIV averted was estimated at $264, $963 and $2223 respectively for sex workers, 'high' and 'moderate' risk clinic clients in Nairobi. The development of such prevention strategies and their cost effective analyses are very important for developing countries, especially Africa, since the problem of gender seems to have a negative impact on the prevention of HIV from men to women. Research must thus be focused in this particular area.

2.2.8 Vaccines

Vaccines have been a matter of few cost effectiveness analyses because there is not yet an effective vaccine against HIV. Since the outcome cannot be measured precisely, only simulations are possible and little research is focused on it. However, the current progression of the infection requires great attention either from scientific or political levels to address the HIV pandemic. Another area recently mentioned as a new issue to deal with HIV infection is male circumcision.

2.2.9 Male circumcision

Though male circumcision is an old practice in many regions, it is only recently that this practice is seen as a probable HIV prevention strategy. Yet it is inadequately analysed by researchers. However, two major studies aimed at assessing the cost-effectiveness of this practice have revealed significant results. Kahn et al. (2006) carried out a randomized controlled intervention trial of adult male circumcision (MC) in South Africa for a generation of 1000 men. The authors developed a determinist cost and epidemiologic model to estimate their outcomes in terms of costs due to averted HIV infections and the expected benefit of male circumcision (HIV infections prevented) on the basis of the estimated HIV incidence in susceptible men and the reduction in that incidence due to male circumcision. In their analysis, they compared male circumcision to a situation of no intervention. Their results estimated the cost per HIV averted to be $181. But when adjusted for averted lifetime HIV medical costs (using a discount rate of 3%), the net savings is $2,411 per male circumcision. One positive aspect of their research is that it shows how cost-efficient male circumcision is, whatever the level of coverage. However, since their research is based on only one clinical trial we wonder if some cultural identities of the community in which the trial is carried out did not have effect on their results. Moreover, this type of intervention is not relevant for many communities; in West Africa, for example, male circumcision is a traditional obligation.

In their paper, Kalichman et al. (2007) explained to what extent the halting of three randomized controlled trials of male circumcision, based on interim results, was not a good decision. Kahn et al. (2006) also realized that that decision was not the best alternative. They argued that the results may not be so much related to male circumcision owing to four main reasons. First, they mentioned that the protection of male circumcision could be partially offset by the increase in HIV risk behaviour such as an increase in sexual partners or decrease in the use of condoms. Then they observed that the trial settings are far different from natural settings owing to ethical obligations (men in the trials received ongoing risk-reduction counselling and free condoms) and this may affect the results. Moreover, they suggested that since there is no evidence that circumcision increases or decreases the risk of HIV transmission by HIV-infected men, an epidemiological model of male circumcision should consider that dynamic. They defended their argument by stating that HIV-infected circumcised men will increase the risk of HIV transmission to their partners. Finally, they stated that circumcision likely reduces the risk of acquiring a non-HIV STI and may thus be partially responsible for the decreased HIV risk observed in the above-mentioned trials.

These two papers illustrate the stage of the debate on male circumcision as a cost-effective intervention to prevent HIV infection. Further investigations are expected to clarify the debate.

This review explored the available cost-effectiveness analysis on HIV/AIDS prevention strategies. It helps us to understand that the cost per HIV infection averted, cost per DALY averted or cost per QALY gained do not only vary from one intervention to another but also from one region to another as the level of sero-prevalence is of paramount importance. Even if the promotion of male condoms is widely accepted as being the best cost-effective intervention, its usage is a matter of controversy. Religion, tradition and even gender behaviour are among the factors that betray the promise of condom promotion. Thus, there is no universal cost-effective intervention in the fight against HIV/AIDS and every society has to find the best way to address the pandemic. Male circumcision is believed to yield a new hope but its efficiency remains to be proved.

2.2.10 Production Cost in the literature

Besides the above literature, which mainly focused on the cost effectiveness of HIV programmes, the following portion will examine cost analyses where cost of providing HIV prevention services were estimated. Unlike cost effectiveness analyses, studies using econometric models to predict costs of HIV prevention programmes are few (Johns and Torres, 2005). Though all these analyses deal with costs, they can however be classified in two different groups. The first, the most common, includes reviews that assess costs in a particular program in a specific area and at a given point in time (Kumaranayake and Watts, 2000; Creese, et al., 2002; Scotland et al., 2003; Walker, 2003). Among the latter, which examines how average costs may vary with some factors such as level of coverage, prevalence, location, time periods etc., the work of Guinness et al. (2005) is of paramount importance.

Production cost is a function of the cost of the combination of inputs and technologies used in the production process. As some inputs are fixed in the short run, economic theory posits that changes in the level of outputs may entail changes in average costs not only in the short run but also in the long run (Johns and Torres, 2005). Different aspects of the production costs of HIV/AIDS prevention programmes have been documented and have shown that the best way to assess changes in costs would be to collect data and analyze them in time series analysis. However, owing to the small size of available cost data on HIV interventions, non-parametric models have been widely used to estimate total, average and marginal costs for different activities (Pett, 1997).

Data from 34 HIV/AIDS interventions in sub-Saharan African countries have shown that the main driving factors of scaling-up prevention costs were the size of the population, the capacity constraints for low-programme strength countries, and the estimated number of higher-risk sexual acts (Kumaranayake and Watts, 2000). As for the costs of care and treatments, in addition to the above mentioned factors, HIV prevalence and the proportion of treatable STDs, as well as access to health infrastructure and the number of orphans, were also among the driving factors. The same study revealed that elasticity of prevention costs with respect to the size of the population is almost unitary while for the costs of care and treatment, the same elasticity is about 0.83.

A systematic review of costs of scaling-up health interventions conducted by Johns and Torres (2005) tries to identify factors that modify cost curves as coverage increases and to describe cost curves for different kinds of interventions and level of coverage. Though many articles were included in their research, few, however, dwelt with HIV/AIDS. They highlighted that different coverage levels and different settings lead to a change in average costs. Estimations based on econometric analysis have shown that in sub-Saharan Africa, there would be an increase in the average costs of curative and preventive HIV/AIDS programmes if the coverage rises to 25% of the population (Kumaranayake and Watts, 2000). According to their results, it costs more to provide care and treatments than to prevent. While average cost of prevention activities is only \$4.24, care and treatments cost on average, about 8 times more. Marginal cost of care and treatments is 7 times higher relative to prevention which is \$35.68.

For high-risk target populations such as sex workers, there are economies of scale as coverage increases. From a cost dataset of 78 state-funded HIV prevention projects, Guinness et al. (2007) built an econometric model to show that to be scale efficient, a project has to target between 1750 and 2000 sex workers and that a 5 fold increase in coverage level will lead to a 4 fold drop in average cost. Average costs are also influenced by local price variations, target group and the location of the project. Their analysis also reinforced the evidence that in HIV prevention projects, marginal cost rises with the level of coverage.

In other research, Guinness et al. (2005) used 17 case study HIV prevention projects in Southern India to ascertain the production costs. The cost data collection was uniform across the projects due to the use of guidelines of best practice which prescribe not only the key components of the targeted HIV prevention projects, but also the structures of the budget. Even though they collected financial costs, it is full economic costs that were used in the analysis. Many theoretical models were explored to identify and explain the causes of average cost variations. Relationships between costs and scale were also tested. The authors found that costs of STI treatment vary with different methods of management, and that personnel and building costs are the most important fixed costs, though these fixed costs vary from 13.5% to 41% of total costs. With non-parametric tests, they showed that between coverage, on the one hand, and funding agency, budget, and literacy rate on the other hand, there are significant relationships. Unlike all expectations, they did not find any relation between volume and coverage of outputs except in the case of STI treated. They have also provided evidence of variation in cost per unit of volume of services ranging from US$62.5 as cost per STI treated to US$26.3 as cost per first contact with the target group. Their data has shown that a quadratic model fits better than a linear form to assess the relationship between total costs and coverage. There results overall provide some sound insights on how HIV prevention programs vary with different level of outputs and outcomes but their data do not allow them to assess the effect of experience on reduction of costs, which can only be done by panel analysis.

This study will not only assess the cost of providing HIV preventive activities to targeted groups, here FSW in Benin, but it will also try to analyze how these costs vary with HIV prevalence rate and with time.

2.3 CONCLUSION

The general concern given to HIV/AIDS especially in developing countries has led to the development of many preventive and treatment activities targeting vulnerable groups in order to curb the pandemic. Cost and cost-effectiveness analysis of HIV prevention programmes have been documented in many research studies to ascertain the concepts of scale, scope, and the shape of the cost function. While this research did deal with cost estimation and factors that can influence total and average costs of existing activities, there is less documentation on how costs vary with time. Several recent studies based mainly on data from areas with high HIV prevalence showed a wide gap of cost-effectiveness between different strategies.

The paucity of consistent and longitudinal cost data has entailed the use of nonparametric models in the estimation of total, average and marginal costs of HIV/AIDS prevention and treatment projects. On the topic of prevention and treatment costs, econometric studies do exist; however, none has included a time series dimension in the analysis.

CHAPTER 3 BACKGROUND AND METHODOLOGY

The previous chapter provided an overview of economic analysis and reviewed the literature on cost-effectiveness analyses of most HIV/AIDS preventive activities. Reviews on cost analyses have also been explored and gave more insight on the cost function. This chapter aims to provide the background information on the AIDS 3 project in Benin and the method used to undertake the cost analysis of the HIV/AIDS prevention program targeting female sex workers from 2001 to 2005. The first section sets out the background of the project. The second presents the methodology used to undertake the cost analysis of the AIDS 3 project.

3.1 BACKGROUND ON AIDS 3 PROJECT

The sheer increase of the prevalence of HIV has worried both scientists and governments and has led to the design and implementation of many preventive programmes among which is The West Africa Aids Program (AIDS) that covered many African countries including Benin. The implementation of this AIDS program was done through three main steps which are AIDS 1, AIDS 2 and AIDS 3; each of these was designed based on the results of the previous phase. This thesis focuses on the last phase of the program; and will first present the historical context and motivation of the AIDS 3 program, then its objectives and finally the way it was delivered.

3.1.1 Historical Context and Motivation of AIDS 3 project

As in almost all West African countries, female sex-work is the most common form of sex-work in Benin. Female Sex-Workers (FSW) can be classified in three main groups depending on the type of commercial sex work they are practicing; it can be either overt or covert sex-work or casual, gift-related, affairs.

The overt sex-work, also known as formal sex-work, is mainly practiced by women from neighbouring countries, especially Ghana, Nigeria and Togo. They identify themselves as Sex-Workers and on average, they are older than women of covert sex-work and most of the times work in the same location. They live in groups in "closed houses" in different areas and use their rooms as passing rooms where they practice their activities. There is no fixed time for their activities; however, evenings are their busiest times.

Women of covert or clandestine sex-work are generally young and rarely identify themselves as Sex-Workers. They are most of the time from the community in which they are living or from the surrounding area. As such, many of them are Beninese and they only work during evenings after their formal professional activities (apprentices, stall sellers, hairdressers, students, etc.). Unlike overt FSW who can have many sexual partners within a day, covert FSW rarely have more than one client a night. Hardly do they work where they live. Most of the time, they wait along streets in specific areas of the town trying to attract the attention of potential clients with whom they will spend the night.

Though both groups are doing the same activity, their sexual behaviors are not alike. The use of condoms is relatively high among overt FSW. This is the result of many preventive programs and regulations that women themselves and/or the owners of the houses have set. Covert FSW, however, have a low usage rate of condoms with their clients (West Africa HIV/AIDS Epidemiology and Response Synthesis, 2008). While covert FSWs have partners who may not know about their clandestine sex-work, overt FSWs partners, by contrast, are used to visiting their girlfriends in their workplace.

If we include sexual relations for gifts in the definition of sex-work, then it will be apparent to consider a third type of sex-work. In fact some young girls, who engage themselves in sex with a man most of the time older than them, barely consider such relations as sex-work. Unlike covert and overt FSW, they rarely look directly for clients; however, they tend to have more concurrent sexual partners.

Except in Cotonou where many preventive programs targeting FSWs have been implemented, the prevalence of HIV has markedly increased in other provinces of the country as shown in table 1. From 3.3% in 1986, the infection rate reached 55.2% in 1999 (Projet SIDA3. *Plan de Mise en Oeuvre*, 2001). In 1999, heterosexual transmission represented 90% of the transmission channel of the infection among FSWs.

In Cotonou, while the HIV prevalence among FSWs working for more than 5 years is 43.3%, about 26.2% of FSWs who are practicing less than 6 months are already infected. Lowdes and al. provide the evidence that FSWs are the centre by and through whom HIV and other STI spread in the general population. Other research confirms this evidence and has shown that interventions undertaken during AIDS1 and 2 have averted 50% of HIV infection averted among FSWs and about 33% among the general population (op cit). This has fostered the design and implementation of the third phase of the West Africa Aids Program.

Table 3.1: HIV Prevalence among FSW in 1993, 1996 and 1999

Provinces	*1993*	*1995-96*	*1999*
Atlantique	-	-	60.0
Atakora	15.2	38.4	56.4
Borgou	30.9	43.5	45.1
Mono	58.0	85.4	49.0
Oueme	41.2	58.1	62.7
Zou	26.8	50.0	58.3
Cotonou	53.3	49.4	40.7

Source: PNLS (Pogramme Nationale de Lutte Contre le SIDA)

3.1.2 The main objectives and the funding of the program

The AIDS3 program is a program in support of the National Program of Fight against AIDS. It strengthens strategies that are targeted. Basically the project covers a wide geographic area and targets high risk groups within a gender perspective. Female Sex-Workers as well as their clients, partners and surrounding communities are included.

In the same way as the first and the second phases of the West Africa Aids Program, the AIDS3 project is financed by the Canadian International Development Agency (CIDA) through CHA (*Centre Hospitalier Affilie Universitaire de* Quebec), based in Quebec. The executive board is composed of a local administration office that carries out the program though many local health centres and Non Governmental Organisations (NGOs).

The goals of AIDS3 is to contain and possibly to reduce the spread of HIV/AIDS and other STI among high risk groups, namely FSW (both overt and covert) and their surrounding communities. AIDS3 is intended to carry out the following four activities:

- *Follow up of STI in Sex-Workers' environments*
- *Follow up of STI in other risky environments*

- *Strategic Management of STI medicines*
- *Collaboration with private drug stores*

Not all locations, however, are included in the AIDS 3 project. Only cities and areas with high prevalence of HIV/STI were considered a priority. Thus Cotonou, Porto Novo, Abomey-Bohicon, Parakou and Malanville were targeted owing to the level of sex-work in these communities. However due to the availability of new epidemiological data, other cities have been gradually included in the project two or three year later.

3.2 METHODOLOGY

This section presents first the study setting of the sites included in the analysis and the rationale behind their choice. Second it develops data collection and cost computation tools. A detailed description of cost computation based on the ingredient based methodology is provided and the way costs are allocated to different activities is shown, and average cost per activity is used as an indicator for comparing costs. The last section describes the sensitivity analysis which helps to assess cost variation across intervention and study sites.

3.2.1 Study Setting

The AIDS 3 Project included a total of 7 sites. However we only include four selected sites in this study owing to availability of consistent and relevant data. Moreover the mapping of commercial sex work and the census of female sex workers in 2004 revealed that DIST (2711), Parakou (1021) and Porto-Novo (864) were the top commercial sex work areas in term of number of FSWs. Bohicon was included in the analysis to capture the cost of starting up a prevention activity with a lower level of activity. In addition, data for this site are consistently available.

3.2.1.1 CSC Bohicon

Centre de Sante Communautaire (CSC) *de* Bohicon is a public health centre located in the city of Bohicon which is 10 kilometers away from Abomey, the capital city of the province of Zou. Bohicon has the advantage of being at the joint point of three major traffic roads, one from Cotonou (Southern Road), the second from Parakou (Nothern Road) and the third from Abomey. As a commercial city, Bohicon hosts many transportation and trade activities which lead to the development of sex and sex-related activities.

CSC Bohicon provides a wide range of health services to the general population with particular emphasis placed on services for FSWs and their partners. Among these services are regular screening for STI and HIV, free treatment of STIs, monthly check-up, visits to the FSWs in their work places, FSW condom distribution, and the referral of HIV positive persons to a specific health centre for treatment and care. Sexual partners of FSW also received free counseling and screening of STI and HIV; but they paid a subsidized price for their treatment. Field workers of SCS Bohicon paid regular visits to FSW in their work place either to supply them with condoms or to advise them.

Basically, field workers visited sites of sex workers and referred them to the health centre. When FSWs arrive at the clinic, the set of activities described above is proposed to them. The process is done with the consent of the patient and upon her agreement; she is regularly visited by field workers. FSW were always given the advice to come with their partners or to refer their clients to the health centre.

3.2.1.2 DIST Cotonou

Dispensaire des Infections Sexuellement Transmissibles (DIST) is a semi-public health centre located in the heart of Cotonou, the biggest city of Benin. The geographic position of this health centre gives it two great advantages. First, the centre itself is hosted in the greater public health centre (CSCOM-Cotonou1) open to the whole public. This strategic position reduces the risk of stigmatization FSW may face if they were the sole group frequenting it. Second, this greater health centre is in the biggest commercial centre of the city, and is about 3 km away from the largest site of open sex work. DIST is specialized in the treatment of Sexually Transmitted Infections. Though most of the activities in DIST targeted Sex Workers (FSWs), specific activities were however designed for other groups such as partners, and regular or irregular sexual partners of FSWs.

Two types of activities were implemented at DIST; hospital based activities and field activities. Hospital based activities included not only health services such as screening, counseling, treatment of STI, etc.; but also regular meetings of FSWs peer educators with field workers. During these meetings, special training and advice were provided to the peers as to how they can empower their fellow FSW within the spoke of their activities. This activity is intended to reduce the vulnerability of FSWs by allowing them to have negotiation power.

As for field activities, they can be divided into two kinds, depending on the number of people involved. There are individual field activities where field workers and/or peer educators contact FSWs for individual counseling and advices. The second kind of activities targets groups of people in their work place through video projections. The main objective of this latter kind of activity is to sensitize individuals or groups of individuals who may never have time to visit DIST owing to their professional activities. The majority of these were apprentices; sometimes, free screening for STI was provided to those who consented.

3.2.1.3 ONG Solidarité (Porto-Novo)

ONG *Solidarité* is a Non Governmental Organization which was created to provide assistance and health care services to people living with HIV. This NGO is located in Porto Novo, the capital city of BENIN, and hosts a clinic where different health services are provided. As one of the rare clinics to provide HIV related health care in Porto-Novo, ONG *Solidarité* receives patients from different suburbs. Unlike DIST, the location of ONG *Solidarité* is easy to access in great confidentiality. This specific characteristic reduces the risk of stigmatization FSWs may face when trying to attend the clinic. The major activities for the clinic are counseling, screening of STI, free treatment of curable STI, and training of peer educators. Field workers also project HIV related movies in different places in the city to sensitize the population and to inform them about the opportunity for free screening. They often visit FSWs to advise them.

3.2.1.4 OSV Jordan (Parakou)

OSV Jordan is an NGO located in Parakou, a northern city of BENIN. The centre hosts a clinic were different groups of people can receive health care. However, particular attention is paid to FSWs and people living with HIV. Like ONG *Solidarité*, OSV Jordan's services reach different groups of people from very wide areas, mainly the suburbs FSWs of Parakou. Access to OSV Jordan does not lead to any form of stigmatization for FSWs, since women of different walks of life do frequent it for diverse reasons. Eventually, basic STI care (counseling and screening of STIs, treatment of curable STI) is offered to all patients. However, these services are only offered at no cost to FSWs. Training of peer educators are provided at OSV Jordan, and projection of films and sensitization of the population are among the activities of field workers. Field workers also pay regular visits to FSWs at their work place, and give them advice on responsible sexual behavior.

3.2.2 Data Collection and Cost Calculation

The data collection framework is designed to allow not only the collection of financial cost data, but also the computation of economic costs. It will also help in the identification of the main factors that have significant influence on costs and allow the gathering of output and outcome data, and the assessment of the relative efficiency of different delivery modes.

3.2.2.1 Data Collection

As the AIDS-3 project ended before this evaluation, cost data has been collected both retrospectively and prospectively. First, we spent a week in Quebec City to review all data sources such as activity reports and financial statements and then spent three months (from June 2008-August 2008) in Benin to gather complementary data.

During the collection of the retrospective data, all financial statements of “Projet SIDA 3” were read and financial information on full and part-time staff was gathered and put in an Excel file according to the standardized guidelines (Kumaranayake et al., 2000). Capital and recurrent costs such as salaries, buildings, vehicles and operating costs, which were related to the project, government and NGO providers involved in delivering activities to targeted groups, were also gathered. An exhaustive collection of activities implemented year after year in each site of the project was recorded.

In addition to this, field data was collected in order to allow the assessment of economic costs. During the field data collection, some former staff of the project were interviewed in order to ascertain resource allocation to different activities undertaken during the implementation of the project. No formal questionnaire was used; however, efforts have been made to ensure that all information was collected with minimal bias. Information on how each staff person spent his time between activities was then gathered; and the allocation of resources between services provided and activities performed was described. One staff person for instance, can be involved in the production of several services, and one supply item can be used to provide different services. Hence, time of staff is shared among activities, and cost of items is allocated to activities in proportion to their contribution. Following this above mentioned process, information on all 15 health centres involved in the project were collected for the period 2001 to 2005, the period during which the project was implemented.

Interest rate and inflation information were retrieved from the World Development Indicator (WDI) database, and the prices of all inputs were collected. The average yearly official exchange rate between the United States Dollar ($US) and FCFA was retrieved from the website of BCEAO (The Central Bank of the West African Economic Community) for the years 2001 to 2005.

An informal interview with the previous field activities coordinator helped us to have access to the monthly activity reports of all the 15 sites covered by the project. From these reports, we retrieved the range and nature of all activities performed in each site within the scope of the project.

In each site, all activities undertaken were assessed from their very beginning to their final stage. This allows the inventory of human, financial and supplies resources required to carry out all activities. For each of them, the target group was clearly identified and efforts were made to specify and enumerate the exact number of activities done month after month. The size and the nature of the population covered are documented. HIV prevalence rate and characteristics of the targeted group are reported.

The delivery mode in each site was identified and changes over time were noted. Each intervention can be classified as a combination of field work activities, health centre based activities or administration support and the participation weight of each of these types of activities is appraised.

For interventions targeting several groups at a time, resources were allocated in proportion to the number of people of each target group reached.

3.2.2.2 Costing Computation

After the collection of cost data and output information, cost per activity and per site is computed by using an ingredients-based costing methodology to consider both the financial and economic costs. This section will encompass the main components of the cost computation and the basic interpretation behind each component.

Costs are assessed from the perspective of the provider. For each activity, both financial and economic costs of different inputs are evaluated. While financial costs represent actual expenditure on goods and services purchased, economic costs include the estimated value of goods or services for which there were no financial transactions or where the price of the good did not reflect the cost of using it productively elsewhere. Economic costs take into consideration the value of donated resources as well as differentials between expatriate and local staff. Economic costs were estimated through discussion with project staff and observation at the project sites of the resources used. All input resources are classified as two types of costs: capital costs and recurrent costs. Table 3.1 presents the classification of the main input costs.

Table 3.2: Costs Classification by Main inputs

Capital Costs	*Recurrent Costs*
Buildings	Personnel
Equipment	Supplies
Vehicles	Vehicle operating and maintenance
Consultancies (non-recurrent)	Building operating and maintenance
Trainings	Consultancies (recurrent)
	Other (including media fees)

Source: Kumaranayake et al., 2000

Capital costs include all items expected to last longer than a year, and an interest rate of 10% is used to annualize their value as a straight-line depreciation over their life span. Buildings are expected to last for 30 years while most of the equipment and vehicles are assigned either 5 or 10 years depending on how they have been used. Training, the impact of which is supposed to last for more than a year, was also treated as a capital cost. Consultancies included in capital costs are consultancies which have led to an increase in the human capital of the staff of the project.

Recurrent costs include the cost of staff, supplies, vehicles and buildings maintenance and operating costs as well as recurrent consultancies and other costs such as communication fees. Two types of administrative staff are identified: permanent staff and part-time staff. The cost of permanent personnel is proportionally allocated to each activity depending on the contribution of each staff in the implementation of a given activity. For part-time staff, their salaries and other remuneration are allocated to activities on which they worked or for which they have been paid with a view on the time spent on each activity. Where possible, costs for the start-up of the project are included. Supplies are all items used either in the health centre or during field work. Many types of supplies are considered, ranging from health services supplies (cotton, alcohol, needles, thermometers etc.) to field materials such as information leaflets, and condoms distributed, film projection materials, etc. Vehicle operating and maintenance costs take into account all costs related to the fuelling, purchase of spare parts and the repair of vehicles, while building operating and maintenance costs include costs of renovation (painting, roof repairing, air conditioning, cleanings etc.). Some consultancies usually start and end within a given period and are quite often regular (mapping, annual surveys, etc.). Such consultancies are classified as recurrent consultancies and their costs are included in recurrent costs.

3.2.2.3 Output evaluation

Volume of activities performed and level of targets reached are used as a proxy for output and outcome indicators respectively. Due to the wide range of activities carried out during the implementation of the AIDS 3 project, several output and outcome indicators are identified, namely, the number of male and female condoms distributed, the number of patients to whom counseling was provided in health centres, the number of awareness movies projected, the number of follow-ups done, the number of visits paid to target groups, the number of diagnoses performed, and the number of STI treated. However, due to the lack of consistent and steady data, only the following four output indicators are relevant to be used: number of follow-ups done, number of visits paid to target groups, number of diagnoses performed, and the number of STI treated.

Follow-up activities are ones requiring the presence of a person from the target group, here a FSW, in a health centre and the performance of a regular check-up done by a doctor and all visits of a field worker or a group of field workers to a FSW or a group of FSWs with the aim to give them advice or counselling related to prevention and sexual risk-free behavior. By diagnosis performed, we refer to diagnosis done by a doctor to screen any kind of sexual infections; and STIs treated are STIs that have been diagnosed and actually treated. It is worth mentioning that STI treated are not necessarily STI healed. Though treatments were provided to all patients who have some case of infection, there was no certitude that all patients would be healed.

3.2.2.4 Estimation of Cost per Activity

The total provider costs are estimated using a combination of an ingredients-based costing methodology and a step-down methodology. With ingredient-based costing, quantities of resources are multiplied by their respective prices to determine the cost of resources while with step-down methodology, total costs are allocated to activities through an ingredient matrix.

The matrix representation of the total cost computation takes the following form:

$$Cost\ Matrix = Input\ Matrix \times Coefficient\ Matrix$$

Where:

$$Input\ Matrix = \begin{bmatrix} \begin{pmatrix} b_{1,1}^1 & \cdots & b_{1,m}^1 \\ \vdots & \ddots & \vdots \\ b_{15,1}^1 & \cdots & b_{15,m}^1 \end{pmatrix} \\ \begin{pmatrix} b_{1,1}^2 & \cdots & b_{1,m}^2 \\ \vdots & \ddots & \vdots \\ b_{15,1}^2 & \cdots & b_{15,m}^2 \end{pmatrix} \\ \vdots \\ \begin{pmatrix} b_{1,1}^5 & \cdots & b_{1,1}^5 \\ \vdots & \ddots & \vdots \\ b_{15,1}^5 & \cdots & b_{15,1}^5 \end{pmatrix} \end{bmatrix}$$

$$Coefficient\ Matrix = \begin{bmatrix} \alpha_{1,1} & \vdots & \alpha_{1,4} \\ \alpha_{2,1} & \vdots & \alpha_{2,4} \\ \vdots & \vdots & \vdots \\ \alpha_{m,1} & \vdots & \alpha_{m,4} \end{bmatrix}$$

$$Cost\ Matrix = \begin{bmatrix} \begin{pmatrix} c_{1,1}^1 & \cdots & c_{1,4}^1 \\ \vdots & \ddots & \vdots \\ c_{15,1}^1 & \cdots & c_{15,4}^1 \end{pmatrix} \\ \begin{pmatrix} c_{1,1}^2 & \cdots & c_{1,4}^2 \\ \vdots & \ddots & \vdots \\ c_{15,1}^2 & \cdots & c_{15,4}^2 \end{pmatrix} \\ \vdots \\ \begin{pmatrix} c_{1,1}^5 & \cdots & c_{1,4}^5 \\ \vdots & \ddots & \vdots \\ c_{15,1}^5 & \cdots & c_{15,4}^5 \end{pmatrix} \end{bmatrix}$$

The Input Matrix is a 5×1 block matrix where each block is a $15 \times m$ matrix that contains the input costs of a given year, with 15 representing the number of health centre and m the number of inputs. The element b_{ij}^k represents the cost of the input i in health centre j during year k.

The Coefficient Matrix is a $m \times 4$ matrix where α_{ij} is the corresponding %age of input i allocated to the implementation of activity j.

In the Cost Matrix, c_{ij}^k is the total cost of activity j in year k in the health centre i.

The average cost per outcome is calculated using output measures. Output measures are compiled directly from the intervention as described above and are related to the efficient delivery of different components of the intervention. With regard to the outputs, the following four average costs are calculated: average cost per follow- up, average cost per diagnosis performed, average cost per visit and average cost per STI treated. In each site, the average per activity is obtained by dividing the total cost of the activity by its volume. Hence, we obtain the Average Cost per Activity per health centre and per year which will be used for analysis of variation. Cost profiles will also be explored to reveal the share of every cost component with respect to the total cost in each health centre.

3.2.3 Analysis of Variation

The previous section allows the computation of cost per activity per site and per health centre. The analysis of variation will use estimated cost data to see how average costs per activity vary within and between health centres. The sections of this analysis will include first the assessment of relation between coverage and volume of clinic based activities, then average costs variation analysis.

3.2.3.1 Relation between Coverage and volume of activities

In HIV/AIDS prevention strategies, field workers and peer educators are assumed to be the best way to contact FSWs in their working places. Hence follow-up activities are widely developed to increase visits of the target population in health centres where adequate care will be provided to them. The total number of follow-ups done by field workers will be used as an indicator of coverage while the number of visits of FSWs to health centres will be used as the volume of clinic based activity. To see if there is a relation between these two indicators, a non-parametric test is used, namely a Spearman rank correlation coefficient. The null hypothesis is that there is no relation between coverage and volume of activities.

Since activities included in this analysis have the same target group, then comparison of coverage on the one hand, and volume of activity on the other hand, can be made between health centres. Yet, the same level of coverage in two different sites, does not necessarily mean that these two sites will have the same results (volume of activity), and many variables can explain this difference. Assuming that there is homogeneity in field work activities, the level of prevalence is considered as the main factor that can explain divergence of results between health centres. The higher the prevalence rate, the higher the return of field activities. A t-test is run so see how prevalence rate and location may affect the ratio between volume and coverage. This ratio (volume/coverage) has the advantage of cancelling out the large gap between the sizes of activities across health centres and gaps related to the size of the population target group in each location.

3.2.3.2 Cost variation analysis

An average cost variable for each specific activity is compared with the corresponding scale variable across health centres and through years. The quantity of data collected does not allow the use of panel data estimators. Hence, scatter plots are used first to explore the relation between the two variables, and then non-parametric methods are used to scrutinize the same relationship. This approach was previously used to assess the same relation in the literature (Guinness, 2005).

Though many factors can explain variations, only the effects of scale variables, location, and the prevalence rate on average cost variables are analyzed. The impacts of these explanatory variables are assessed by two tests. First, Spearman rank order correlation coefficient tests are done to find whether there is a relationship between average cost and scale. The null hypothesis is that there is no relationship between average costs and scale variables. Then t-tests are performed to see how prevalence and location may affect averages costs.

3.3 CONCLUSION

This chapter had the goal to give a brief summary of the AIDS3 project, an overview of its aims and achievements, and the methodology to carry out the cost analysis. The background information of the project revealed that FSW were the targeted group of the project and that many activities were developed to address their needs. Though many sites were in the project at its end, all did not start at the same time and disaggregated data are not consistently available for all sites. Based on the cost methodology, only four sites were included in the analysis. Ingredient-based analysis based on retrospective data collection helped to develop the computation matrix of both the total and the average costs of each activity.

The paucity of data forced us to give priority to the use of non-parametric tests to ascertain the relation between average cost and scale variables on the one hand, and on the other hand, the relation between average cost and HIV prevalence and location.

CHAPTER 4 RESULTS

The previous chapter presented an outline of the approach to costing, the different tools used for data collection and a summary of the data collected. This chapter aims to present the results of the cost analysis of the AIDS 3 project following the methodology presented in the previous chapter. To meet this objective, we describe briefly specific activities done and services provided to FSWs in the four health centers included in the study. In the second section, we present cost profiles and estimates of average cost per activity. The third section provides an analysis of the relation between coverage and volume, and the last section gives the results of variation and sensitivity analysis.

4.1 Documentation of Specific Activities

Specific activities have been provided not only to FSWs but also to other groups of vulnerable people such us their regular partners in all the health centres included in the project. Though the nature and the method of delivery of these services do not vary much, the range changes from one site to another depending on the setting and the number of clients and staff involved.

4.1.1 Summary of Activities

During the implementation of the project, different activities were carried out depending on the target group and the geographic area. These activities included mapping of commercial sex work areas, follow-up of FSW, screening and treatment of STIs, training of peer educators, distribution of condoms, focus groups, information sessions on gender equality and empowerment.

4.1.1.1 Follow-up

Follow up refers to a site visit to FSWs in their working environment, FSW mainly carried out by field's workers and focus group moderators. During follow-up, risk information on STI was provided to FSWs and most of the time they were given condoms at no cost. Table one shows the number of follow-up visits provided per year and per site across the clinics.

Table 4.1: Number of follow up per clinic and per year

Areas	*2001*	*2002*	*2003*	*2004*	*2005*	*Total*
Cotonou	343	732	994	926	1272	4267
Porto Novo	51	103	147	287	618	1206
Abomey-Bohicon	7	35	46	200	711	999
Lokossa	2	51	26	-	-	79
Parakou	37	90	64	337	1039	1567
Kandi	-	-	-	161	288	449
Malanville	-	-	-	232	279	511
Total	*440*	*1011*	*1277*	*2143*	*4207*	*9078*

Source: Final Report, AIDS 3.

4.1.1.2 Counselling

Counselling on HIV preventive sexual behaviours were provided to FSWs and other persons who visited the clinic for any kind of health problem. Eventually the proportion of FSWs and their partners (either regular or irregular) is greater than that of other groups especially at the DIST Cotonou clinic which is specialized in the treatment of STI. Table 4.2 presents the number of counseling visits across the clinics between 2001 and 2005.

Table 4.2: Number of Counseling visits on HIV preventive sexual behaviours per clinic per year

Areas	*2001*	*2002*	*2003*	*2004*	*2005*	*Total*
Cotonou	520	1397	2534	2357	2831	9639
Porto Novo	54	216	502	743	1083	2598
AbomeyBohicon	7	108	136	562	1653	2466
Lokossa	2	81	27	-	-	110
Parakou	51	306	205	642	1784	2988
Kandi	-	-	-	401	736	1137
Malanville	-	-	-	727	722	1449
Total	*634*	*2108*	*3404*	*5432*	*8809*	*20387*

Source: Final Report, AIDS 3.

4.1.1.3 Screening for HIV and Other STIs

Screening for STIs is systematically done in all selected areas if the patients present some symptoms of STI including HIV. The results are shown in Table 4.3.

Table 4.3: Number of Diagnostic Screening for STIs per area and per year

Areas	*2001*	*2002*	*2003*	*2004*	*2005*	*Total*
Cotonou	216	655	1207	1106	1660	4844
Porto Novo	27	133	153	243	675	1231
Abomey-Bohicon	3	134	208	734	1772	2851
Lokossa		91	37			128
Parakou	37	222	111	454	1163	1987
Kandi	-	-	-	303	563	866
Malanville	-	-	-	440	459	899
Total	*283*	*1235*	*1716*	*3280*	*6292*	*12806*

Source: Final Report, AIDS 3

4.1.1.4 Treatment of STIs

After the screening, treatment is provided to every FSW presenting with STI symptoms. In addition to treatment of STIs, clients are provided with counseling on risky behavior.

Table 4.4: Number of STIs treated per area and per year

Areas	*2001*	*2002*	*2003*	*2004*	*2005*	*Total*
Cotonou	181	523	979	878	1283	3844
Porto Novo	23	110	142	217	569	1061
Abomey-Bohicon	2	82	115	392	1214	1805
Lokossa		57	25			82
Parakou	31	162	83	355	929	1560
Kandi	-	-	-	237	501	738
Malanville	-	-	-	371	344	715
Total	*237*	*934*	*1344*	*2450*	*8188*	*9805*

Source: Final Report, AIDS 3.

Owing to the paucity of the data collected, only four zones, namely, Cotonou, Porto-Novo, Abomey-Bohicon, and Parakou are the subject of further analysis. The cost analysis is narrowed to these four areas. Moreover, only one health centre in each of these areas will be subject to analysis, again owing to lack of cost information in the other health centres.

4.1.2 Brief Comparison of activities between Health Centre

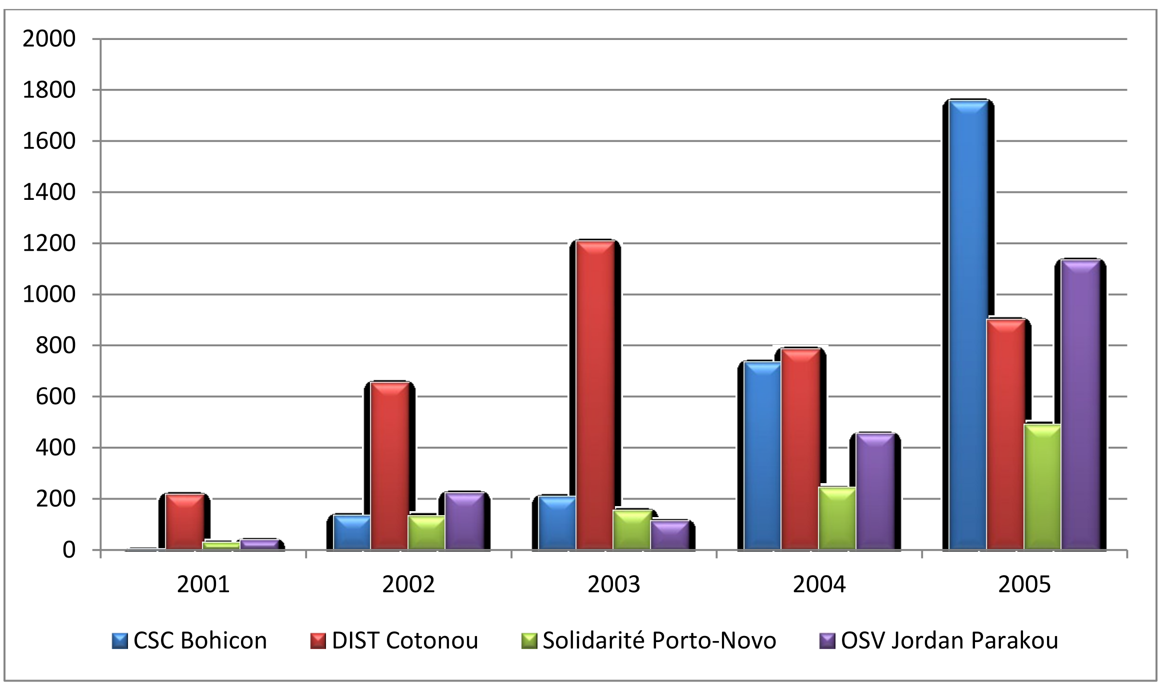
The volume of activities is unevenly distributed across the four study sites. However, from 2001 to 2005, there was a general increase in the scale of activities and services provided to FSW and their partners in the health centres. Despite the similarity of activities in study sites, there is variation in their volumes over time.

4.1.2.1 Diagnostic testing for STIs (Diagnosis)

During the implementation of the project, there is approximately 10% difference between the levels of diagnosis performed in the study sites. DIST performed about 39.19%, followed by CSC Bohicon (29.53%), and OSV Jordan (20.38%). Only 10.9% of the total diagnosis is done at ONG *Solidarité.* However as shown in Figure 4.1, there is great variation over time.

Between 2001 and 2005, the number of diagnosis performed in DIST was more than 57% of the total volume, except in 2004 and 2005 where it was respectively 35.4% and 21.02%. DIST is surpassed in diagnosis by CSC Bohicon and OSV Jordan only at the end of the project, when the level of activity in these two latter health centres rose respectively from 33.12% and 20.49% in 2004 to 41.04% and 26.47%.

Figure 4.1:Evolution of Diagnosis per Health Centre

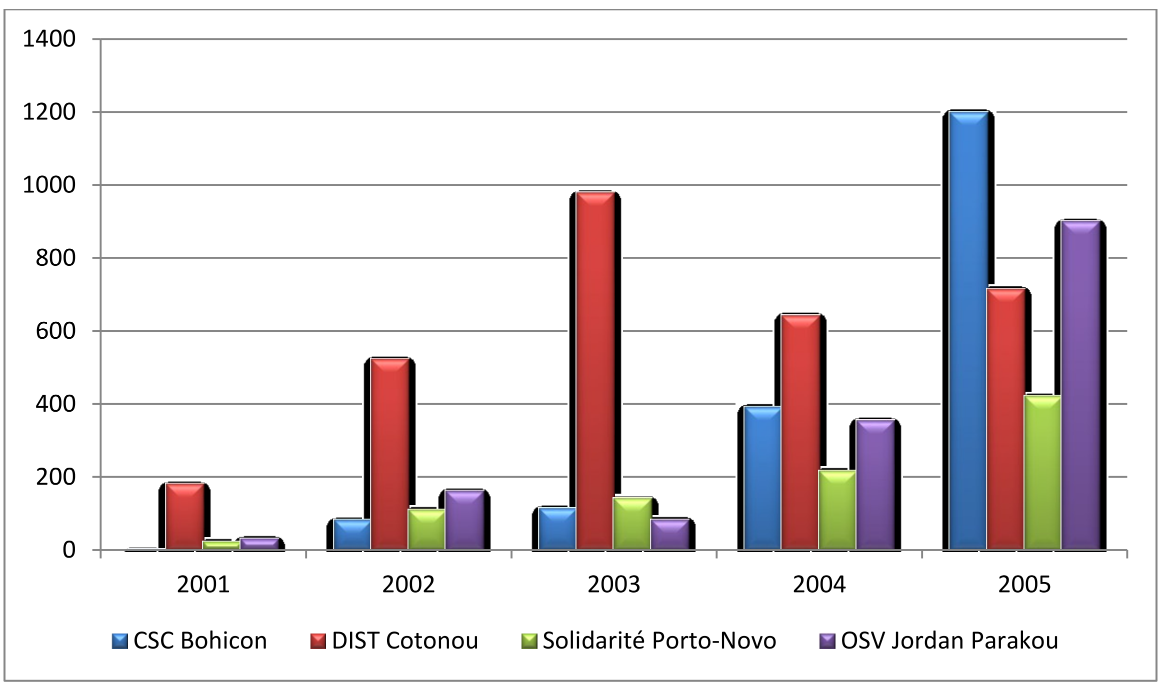


The level of diagnosis done steadily increased at CSC Bohicon and ONG *Solidarité*, but the highest increase in diagnosis is seen in the former health centre where it was only 1.06% the first year of the project. In ONG *Solidarité*, the increase was moderate, starting at 9.54% in 2001 and rising to 11.47% in 2005.

4.1.2.2 Treatment of Sexually Transmitted Infections

The volume of STIs treated at DIST during the project represents 41.78% of the total treatment services provided in the facility, followed by CSC Bohicon (24.61%) and OSV Jordan (21.05%). The remaining patients with STI (12.56%) were treated at ONG *Solidarité.* Figure 4.2 reveals the difference in evolution and level of activity year after year in between the health centres. During the first three years of the project, the number of people with STI treated increased in all the health centres.

Figure 4.2:Evolution of STI treated per Health Centre

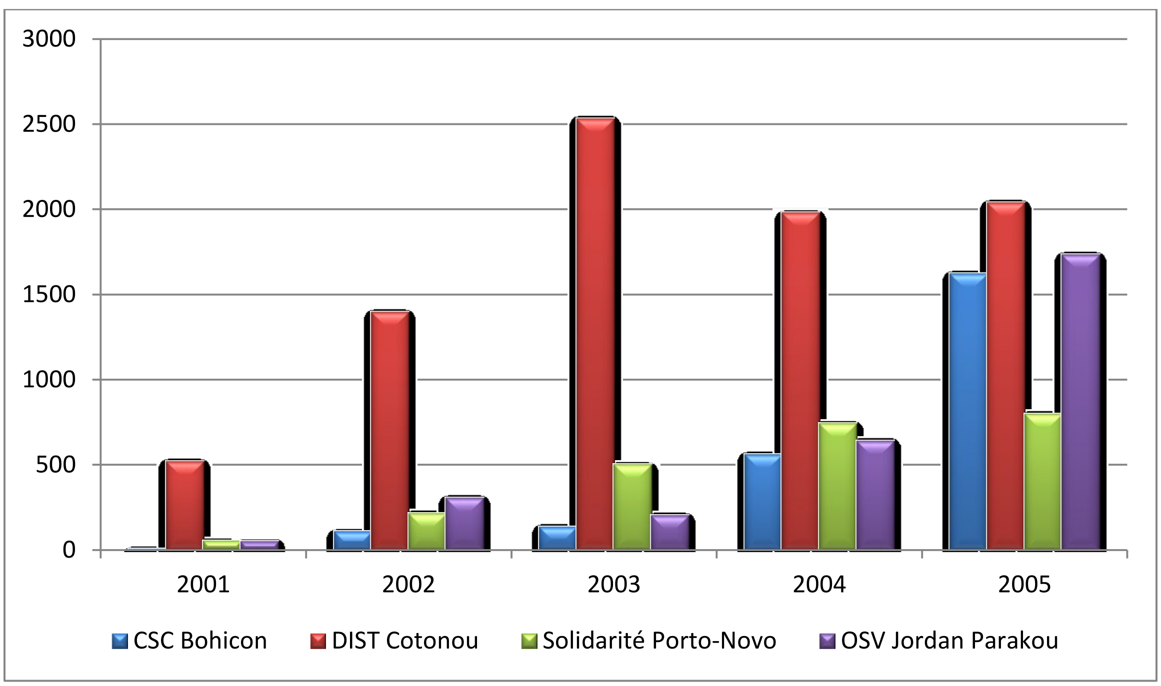


DIST alone has treated more than 59% of the STI between 2001 and 2003. This percentage fell however from 74% in 2003 to 40% in 2004 and 22.08% in 2005. In the remaining health centres, the treatment of STIs constantly increased through the implementation of the project. In 2005, the volume of STIs treated was even greater at CSC Bohicon and OSV Jordan than at DIST; 37.06% and 27.83 % respectively. There was a slight increase in the proportion of STI treated at ONG *Solidarité*; 9.70 % and 13.03% respectively in 2001 and 2005.

4.1.2.3 Visits

During the implementation of the project, half of the visits were realized by the DIST (52.14%) health centre. Figure 4.3 shows that the total number of visits made to FSWs were higher at the DIST as compared to the other health facilities.

Figure 4.3:Evolution of Visits per Health Centre



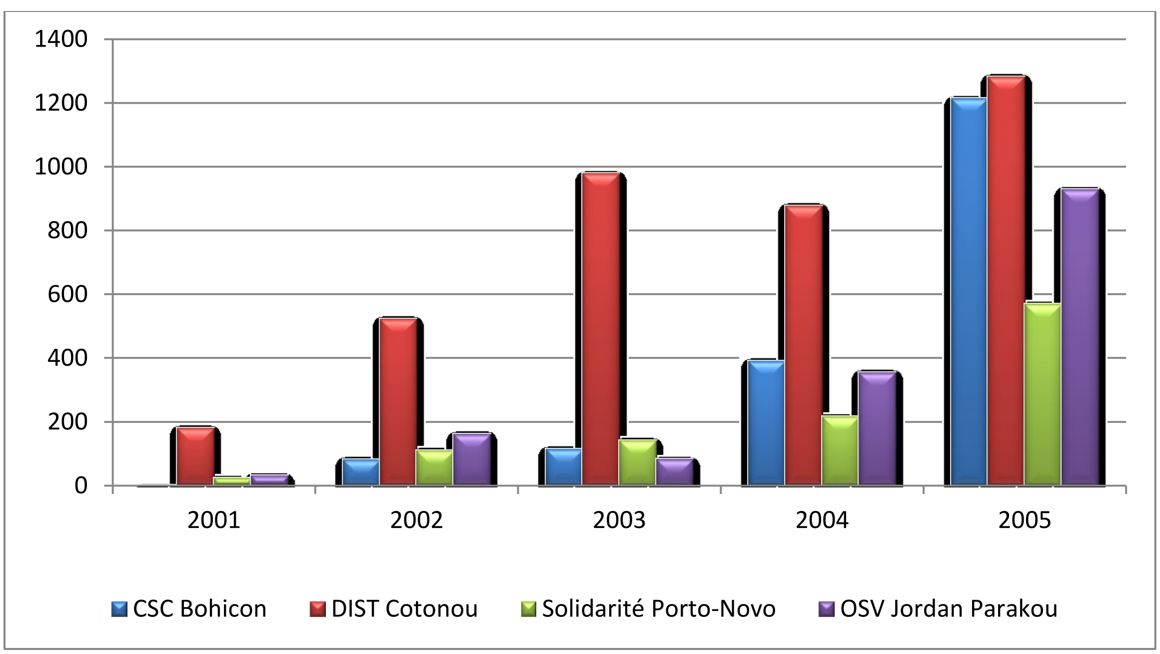
Over the five years, field workers of the study sites increased the number of times they visited FSWs at their work place except 2003 at OSV Jordan and 2004 at DIST, where there was a slight decline in the volume of field activities.

The highest increase in visits is observed at CSC Bohicon. While the proportion of visits to FSWs decreased from 82.28% to 32.9% at DIST, it increased at CSC Bohicon from 1.11% in 2001to 26.19% in 2005. There were some increases in the proportion of visits at OSV Jordan and ONG *Solidarité*, but they were rather moderate.

4.1.2.4 Follow-up

Follow-ups at DIST represented 46.48% of the total volume of follow-ups done in the scope of the project. Except in 2004, the proportion of follow-ups done at DIST regularly increased from 2001 to 2005, and represented at least 32.12% of the total number of follow-ups in each year. As shown in Figure 4.4, volumes of follow-up were also greater at DIST than any other health centre.

Figure 4.4:Evolution of Follow-up per Health Centre



The highest increase in activities over time occurred at CSC Bohicon, as the proportion of follow-ups rose from 0.84% in 2001 to 30.39% in 2005. Increases in follow-ups also appeared at OSV Jordan and ONG *Solidarité*; respectively from 13.08% to 23.25%, and 9.70% to 14.24%.

Overall, DIST had the highest volume of activities all year combined, followed by CSC Bohicon, and ONG *Solidarité*. OSV Jordan had the lowest volume of services provided to FSW and their partners, regular and irregular.

4.2 Cost Of Different Interventions

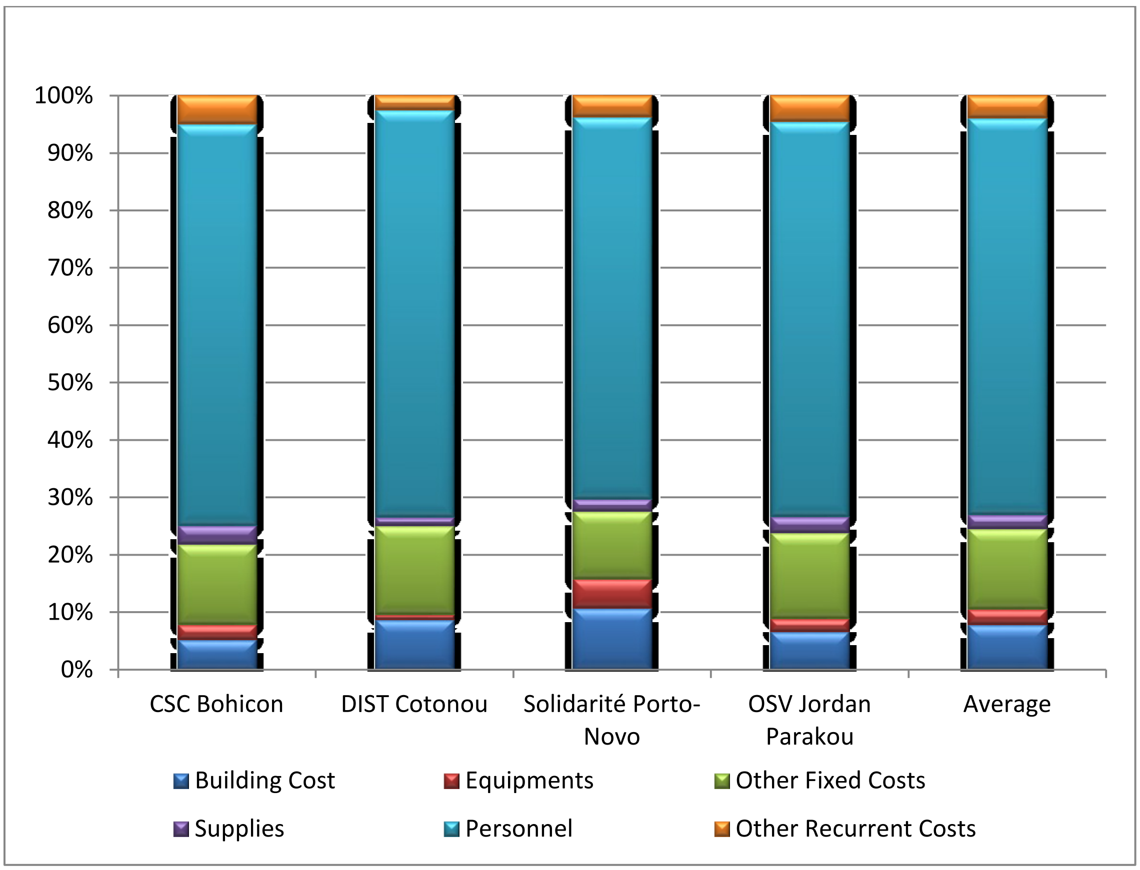
This section describes the profiles of total and average cost estimates for the four clinics included in this cost analysis. It also gives a view of how these costs changed over time.

4.2.1 Total Costs

Figure 4.5 presents a breakdown of the costs by input type across the health centres. Generally, as depicted graphically in figure 4.5, there seems to be no significant variation in the average cost profiles across health centres.

Recurrent costs (personnel, supplies, and other recurrent costs) form a greater share of costs in the health centres; ranging in average from 72.37% to 78.06% of the total costs. Fixed costs (equipments, buildings cost, and other fixed costs) represent approximately a quarter of the total costs. Even if the share of recurrent costs seems to have little variation across health centres, it hides however some divergences in the distribution of this cost profile. In fact, the cost of personnel is the largest part of recurrent costs and represents on average between 66.56% and 70.01% of total costs. The highest percentage (87.73%) is observed at OSV Jordan at the end of the implementation of the project. By contrast, supplies and other recurrent costs (vehicle operating and maintenance, building operating and maintenance, recurrent consultancies, and others) represent only a small proportion of the total costs. Within the study sites, there is little variation in the average share of supplies and other recurrent costs as shown in Table 4.1. On average, they make up, respectively, 2.45% and 3.79% of total costs.

Figure 4.5:Costs profiles, percentage breakdown of total costs by input type per Health Centre



The total costs of the projects vary with the volume of activities and across sites. Cost profiles as a percentage of total costs are thus used to allow comparison owing to the large gap between size of population covered and the volume of their activities.

Table 4.5: Costs profiles, % of the total costs

		Capital Costs			*Recurrent Costs*		
Study Site	*Year*	*Building Cost*	*Equipments*	*Other Fixed Costs*	*Supplies*	*Personnel*	*Other Recurrent Costs*
CSC Bohicon	*2001*	8.79	2.97	8.70	6.36	64.41	8.78
	2002	5.95	2.46	7.40	0.91	76.92	6.36
	2003	6.17	2.73	8.34	0.22	77.29	5.24
	2004	5.61	2.26	18.09	0.64	69.74	3.66
	2005	0.00	2.76	27.44	8.10	61.71	0.00
	Average	*5.30*	*2.64*	*13.99*	*3.24*	*70.01*	*4.81*
DIST Cotonou	*2001*	12.17	0.04	10.45	3.78	72.36	1.20
	2002	7.35	0.02	20.49	1.16	67.51	3.47
	2003	6.42	2.94	14.09	1.16	70.00	5.40
	2004	6.99	0.47	32.48	0.62	57.72	1.72
	2005	11.16	0.71	0.00	0.73	87.40	0.00
	Average	*8.82*	*0.84*	*15.50*	*1.49*	*71.00*	*2.36*
ONG *Solidarité*	*2001*	12.35	5.75	13.97	6.25	56.48	5.20
	2002	9.81	4.76	12.14	1.29	67.47	4.54
	2003	10.11	5.32	10.41	2.21	67.38	4.57
	2004	9.11	4.32	22.13	0.54	60.24	3.66
	2005	12.36	5.56	0.00	0.83	81.25	0.00
	Average	*10.75*	*5.14*	*11.73*	*2.22*	*66.56*	*3.59*
OSV Jordan	*2001*	7.62	1.64	14.75	7.50	60.50	8.00
	2002	6.19	1.30	15.73	1.95	69.51	5.31
	2003	6.42	2.94	14.09	1.16	70.00	5.40
	2004	5.20	2.22	29.98	2.83	56.34	3.43
	2005	8.07	3.31	0.00	0.89	87.73	0.00
	Average	*6.70*	*2.28*	*14.91*	*2.87*	*68.81*	*4.43*

On average, other fixed costs (vehicles, non-recurrent consultancies, and trainings) are the second largest cost profile and the greatest share of fixed costs. With an average share of 14.02%, other fixed costs are not stable over time. Their proportion of the total costs increases slightly in the first year of the project from 11.97% to 13.94%; while in 2003, it decreases to 11.73%. It reaches its highest level of 25.67% in 2004 before falling to the 6.86% at the end of the project. In contrast, there is little variation in this cost profile across health centres; the lowest percentage (11.73%) is observed at ONG *Solidarité* and the highest at DIST (15.5%).

Building cost is on average the next largest and the third share respectively of fixed costs and total costs. It ranged between 5.30% and 10.75% of total costs with an average of 7.89%. This average percentage in urban study sites is 9.78% and only 6% for semi-urban health centres.

Except at ONG *Solidarité*, the cost of equipment as a proportion of total cost is relatively low during the implementation of the project. With an average of 2.72%, the share of equipment in the total cost did not change over time; it varied between 2.22% and 3.01% from 2001 to 2005.

4.2.2 Estimation of Average Cost per Activity

Estimates of average costs of activities in each study site are summarized in Table 4.2. The average cost of a diagnosis of STI/HIV ranges between $ 21.31 and $ 373.17. Actually, except CSC Bohicon, the average value does not exceed $ 82.56 for the other sites. It is worth noting that this difference is due to the large value of the average cost of diagnosis during the first year of the project ($ 1770.08) in that particular site because of the small volume of activity.

Though the average cost per STI treated in all health centres is $ 60.31, the variation across site and through time is evident as shown in Appendix 1. For example the maximum average cost is more than fifty six times the minimum, and the average cost per study site is between $ 27.60 and $ 587.55.

Table 4.6: Average Cost per activity, USD (2000 prices)

		Average Cost in CFA 2000			
Health Centre	*Year*	*Diagnosis*	*STI*	*Visit*	*Follow up*
CSC Bohicon	2001	1770.08	2779.83	506.09	1742.72
	2002	45.18	71.48	42.21	55.59
	2003	34.60	59.01	39.05	46.18
	2004	12.61	22.41	12.31	17.62
	2005	3.38	5.01	7.73	10.35
	Average	*373.17*	*587.55*	*121.48*	*374.49*
DIST Cotonou	2001	36.47	49.26	11.68	33.55
	2002	20.59	26.52	8.21	21.92
	2003	6.74	8.02	2.45	6.34
	2004	27.25	33.85	9.14	20.60
	2005	15.51	20.37	4.53	7.18
	Average	*21.31*	*27.60*	*7.20*	*17.92*
ONG *Solidarité*	2001	231.97	285.53	79.52	185.28
	2002	57.12	62.54	25.40	49.88
	2003	59.34	59.49	12.48	44.10
	2004	47.13	48.69	11.43	39.09
	2005	17.26	17.87	6.62	9.28
	Average	*82.56*	*94.82*	*27.09*	*65.53*
OSV Jordan	2001	145.93	199.12	78.33	126.97
	2002	30.62	41.44	17.78	33.59
	2003	73.24	94.59	30.30	74.84
	2004	26.44	33.22	14.66	26.48
	2005	6.23	7.53	2.81	5.24
	Average	*56.49*	*75.18*	*28.78*	*53.42*
*All Sites**	*Min*	*3.38*	*5.01*	*2.45*	*5.24*
	Max	*231.97*	*285.53*	*79.52*	*185.28*
	Average	*47.24*	*60.31*	*21.93*	*42.85*

** The first year (2001) at CSC Bohicon is not taken into account.*

With a minimum average value of $ 2.45, check-up visit of a FSW at the clinic can cost as high as $ 79.52 on average. Again, except the first year at CSC Bohicon, the average cost of a regular visit of a FSW per study site ranges between $ 7.20 and $ 28.78.

Average cost per health centre for field work activities (follow-up) varied widely across sites between $ 17.92 and $ 374.49. However, if the first year of CSC Bohicon is not taken into consideration, the cost of FSW reached by field workers is only $ 42.85 on average. This is also due to the low level of activity during the first year at CSC Bohicon.

4.3 COST VARIATION ANALYSIS

Previous sections presented average costs of different activities. This section provides an overview of the average cost variation over time for each activity. Key cost drivers such as volume of activity, coverage, location of the health centre and HIV prevalence are examined.

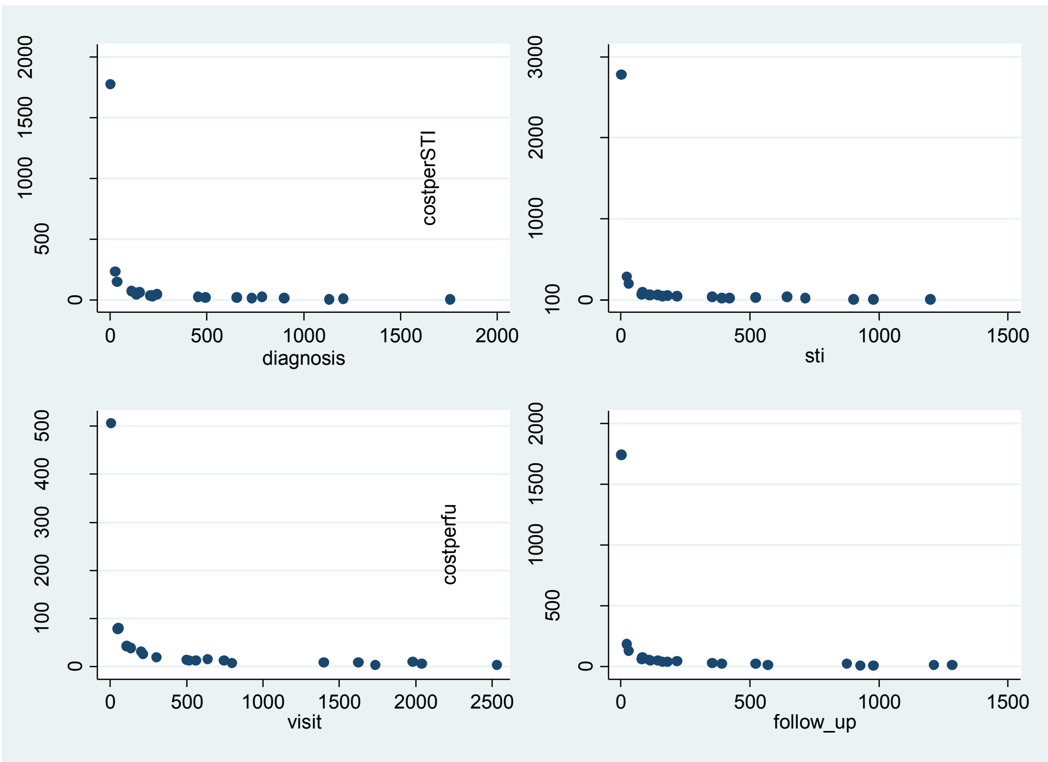
4.4.1 Cost Variation over time

Average costs of all type of HIV prevention activities show an evidence of a down sloping trend during the implementation of the project. From 2001 to 2005, the average cost of diagnosis, STI treated, visit, and follow-up considerably decreased except in 2003 where the volume of activities in all health centres dropped slightly. However, figures in Appendix 1 do not suggest a linear decrease of the average cost over time. Yet large percentage drops in average costs appeared between the first and the second years and decreased further with time. A logarithmic function may best apply to the relation between average costs and time, but it was not analyzed here. With few exceptions, the average cost per STI seems to decrease over time in all sites. Experiences gained over time in the delivery of each activity seems to lower the average cost; however other important factors such as volume of activity, prevalence and location are also to be considered.

4.4.2 Variation Analysis of Average Costs

Figure 4.6 reveals that as volume of activity increases, average cost per activity appears to decline. Here also, the graphs show large reductions in average cost with an incremental increase in volume of activity at a lower level. Even if the graphs did not reveal a U-shaped curve for each average cost, it is clear that they are nowhere near linear. With the size of the activities, average cost continues to decrease with the volume in all sites.

Figure 4.6: Scatter plots of average cost per activity against volume of activity



Non-parametric tests suggest that we can reject with 95% confidence the null hypothesis that there is no relation between average cost and volume of activity. Table 4.3 also confirms that, for our data, average cost per each activity is negatively and significantly related to the volume of the correspondent activity.

Table 4.72: Spearman rank tests of the relationship between average costs and volume of activities

Activities	*N*	*Spearman's Rho*
Diagnosis	20	-0.9564
STI treated	20	-0.9669
Visits	20	-0.9654
Follow-up	20	-0.9669

The volume of activity explains at least 95% of the variation in average cost. More non-parametric tests are done to scrutinize the relation between average cost per activity and two other variables namely, location and HIV prevalence. Statistic tests also reveal that neither HIV prevalence nor rural or urban location of the health centre is likely to influence the average cost. Hence, only the size of activity influences the variation in average cost.

4.4 Relation Between Coverage and Volume

Evolutions of visits and follow-ups were presented in figures 4.3 and 4.4 respectively. As mentioned earlier, we used follow-up as an approximation of coverage. It can be seen from these figures that both coverage and volume have increased over time. A Spearman correlation test between follow-up and visits (see Appendix 2) reveals that the number of visits increases positively with the number of follow-ups, $r(20) = .971,\ p < .01$.

Volume of activity is therefore significantly and positively associated with the coverage.

Fieldwork efficiency (measured by the ratio volume/coverage) seems to vary with the location. Efficiency ratio in urban areas is significantly higher ($M = 2.46,\ SD = .71$) than in rural areas ($M = 1.84,\ SD = .69$), $t(18) = 1.98,\ p = .031$ (see Appendix 3 for output results).

As for the HIV prevalence rate, there is less evidence that it has an influence of fieldwork in the field whatever the area, rural or urban (see Appendix 4).

Though the volume of activity in health centres is closely related to the number of follow-ups (coverage), only the location significantly affects the efficiency of fieldwork; the HIV prevalence does not.

4.5 CONCLUSION

The results presented in this chapter lead to a few general conclusions. First, data suggest that for each activity, there is a large variation in volume between the study sites, and that the level of activity during the implementation of the project was not constant over time. For all activities, DIST has the largest number of activities carried out per year from the beginning until the end of the project.

It also appears from the cost analysis that the average cost per activity for all structures varies with the volume of activity; more specifically, the average cost decreases when the size of service provided increases. In addition, for the same activity, large differences are found in the average cost across health centres.

In addition, while experience gained by workers over time seems to weigh down the average cost, HIV prevalence rate and the location of the health do not appear to influence the cost of activities provided to FSWs.

Finally, activities done by field workers on sex-work sites appear to have an impact on the attendance of FSW to the health centres included in the study, all location alike.

The coming chapter will provide an overview and a discussion on the finding. It will also present the limitations of this cost analysis followed by a general conclusion.

CHAPTER 5 DISCUSSION AND CONCLUSION

The previous chapter presented the results of the cost analysis of prevention activities targeting FSW during the implementation of the AIDS 3 project. This chapter aims to provide general implications that can be drawn from these results.

The first section will discuss the findings of the cost analysis and their implications if future projects are to be developed. The second section will present the limitations of the study, and the third section will give general conclusions of the study.

5.1 OVERVIEW OF THE FINDINGS

The results of the cost analysis of the AIDS 3 project targeting a vulnerable group, namely FSW, gave details of how services in each health centre included in this study were provided, as well as their respective average cost. This section will successively present an overview of HIV prevention activities, the cost profile, and the variation of average costs.

5.1.1 Activities in studies sites

Among all the study sites, DIST had the highest volume of activities, especially for follow-ups. This wide difference in volume of activity of DIST as compared to other health centres, may be attributed to the large experience of workers at DIST. Staff at DIST have years of experience in HIV prevention activities, and most of them have been previously in contact with FSW through other NGOs. Their relation with peer educators, some of which have been in the commercial sex trade for many years, might have been a driving force for the volume of their activities. We can see this through the number of visits; more than 2500 in the third year (2003) of the project. Though the analysis here did not state clearly the contribution of learning in the efficiency of fieldworkers, it is likely that the efficiency of fieldwork, measured as the ratio (visit/follow-up), is due to the trustful relationship that exists between field workers and peer educators. Maturity of fieldworkers might have improved their skills and their efficiency (Guinness et al., 2005). Even if we were not able to observe in full detail how field activities were carried out in each site, it is, however, probable that the way FSWs were approached, using peer educators, and cooperation with close house owners, might have significant impact on the volume of activities. It is not, however, certain that these factors are the only causes that could justify the volume of activity. Other parameters such as the size of the population, and economic activities might have also played a great role.

Counselling on and testing for STI especially HIV are paramount for the control and prevention of HIV/AIDS. Assuming that those activities can only be done at health centres, we can fully understand the importance of follow-ups and visits of FSWs to the clinics. This supports the importance of intensive field work interventions, and a need for ever-growing community based activities in the fight against HIV.

5.1.2 Cost profile

The small variation in the share of staff cost as a proportion of total costs observed across study sites reveals the importance of field and monitoring activities in HIV prevention programmes. Even if the paucity of data does not allow us to do any test to see how the percentage of staff cost as a proportion of total costs varies across health centres, it is clear that staff costs are generally high, and represent at least 57% of the total cost in each study site. This reveals that HIV prevention programmes do need human resources far above other equipment, and require a participation approach in communication and information activities. Nevertheless, it is difficult to generalize this result since human resource remuneration may vary with the location, urban or rural.

Despite the relatively small proportion of building costs in total costs, it seems to be influenced by the type of the health centre. As shown in the results, CSC Bohicon, a public health centre, has the lowest percentage. This can be explained by the fact that buildings are shared by many activities; thus, their usage will tend to be more efficient. DIST, which only provides HIV related activities, has the highest percentage, about 10%. Another explicative factor can be the value of properties measured by the opportunity cost as described in the methodology. In bigger cities for instance, building/rental costs are high while in small towns they are small. The location of activities can thus have a significant influence on the cost of the project. However, given the lack of relevant percentage usage of buildings in many other health centres, quantitative analysis was not done to see how the type of the study site (public, private, NGOs or mix) and the combination of activities might affect building costs. There is not enough information to decide whether it is better to provide HIV prevention services separately or to combine them with pre-existing activities. Further analyses are required to explore scope efficiency in the provision of HIV prevention services.

The volume of equipment does not increase with the volume of activity. In health centres where HIV health care already exists, equipment represents only a small part of the total costs, for equipment was not used for the project activities alone; they were also used for other activities. This can explain why they represent a small proportion in study sites with a large volume of activity. Again, HIV prevention care does not need high investment in equipment; rather it requires a great coordination of outreach activities around a set of health care facilities.

5.1.3 Variation of Average Costs

Over time, average cost of each activity decreased in all health centres. Two main factors appear to explain this trend in average cost. First, the steady increase of volume of activities appears to be the most important factor that reduces average costs. This is clearly shown by the result of the non-parametric tests with pointed out that the relationship between volume of activity and average cost is very consistent. The analysis also reveals that the average cost is negatively associated with the volume of activity (at least with the size of the data used in the study). As for example, the high level of average cost of diagnosis at CSC Bohicon during the first year of the project may be due to the relative small number of diagnoses done in that particular health centre. This implies that in HIV prevention activities, there are economies of scale as the size of services provided increases, and this is consistent with the theoretical U-shaped average cost curve. This result is consistent with econometric analysis based on cost data of HIV prevention activities in India (Guinness et al. 2005). Our data, however, only shows the decreasing part; may be the volume of activities done is not large enough for us to see the optimal point where the average cost will be at its minimum before the curve will start increasing. This justifies the importance of increasing the size of HIV prevention activities.

Another explanation can be the gain in efficiency of the staff which results in lower average cost per activity. DIST for instance, with large experience in HIV prevention activities, has the lowest average cost among all the health centres and for each activity. However, more analysis is required to confirm this observation in the cost data.

It has been suggested that cost effectiveness of HIV prevention activities is higher in high HIV prevalence settings (Vickerman et al., 2006). However, our data does not support this idea as far as average costs of activities are concerned. Results from our analysis do not allow us to reject the null hypothesis that there is no relationship between average costs and HIV prevalence rate. This result raises the dilemma of trade-off between equity and efficiency. As prevalence of HIV does not influence the average costs, then why are services not provided to all groups regardless of their vulnerability? As least, there is potential gain from economies of scale. Future studies will be useful to address this issue. Our results, however, might have been biased since HIV prevalence rates were taken as constant all through the implementation of the project. Had it varied over years, we might have seen its effect on costs.

Location also has no significant effect on average cost of activities except follow-up. The results of non-parametric tests do not provide sufficient evidence to accept that location will affect average cost of diagnosis of STI, their treatment, and visits. Only follow-ups appear to be cheaper in urban areas than in rural areas. Commercial sex work sites in urban areas are located in the heart of the city, while in rural areas, not only are they far from the centre of the city, but they are also distant one from another, making it difficult for fieldworkers to reach. Input costs are likely to be the most important cause of this variation in average costs. Stigmatisation also accounts for part of this since commercial sex work seems to be more acceptable in large cities than in small communities. This highlights the necessity to take into account location and social behaviors when planning prevention activities.

5.2 LIMITATIONS

There are four limitations to the methodology used in the study. First, the nature of the data collected does not allow many manipulations. Second, outputs and outcomes indicators do not permit deep sensitivity analysis. Before the last section, we will discuss the limitations due to the assumptions made.

In the last section, limitations of the methodology are highlighted, and their probable effects on our results are analyzed.

5.2.1 Limitations in the data

Outputs and outcomes data were well documented in activity reports of each health centre, and aggregate input cost data were available and accessible through financial statements of the project. Yet among the fifteen health centres included in the study, detailed costs were available for only four. This lack of consistency and continuity in the data from 2001 to 2005 (period covered by the project) considerably reduced the sample size. Further detailed analysis would have been possible had costs per output or outcome been computed for all health centres.

The retrospective collection of information was not optimal for two reasons. First, all services provided to FSW within the scope of the project ended formally in 2005 and all the staff of the projects were not around to be interviewed. Secondly, members of the staff who were available for interview were involved in other activities with new schedules and time tables. Yet, they were asked to provide information on how they were sharing their time between activities. This process relied basically on recalling of information from almost three years prior.

5.2.2 Limitations in the indicators

Using average cost per activity as an indicator gives an estimate of the cost required to carry out activities. However, this indicator is static and does not provide information on how the cost will change as the volume of services increases. Incremental indicators (marginal cost for instance) would have given more details about resource allocation and efficiency in activities. Moreover, average cost per activity does not show the effect of the project on the target population. The actual impact of each activity is hence not revealed; and it would not be possible to say with certainty which activity should be given priority in designing future programmes. For instance, two activities may have the same average cost, yet one may have greater impact on the prevalence rate in the target group than the other.

5.2.3 Limitations in hypothesis

While computing costs, we assume a production function in each site. Yet, little is known about the efficiency of the production process, as it was not possible to know whether financial and human resources were being used at their optimum during the implementation of the project. In some sites, the production function may not actually be efficient.

We also assume that the treatment of STI, counseling on HIV and other STIs, follow up and all other services offered by the institutions are constant in their procedure over time.

Thus the production function of these different activities is assumed to be constant during the implementation of the program. Yet, time plays a paramount role in the delivery of services especially when it comes to infectious diseases such as HIV/AIDS where mutation of the virus requires adjustment of treatments. The same assumption excluded the gain due to experience on each site where services were provided to the target group.

Taking as constant the prevalence rate during the duration of the project undermined the impact of the project, as activities of the project were designed to lead to a reduction of this rate over time.

5.2.4 Limitation in analysis

Output and outcomes variables are known with certainty in the computation of average costs, but all factors are subject to variation. Inputs prices, exchange rates and building costs have changed over time. Sensitivity analysis can be performed to see how the fluctuation of the exchange rate between CFA and US dollars on the one hand, and the building cost on the other hand, affect average costs of services provided in different health centres. First, the highest and the lowest exchange rates between CFA and US dollars during the years of the project can be used respectively to recompute total and average costs of each activity in each site. These two scenarios may provide more information on how recurrent inputs costs can affect average cost per activity. Moreover, buildings do not have the same costs as we move from town to rural area. Sensitivity analysis may also be done to determine the impact of building costs on variation in average costs between health centres.

5.3 General Conclusion

This section will successively present the implications of the results of this study, and further research that needs to be done in relation to HIV prevention activities.

5.3.1 Implications of the results

NGOs, private, and public institutions are important for the implementation of HIV prevention programmes in Benin. Results of this study have implications on how budget allocation should be carried out depending on the provider of prevention services, the size of services to deliver, and the location of the project.

In the planning of HIV programmes, great consideration should be given to the location where services are to be delivered, as far as fixed costs are concerned. In rural areas, if the size of vulnerable groups is large enough, then considerable resources should be allocated to field work.

Also, important financial resources may be required to meet building costs if the provider is not a public institution or if the programme is based in an urban area.
Moreover, the role of human resources (field workers, clinic-based staffs or monitors) is paramount, and should then be considered accordingly. Their quality and their relationship with FSWs will significantly affect the efficiency of the project.

In addition and if possible, services should be enlarged to other vulnerable groups such as covert sex-workers, in order to increase the volume of activities so as to take advantage of economies of scale.

Finally, regardless of the location or the health facilities, fieldwork must represent the core activity around which other activities should turn. They will lose their momentum if fieldwork falls.

5.3.2 Further Research

This study analyses the cost of providing HIV prevention services to vulnerable groups, namely FSWs. It explores in some ways how different factors can affect average costs of services provided. Yet, more research needs to be done in order to strengthen the results.

First, as there is a trade-off between volumes of services provided and their quality, cost-effectiveness analysis should be done to ascertain if there is a real need to increase the volume of activities.

Second, this study did not analyze how the combination of HIV prevention activities with other health care services would reduce the cost of activities. Analysis of economies of scope will provide more details on how the type of institution (independent NGOs, public health centre or mix) and the delivery mode will affect the cost of activities.

Another aspect of research that needs to be considered is outsourcing of activities. Some institutions, based on their experience, might be more efficient in providing a specific service than others. Future research should be focused on how contracting out some HIV preventions activities will help increase efficiency in the fight against HIV.

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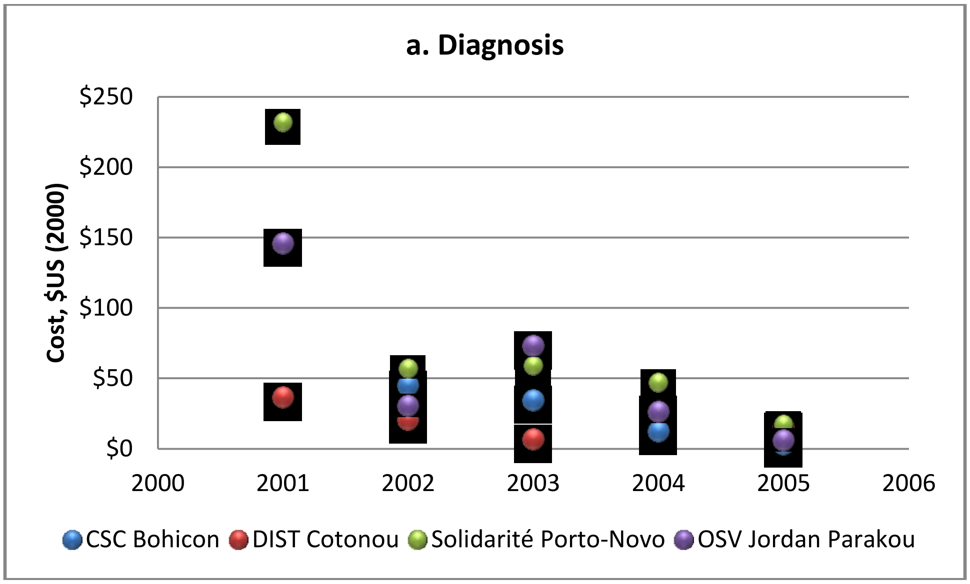
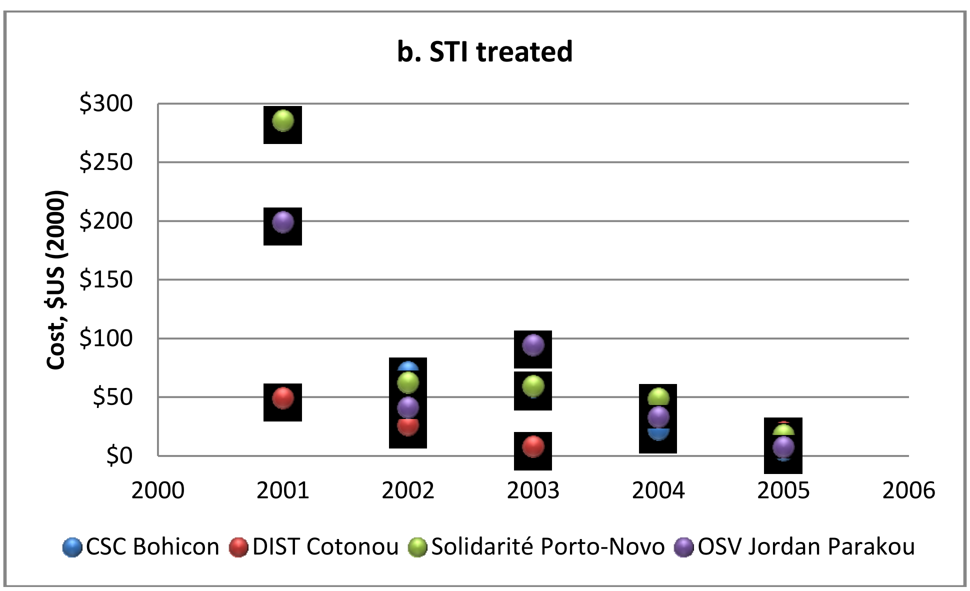
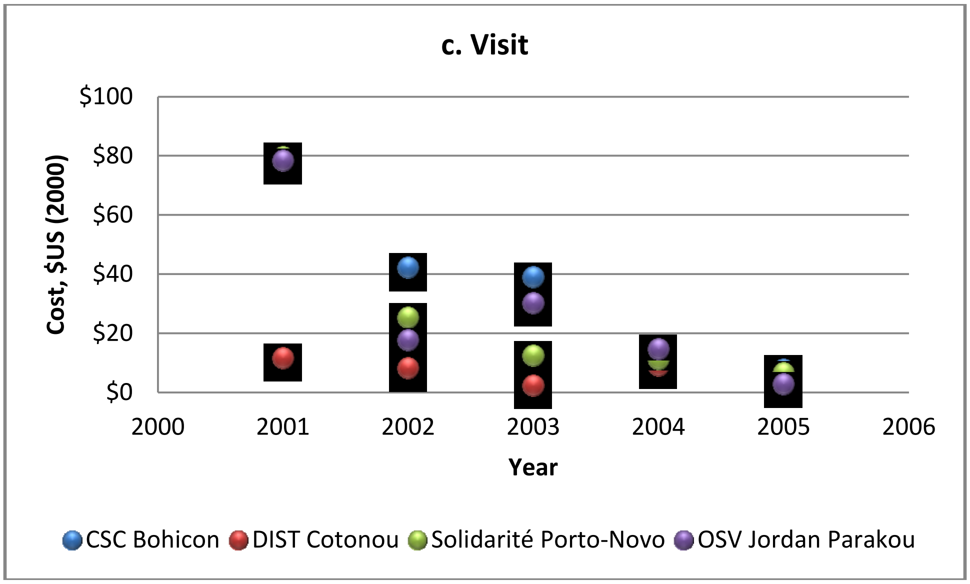
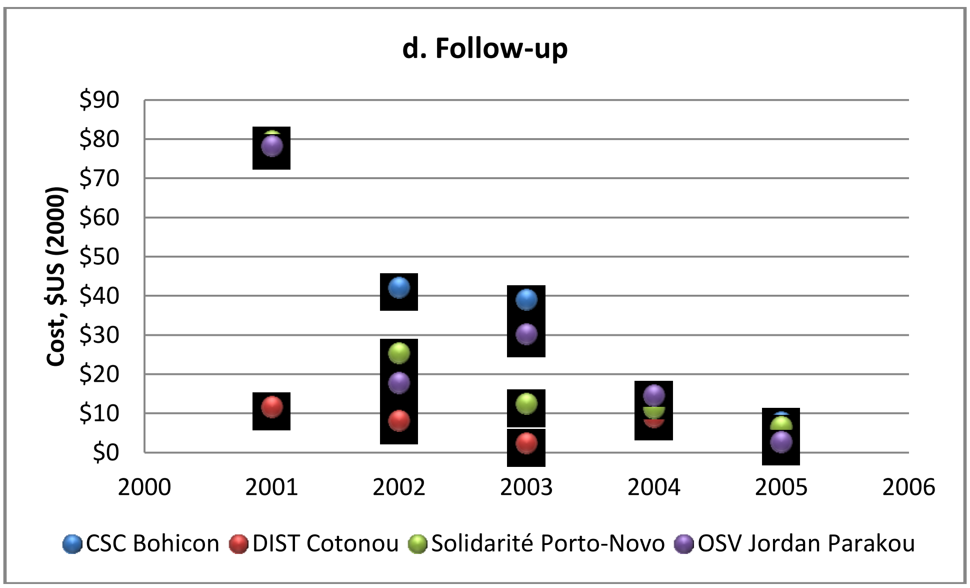
APPENDIX 1:   Trend Average Cost per Activity voer time






c. Visit
$100
$80
$60
$40
$20
$0
Cost, $US (2000)
2000
2001
2002
2003
2004
2005
2006
Year
CSC Bohicon
DIST Cotonou
Solidarité Porto-Novo
OSV Jordan Parakou


d. Follow-up
$90
$80
$70
$60
$50
$40
$30
$20
$10
$0
Cost, $US (2000)
2000
2001
2002
2003
2004
2005
2006
CSC Bohicon
DIST Cotonou
Solidarité Porto-Novo
OSV Jordan Parakou

APPENDIX 2: Result of Spearman rank order test of relation between coverage (follow-up) and volume of activity (Null hypothesis: there is no relation between coverage and volume of activities).

	N	*Spearman's Rho*
Visits	20	0.9714*

** Significant at 1%*

Prob > t = 0.0000 ddf= (n-2) = 20 - 2=18

APPENDIX 3: Result of two-sample t test with equal variance for mean ratio between urban and rural area

Location	*Obs*	*Mean*	*Std. Err.*	*Std. Dev.*	*[95% Conf. Interval]*	
Rural	10	1.845214	.2190191	.6925991	1.349758	2.340669
Urban	10	2.465495	.2232081	.705846	1.960563	2.970427
Combined	20	2.155355	.1679987	.751313	1.803729	2.50698
diff		-.6202814	.3127159		-1.277273	.0367103

diff = mean(Rural) - mean(Urban) t = -1.9835
Ho: diff = 0 degrees of freedom = 18
Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0314 Pr(T > t) = 0.0628 Pr(T > t) = 0.9686

APPENDIX 4: Result of two-sample t test with equal variance for mean ratio between location of difference HIV prevalence

Prevalence	*Obs*	*Mean*	*Std. Err.*	*Std. Dev.*	*[95% Conf. Interval]*
.75	10	2.144769	.3125875	.9884883	1.437647 2.851891
1.5	10	2.16594	.146391	.4629291	1.83478 2.497099
combined	20	2.155355	.1679987	.751313	1.803729 2.50698
diff		-.0211702	.3451685		-.7463422 .7040018

diff = mean(0.75) - mean(1.5) t = -0.0613
Ho: diff = 0 degrees of freedom = 18
Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.4759 Pr(T > t) = 0.9518 Pr(T > t) = 0.5241

APPENDIX 5: Percentage Evolution of Activities per Health Centre

	Health Centre	*2001*	*2002*	*2003*	*2004*	*2005*	*Total*
Diagnosis	CSC Bohicon	1.06	11.71	12.39	33.12	41.04	29.53
	DIST Cotonou	76.33	57.26	71.89	35.42	21.02	39.19
	Solidarité Porto Novo	9.54	11.63	9.11	10.97	11.47	10.90
	OSVJordan Parakou	13.07	19.41	6.61	20.49	26.47	20.38
	Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
STI	CSC Bohicon	0.84	9.35	8.72	24.39	37.06	24.61
	DIST Cotonou	76.37	59.64	74.22	40.01	22.08	41.78
	Solidarité Porto-Novo	9.70	12.54	10.77	13.50	13.03	12.56
	OSV Jordan Parakou	13.08	18.47	6.29	22.09	27.83	21.05
	Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
visit	CSC Bohicon	1.11	5.33	4.03	14.31	26.19	15.08
	DIST Cotonou	82.28	68.92	75.04	50.42	32.91	52.41
	Solidarité Porto-Novo	8.54	10.66	14.87	18.92	12.90	14.32
	OSV Jordan Parakou	8.07	15.10	6.07	16.35	28.00	18.19
	Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Follow-up	CSC Bohicon	0.84	9.35	8.72	21.28	30.39	21.83
	DIST Cotonou	76.37	59.64	74.22	47.67	32.12	46.48
	Solidarité Porto-Novo	9.70	12.54	10.77	11.78	14.24	12.83
	OSV Jordan Parakou	13.08	18.47	6.29	19.27	23.25	18.86
	Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*