Performance, costs and cost-effectiveness analysis of the Tay Ho HIV integrative prevention and care & treatment outpatient clinic, Vietnam. Is the model worth scale up?

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Prof. Dr. Martin Spiess

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Acknowledgement

To Professor Marcel Tanner, you believed in me more that I did,

To the Members of the Jury who do me the favour to evaluate my work,

To the Médecins du Monde team in Vietnam and Paris for allowing this work and supporting me all those years

To Peter James Barnard,

To Hao Bing,

To Nguyen Thinh Cuong,

To my family,

To Laetitia, my most important partner,

To the lost ones.

Abbreviations

AIDS	Acquired Immuno Depression Syndrome
ARV	Anti-Retroviral
CSW	Commercial-Sex Workers
DALY	Disability Adjusted Life Years
DFID	Department For International Development
HAART	Highly Active Anti-Retroviral Treatment
HBC	Home-Based Care
HIV	Human immuno-deficiency Virus
HLY	Healthy Life Years
ICER	Incremental Cost-Effectiveness ratio
IDUs	Injected-Drug Users
YLL	Years of Life Lost
YLD	Years of Life with Disability
MSM	Men Having Sex with Men
MT	Mobile Team
NGO	non-governmental organisation
PEPFAR	Presidential Emergency Plan For AIDS Relief
Pre-ARV	Pre- Anti-RetroViral
QALY	Quality Adjusted Life Years
SDA	Step-Down Accounting
SP	Sexual Partner to an at-risk person
VCT	Voluntary Counselling & Testing
WHO	World Health Organisation
WSDA	Weighed Step-Down Accounting

Summary

Background

Since the early 1990s, Vietnam has been experiencing an HIV/AIDS epidemic with a general prevalence rate of 0.42 % in 2008 and a projected prevalence rate in 2012 of 0.47%. Although the general HIV prevalence rate is considered low, the virus heavily affects some at-risk population groups in Vietnam, including commercial sex workers, injectable drug users and the men who have sex with men. According to studies, prevalence among these groups is considerable, up to 65%. Risky sexual behaviours are common practice in all three groups, and the chain of infection is intertwined. Besides, the situation is rendered even more complex in respect of HIV transmission prevention and PLHA treatment because of a governmental zero tolerance policy in respect of drug-users and a high level of stigma and discrimination towards PLHA in the Vietnamese society.

In that context, the active fight against HIV in Vietnam began in earnest at the end of 2003, with the arrival of one major international donor scheme, namely PEPFAR, followed in 2006 by the start of disbursement of the Global Fund, and the active work of the World Bank and DFID and other bilateral agencies, amounting to US$ 114 million in the single year 2008. At the same time, the Vietnamese government was spending US$9.7 million on the fight against HIV amounting to less than 1% of the Ministry of Health's budget. As a consequence, Vietnam became highly dependant on international aid to finance its fight against the epidemic. Meanwhile, it is estimated that about 30% of the needs are covered in terms of prevention activities and medical assistance to PLHA.

There is thus a critical need for identifying the most cost-effective models of intervention in the Vietnamese context to help scale-up programmes in the country and meet the needs in respect of both prevention and treatment.

It is in this context of limited resources and high social barriers for at-risk population that the French non-governmental organisation, Médecins du Monde, developed an integrated prevention and care model, implemented at the end of 2005 in Tay Ho, a district of Hanoi. The MDM has undertaken both financial and technical support and the main components of its model include a prevention component consisting of a mobile outreach team and the VCT unit, and a care and treatment department including adherence training, support through home-based care and HAART.

The assumptions that led Médecins du Monde to implement such of model of action were that integrating prevention, detection, and care & treatment services within the same structure would help better targeting and attracting at-risk populations, hence increase programme performance, and finally build a cost-effective response through cost-savings and internal programme synergies.

Goal and objectives

The goal of this research is to test the hypothesis on which this model of intervention relies: that the integration of outreach, detection and care & treatment components within the same outpatient clinic, in the Vietnamese context, results in a high caseload of at-risk clients and patients along with structural economy of scale, translating in high cost-effectiveness levels for the model's key components.

As such, the goal of the research translates into the following objectives:

- Assessing model's outputs by analysing prevention, testing and care & treatment components performance in term of provision, coverage, utilisation and impact
- Analysing central components of the model (VCT and HAART) cost-effectiveness, vs. the null-set scenario, and standards reflected in international literature
- Analysing potential sources of synergies within the program and their impact on the cost-effectiveness level of its key components

Method

This research is based on a bottom-up three-layer analysis:

- one related to each programme's component performance and output;
- another related to each programme component's costs and unit costs; and
- a third related to the cost-effectiveness analysis of the programme's two central components, the VCT and the care and treatment services

Results are presented as follows:

- A first part presenting performance results
- A second dedicated to the financial and economic analysis, laying out:
    - Model's components financial unit-costs
    - Key components – VCT and care & treatment – cost-effectiveness analysis, with two sub-parts, a first one on the analysis of synergies within the model based on financial unit-costs analysis, and a sensitivity analysis based as well on financial unit-costs

For each layer, the method of data collection and analysis is designed to address some field-related constraints including that:

- the research is partly based on retrospective data;
- the field is not designed to conduct academic research; and
- the M&E system at field level is limited and cannot be adapted for the purpose of the research.

The theoretical foundation of the thesis is founded on:

- Habicht's guidance on the development of programme performance indicators in terms of provision, coverage, utilisation and impact;
- the World Health Organisation-CHOICE guideline on cost-effectiveness analysis; and
- an adaptation of the step-down accounting methodology to allocate indirect

costs in a systematic fashion and ensure transferability of the results

Findings

The underlying hypothesises supporting the implementation of that model of intervention combining prevention and care & treatment components proved true.

The model promoted strong synergies, which contributed to the increase in numbers of patients attending at the OPC level. Critical harm reduction activities could be carried out directly in the city's hotspots while at the same time the mobile outreach team was identifying potential PLHA in need of a treatment. The concentration of these two functions within one team reduced the cost per client referred for VCT, and helped to raise awareness of existing medical services offered by the OPC targeting directly the most at-risk populations.

The integration saved as well costs by boosting the demand for the clinic's services and the use of the significant resources invested in the setting up of such a model in term of fixed capital and trainings. The model worked as a system with positive feedback loops preventing new infections and actively treating identified People Living with HIV/AIDS through levelling off social barriers. This system worked not only from outreach to treatment, but certainly as well from treatment to outreach by increasing VCT attraction, at-risk persons being aware of the presence of immediately free medical services within the same structure.

As calculated in our research, the average ICR of the VCT unit vs. the null set scenario was 12 I$/DALY(3,0) averted, well below World Health Organisation-CHOICE SEAR indicator of 40 I$, and 252 I$/DALY(3,0) averted for the care & treatment unit, well in line with international standards. A model in which outreach and detection services were not integrated with care and treatment service would have increased unit costs (by a factor of four (4)), resulting in the medical component running costs per DALY averted far below international standards. The same would have been the case had the VCT unit not been integrated with the mobile outreach service, at least in the first two (2) years of the programme's operation. Integrating the mobile outreach team with the services offered by the VCT unit, cut costs to the latter by a factor of three (3). Nonetheless factors related to adherence to treatment and the delay in identifying patients for testing and treatment hampered the global cost-effectiveness of the programme.

Conclusion

The model is cost-effective, yet limited.
First, the demonstrated synergy highly depends on the context in which the programme operates. Were the prevalence in the target population to decrease below 15%, the synergy between the mobile outreach team and the VCT unit would begin to disappear. Moreover, were VCT services to be mainstreamed in Vietnamese society, the extra-cost incurred by the work of the mobile outreach team would hinder this synergy. Second, because of contextual limitations the model showed only an average cost-effectiveness by international standards, especially within its medical component. The model was unable to retain pre-ARV patients in sufficient numbers, or to convince them to abide by the OPC protocols in the absence of critical

complementary services, such as Methadone Maintenance Therapy, and/or early access to ART. The introduction of a Methadone Maintenance Therapy in an environment in which about 60% of PLHA are opiate-users would change dramatically the outcome of HAART, not to mention reducing HIV transmission. Third, in our views, the main limiting issue of this model might be the intense technical support it needed to be implemented and supervised. Indeed, the presence of an external NGO, such as MDM, though necessary in the international co-operation scheme, added critical costs to that programme. Over three years, the share of NGO expenses was considerable, amounting to 58.1% of the total. This cost share reflected the complexity of setting up the programme in the Vietnamese environment and the necessity to channel international funding, control spending, report to donors, and ensure the overall technical supervision of the model. Besides, costs also rose because the general NGOs co-operation system in Vietnam creates significant market distortions as a result of a limited local pool of skilled labour creating niche job markets. It is hence likely that the international system in place inflated costs at the NGO level by creating not only job-market distortions, but also several time-consuming tasks, such as reports, proposal writing, seeking fund prolongation agreements, and juggling different accounting and report norms.

As such, the question remains on how transfer both financial and technical burden to local authorities in a context of limited resources.
The Vietnamese government spends US$1,100,000,000 on health care according to official figures from the National Office of Statistic, representing an expense per citizen of US$13.75, including general administrative costs. The sole medicine cost if the current number of PLHA (240,000) in Vietnam were to have access to first-line HAART rises to a minimum US$24,000,000 per year (or 3% of the total health budget), excluding medicines and management costs. Apply the model's average cost to follow-up a patient for one year of HAART, including medical management and biological follow-up in an optimal situation (average caseload of 750 patients), and that cost would exceed US$200,000,000 a year, (or almost 20% of the annual health budget). This excludes integrating general supervision and management costs, which, depending on the efficiency of the system put in place by the Vietnamese authorities, could add an extra 30% to the total.

It seems that in the long term, the matter of the context and technical assistance are central. Though cost-effective and well adapted to the current constraints of the Vietnamese environment, the Tay Ho OPC approach is only a short-term solution until prevention and detection activities are mainstreamed and social obstacles lifted off. It could well be the best model to address HIV/AIDS in the Vietnamese context, or in any other places where concentrated epidemics are evident to quickly break an epidemic. Yet, the issue of the social and financial sustainability of such models remains and should be specifically explored. As such, it appears that research in the future should start focusing not only on the best mix of activities, but on the best model of technical assistance delivery, transfer and sustainability.

Part A Introduction

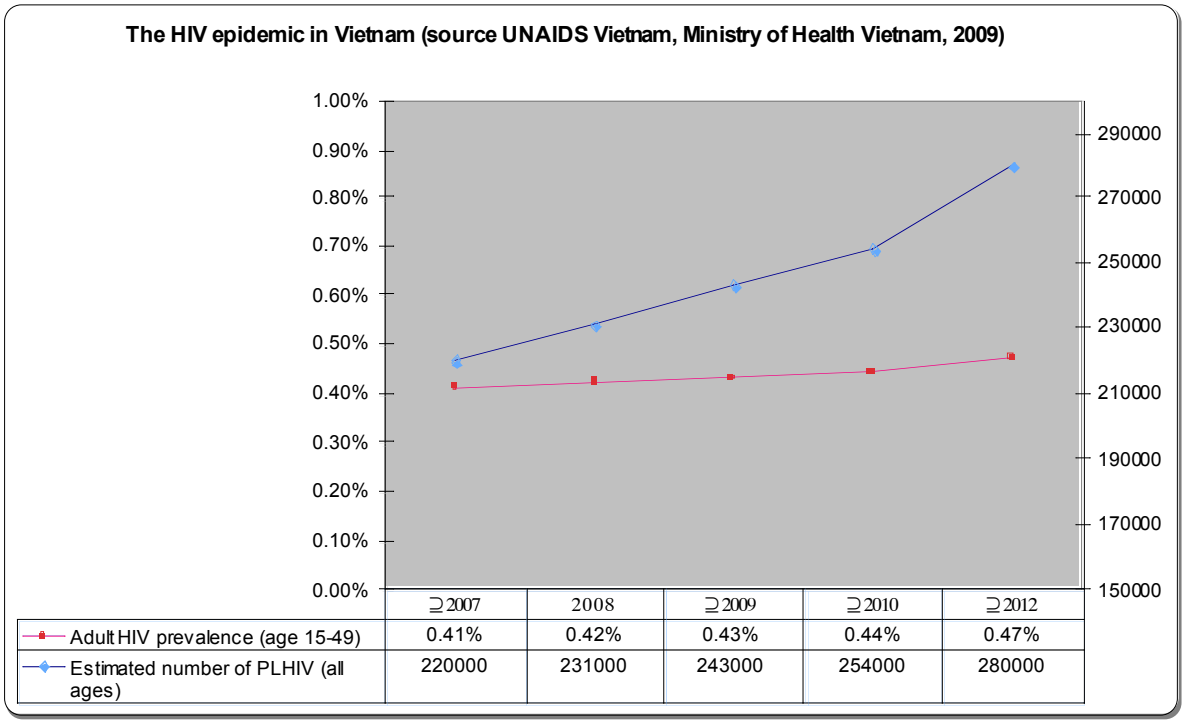
Background
Objectives of the research
Material and Method

Background: HIV in Vietnam: a concentrated epidemic

The patterns of the epidemic

Since the early 1990s, Vietnam has been experiencing an HIV/AIDS epidemic (Quan 2000, Hien 2002, Ruxrungtham, 2004) with a general prevalence rate of 0.42 % in 2008 and a projected prevalence rate in 2012 of 0.47% (UNAIDS-www.unaids.org.vn).

Figure 1 The projected HIV epidemic dynamic: *estimated number of People Living with HIV/AIDS and general HIV prevalence in Vietnam from 2007 to 2010*



Source: UNAIDS

Although the general HIV prevalence rate is considered low, the virus heavily affects some at-risk population groups in Vietnam, including commercial sex workers (CSW), injectable drug users (IDU) and the men who have sex with men (MSM). According to studies, prevalence among these groups is considerable.

For instance, measured prevalence for IDUs ranged from 23.9% in Hanoi (IBSS 2006) to 32% in Long An province (Tran 2006) and 65.8% in Haiphong (IBSS 2006). The situation is only a little better among CSW, with differences according to the type of sex-work (street-based or karaoke/bar/club-based) being practised. Studies show prevalence ranging from 7% to18% for bar/club- and street-based CSW in Ho Chi Minh City (Nemoto 2008), from 9.4% to 22.6% for those in Hanoi (IBSS 2006) and 3% to 29% in the Can Tho province (IBSS 2006). Meanwhile, the situation among the MSM group is alarming, with estimated prevalence ranging from 5,3% in Ho Chi Minh City to 9.4% in Hanoi (IBSS 2006).

Risky sexual behaviours are common practice in all three groups. Needle-sharing is common among IDUs (Tran 2006), with 15% to 47% reporting sharing needles (IBSS 2006). Condoms are inconsistently used by commercial sex-workers. Research shows inconsistent condom use associated with up to 85% of the CSWs interviewed (Tran 2008, Nemoto 2008, Nguyen 2009), and sexually-transmitted infections reported in 66.7% of the cases in the 12 months prior to the study (Tran 2008). The MSM-sex-worker sub-group appears to present the same characteristics. In one study (Clatts 2007), 47.4% of MSM-sex workers respondents reported not using condoms when engaging in anal sex.

As a result, sex-workers' clients become a potential bridging population. In a recent study (Nguyen 2009), 55.8% of the clients interviewed were found to be potential or active bridger because of their inconsistent condom use and marital status, with consistent HSV1 & 2 infection rates (21% and 33%).

The chain of infection is intertwined. Injectable-drug users may have unprotected sex with CSWs, and thus have high rates of sexually-transmitted infections. A 2006 study reported a sexually-transmitted infection rate of 30% among IDUs (Go 2006). Injectable drug users may also have high-risk sex with casual partners as reported in Bac Ninh, where 33% of a sample of IDUs reported risky sexual behaviour (Schumacher 2008). Studies of CSWs, especially those street-based showed similar high-risk behaviours: 5.7% of the CSW in Nha Trang (Tran 2008), 17% of the CSW in Hanoi and Can Tho (IBSS 2006), and 30% of street-based CSW in Ho Chi Minh City (Nemoto 2008) reported such behaviours.

It is clear that knowledge, attitudes and practice among at-risk groups need improvement. In the 2006 IBSS survey, a meagre 9.2% of the IDUs interviewed in Hanoi and Ho Chi Minh City could correctly identify ways of preventing HIV infection and/or reject misconceptions about HIV transmission.

Stigma and discrimination

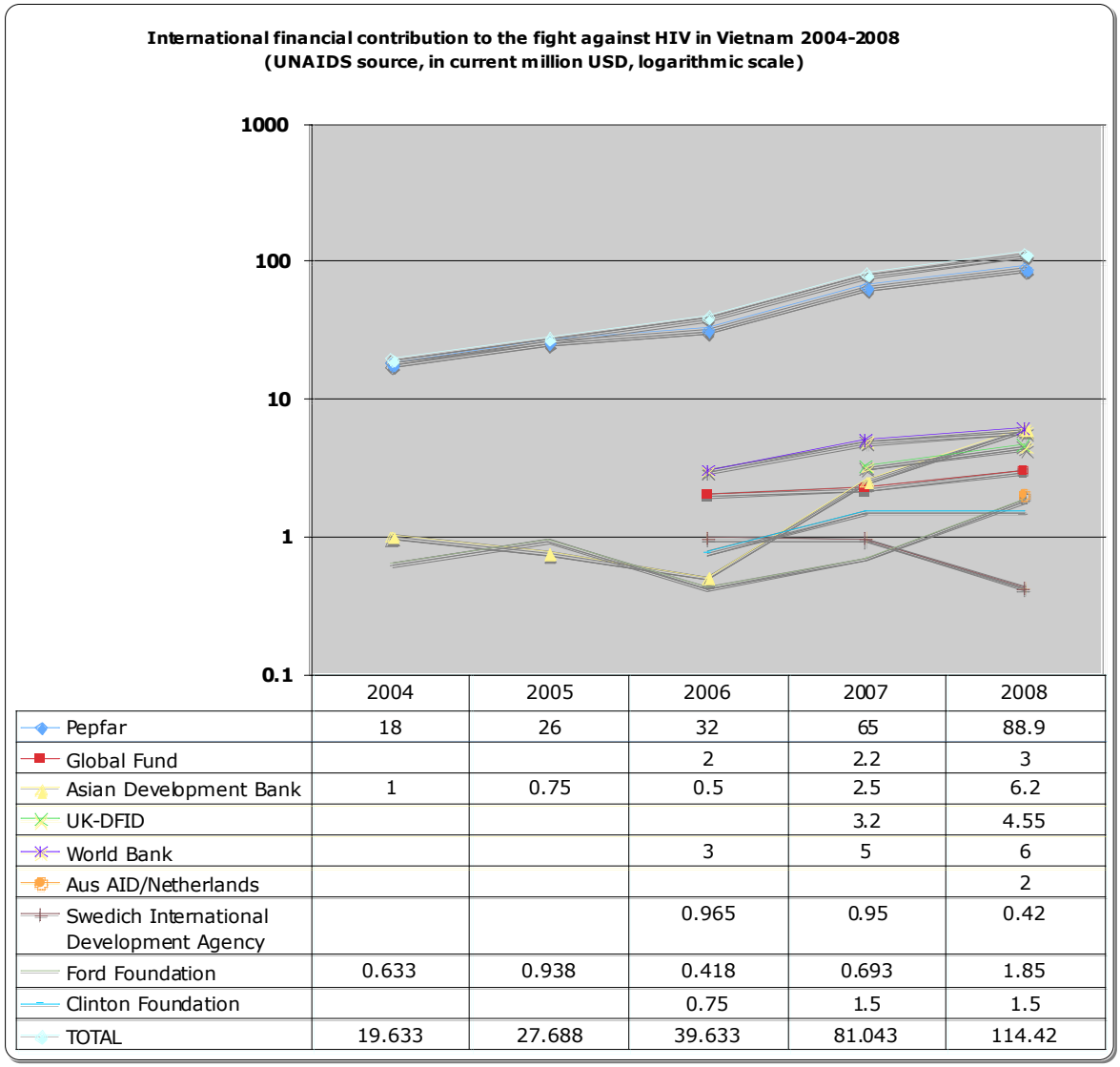
The situation is complex in Vietnam in respect of CSWs, IDUs and MSM.
In response to the rapid evolution and increase in drug use, notably heroin, in the country (Nguyen 2008), the Vietnamese government has been enforcing a zero tolerance policy in respect of drug users, and thus undermining harm-reduction efforts (Hammet 2007, Thanh 2009). In parallel, factors of social stigma and law enforcement have resulted in a grey area for commercial-sex work. Because the environment for CSWs is so hostile, they are fearful and driven underground and become "non-visible" (Johnston 2006). This combination of factors certainly makes harm-reduction, outreach, detection and medical work more complex because disclosure of HIV status in itself brings such risk. (Go 2006).

Nonetheless, the situation is improving with greater acceptance from the authorities and the local population of peer-based harm-reduction programmes, though progress remains fragile (Walsh 2008, Ngo 2009). In most of the country, harm-reduction programmes are now authorised by local authorities, yet with some limits imposed by the police. Needle-exchange activities remain forbidden for the time being, and severe rehabilitation programmes are still enforced throughout the country (Hammet 2008). Clearly, the country is in a transition.

The fight against the HIV epidemic in Vietnam

The active fight against HIV in Vietnam began in earnest at the end of 2003, with the arrival of one major international donor scheme, namely PEPFAR[1], followed in 2006 by the start of disbursement of the Global Fund, and the active work of the World Bank and DFID[2] and other bilateral agencies listed in Figure 2.

Figure 2 The international aid: *international financial contribution to the fight against HIV in Vietnam from 2004 to 2008 per donors.*



	2004	2005	2006	2007	2008
Pepfar	18	26	32	65	88.9
Global Fund			2	2.2	3
Asian Development Bank	1	0.75	0.5	2.5	6.2
UK-DFID				3.2	4.55
World Bank			3	5	6
Aus AID/Netherlands					2
Swedich International Development Agency			0.965	0.95	0.42
Ford Foundation	0.633	0.938	0.418	0.693	1.85
Clinton Foundation			0.75	1.5	1.5
TOTAL	19.633	27.688	39.633	81.043	114.42

Source:UNAIDS

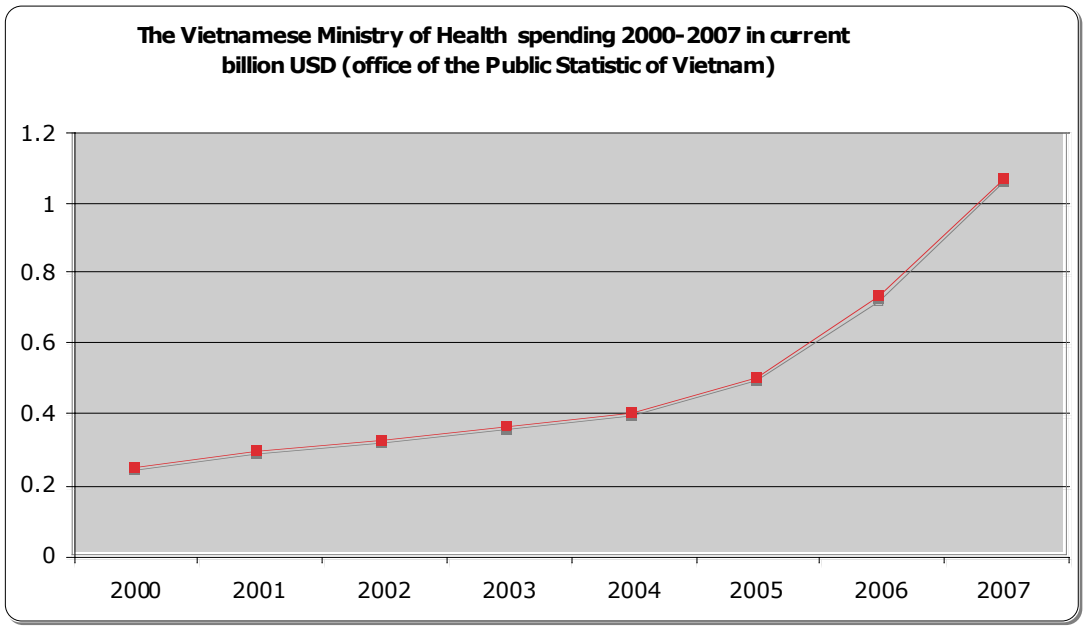
Thanks to this co-operation, at the end of 2007 30% of people living with HIV/AIDS (PLHA) in immediate need of Highly Active Anti-Retroviral Treatment (HAART) were receiving it (UNGASS[3] 3rd country report, 2006). As of September 2008, 24,500 PLHA were receiving HAART through PEPFAR. The PEPFAR-supported prevention

1 The Presidential Emergency Plan for AIDS Relief
2 Department For International Development (UK)
3 United Nations General Assembly Special Session

sites were active in 40 of the 64 existing Vietnamese provinces, reaching in a year a reported 480,600 at-risk persons (http://www.pepfar.gov/press/countries/profiles/116324.htm).

At the same time, the Vietnamese government was spending US$9.7 million on the fight against HIV (UNGASS 3rd country report, 2006), amounting to less than 1% of the Ministry of Health's budget. As a consequence, Vietnam became highly dependant on international aid to finance its fight against the epidemic. According to the Vietnamese Administration for HIV/AIDS Control, international aid accounted for 80% of national spending on HIV in 2008. This dependency to foreign aid makes the situation fragile with Vietnam about to achieve middle-income status in 2010. Because of this new economic status, Vietnam might lose a significant share of that international aid in a context where more than 70% of the needs are not covered and the latest projections do not show a decrease in the general prevalence (UNAIDS). Furthermore, the government's resources are limited. Notwithstanding a considerable push in public spending on health care in recent years, as shown in Figure 3, direct out-of-pocket payment for 86% of the global system cost in 2006 according to World Health Organisation[4].

***Figure 3 The MoH spending**: Public health expenditure in Vietnam in current billion of US$ from the year 2000 to 2007*



Source: Vietnamese Ministry of Health

It is clear that without donor assistance the Vietnamese government would struggle to finance the expansion of existing HIV/AIDS prevention and treatment programmes. With about 30% of the needs covered in terms of prevention activities and medical assistance to PLHA and already an annual budget of about US$120 million, filling the gap would require as much as US$360 million, more than one-third of the Ministry of Health's financial resources.

[4] http://www.who.int/countries/vnm/en/

There is thus a critical need for identifying the most cost-effective models of intervention in the Vietnamese context to help scale-up programmes in the country and meet the needs in respect of both prevention and treatment. The objective here is to give access to care services to about 300,000 PLHA, the great majority of them young adults, as well as to expand prevention activities to ensure the epidemic is contained and does not spread to the general population.

The model developed by Médecins du Monde (MDM) in Vietnam

It is in this context of limited resources and high social barriers for at-risk population that the French non-governmental organisation, Médecins du Monde, developed an integrated prevention and care model, implemented at the end of 2005 in Tay Ho, a district of Hanoi. With PEPFAR funding, MDM has been supporting a government-run outpatient clinic offering comprehensive services, including prevention, harm-reduction and HAART (see Figure 4). The MDM has undertaken both financial and technical support and the main components of its model include:

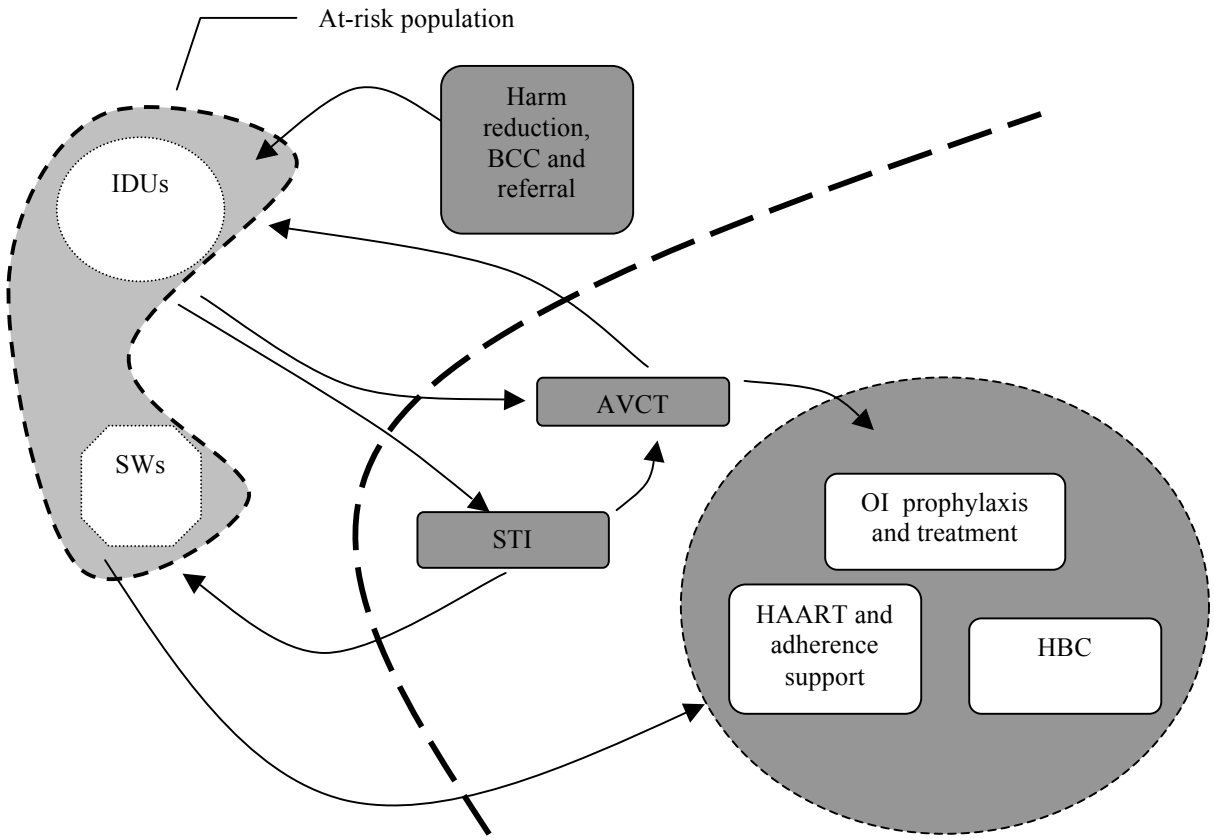
- A prevention component consisting of two main elements: the mobile outreach team and the VCT unit. They work in parallel to reach a common goal: to reduce HIV transmission in at-risk populations in Hanoi. The prevention component includes harm-reduction and behaviour change communication activities, voluntary testing, spreading general information about the epidemic and referring PLHIV to the care and treatment unit. The general population of the city is not a primary target of the programme, though services are open to anyone.
- A care and treatment department: The outpatient clinic offers a comprehensive service to registered patients, from adherence training and support to home-based care and HAART. All services are provided free of charge, including routine biological and morphological tests (ultrasound, X-Ray, scanner). Hospitalisations for severe opportunistic infections are generally not covered by the programme, unless exceptional cases arise.

The assumptions that led Médecins du Monde to implement such of model of action were that integrating prevention, detection, and care & treatment services within the same structure would help better targeting and attracting at-risk populations, hence increase programme performance, and finally build a cost-effective response through cost-savings and internal programme synergies.

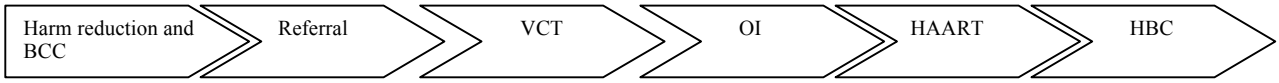
The Tay Ho model in itself is not original. It has already been set up in other countries. But such a comprehensive, all-encompassing model was rare in Vietnam at the time of implementation.

(A more detailed description of the various sub-units of each component is provided in the annex section including staffing, working hours and links with Médecins du Monde)

Figure 4 The programme's components *: organic relations in between the program and the context*



A continuous flow : from at-risk person to patient



Source: PhD - VG

Goal and objectives of the research

According to research cited in previous sections, about one-third of the HIV prevention and medical care needs are covered in Vietnam. Though the HIV epidemic in Vietnam is growing slowly and affects primarily the younger population, long-term aid could be at odds with its development in the next decade. It is therefore critical to identify suitable responses and solutions to optimise resource allocation and to help build a sustainable and effective response to the epidemic.

Hence, the goal of this research is to test the hypothesis on which this model of intervention relies:

- the integration of outreach, detection and care & treatment components within the same outpatient clinic, in the Vietnamese context, results in a high caseload of at-risk clients and patients along with structural economy of scale, translating in high cost-effectiveness levels for the model's key components.

As such, the goal of the research translates into the following objectives:

- Assessing model's outputs by analysing prevention, testing and care & treatment components performance in term of provision, coverage, utilisation and impact
- Analysing central components of the model (VCT and HAART) cost-effectiveness, vs. the null-set scenario, and standards reflected in international literature
- Analysing potential sources of synergies within the program and their impact on the cost-effectiveness level of its key components

Material and method

Framework

This research is based on a bottom-up three-layer analysis:

- one related to each programme's component performance and output;
- another related to each programme component's costs and unit costs; and
- a third related to the cost-effectiveness analysis of the programmes's two central components, the VCT and the care and treatment services

Results are presented as follows:

- A first part presenting performance results
- A second dedicated to the financial and economic analysis, laying out:
    - Model's components financial unit-costs
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Key findings of each part are presented in a box at the beginning of each section.

Programme's output were directly computed and analysed from site's primary data and Médecins du Monde M&E reports. Financial information comes from the

Médecins du Monde's program accounting documentation.
Data were processed used Excel® matrixes.

For each layer, the method of data collection and analysis is designed to address some field-related constraints including that:

- the research is partly based on retrospective data;
- the field is not designed to conduct academic research; and
- the M&E system at field level is limited and cannot be adapted for the purpose of the research.

Meanwhile, the method had to be transparent, reproducible, and had to generate transferable information. Yet, ensuring the transferability of the results could be problematic. For instance, indirect costs at NGO level could represent a significant share of one cost-centre's total cost. Yet, as demonstrated by T Adams (Adams 2006), overhead, management and supervision costs allocation methods can be a major obstacle to the transfer of results, because they often give conflicting recommendations.

As a result, the theoretical foundation of the thesis is founded on:

- Habicht's guidance on the development of programme performance indicators in terms of provision, coverage, utilisation and impact (Habicht et al.1999);
- the World Health Organisation-CHOICE guideline on cost-effectiveness analysis[5]; and
- an adaptation of the step-down accounting methodology to allocate indirect costs in a systematic fashion.

Performance and impact analysis

The programme performance analysis is the first layer of analysis of the research. Its aim is to ascertain the ability of the programme to reach its target population and measure programme's outputs which would later translate in sensible unit-cost indicators.

Taking into account Habicht et al's recommendations (Habicht et al. 1999), we built a set of indicators for each component considering four categories: provision, utilisation, coverage and impact. This allowed us to track the performance of the programme at different stages.

Provision indicators reflect the accessibility of a programme and its ability to effectively provide services. These could be, for instance, its geographic accessibility, the size of a target population within the catchment area, the quality of services offered at site level per staff training level, or behaviour.

Utilisation indicators refer to the actual caseload and level of activity of a site or programme. They correspond to the *output* of the programme, but not its *outcome*.

[5] http://www.who.int/choice/en/

Coverage indicators correspond to the interface ability of a programme in reaching its target population. These include, for the purposes of this research, at-risk persons and PLHA in Hanoi.

Finally, impact indicators are directly related to the outcome(s) of a programme, its effect on a population health status, attitude, or knowledge. They measure the level of achievement of a programme's goal.

A minimum set of indicators of each type can inform the programme's intermediate processes, its outputs and outcomes. We will discuss again impact indicators in the cost-effectiveness analysis section of this dissertation by introducing the measurement of Disability Adjusted Life Years (DALY). The main indicators used in that section of the research are described in Table 1.

Table 1 Research's indicators: *selected indicators in term of provision, utilisation, coverage and impact, classified per component*

Prevention activities		
Outreach – harm reduction	Provision	Hours of service; No. of districts covered by the team; Fees; services provided
	Utilisation	No. of at-risk persons contacted
	Coverage	No. of contacts per at-risk category (No. of Injectable-Drug Users contacted; No. of Commercial-Sex Workers contacted; No. of Men Having Sex with Men contacted; No. of Sexual Partners (SP) of an at-risk person contacted; No. of "others" contacted) with gender breakdown. HIV prevalence among referred VCT clients per at-risk category and gender.
	Impact	*Not applicable*[6]
VCT	Provision	Hours of service; fees
	Utilisation	No. of clients No. of clients referred by the outreach team, with their risk category
	Coverage	No. of clients per at-risk category (No. of IDUs contacted; No. of CSWs contacted; No. of MSM; No. of SPs of an at-risk person contacted; No. of "others" contacted) with gender breakdown. HIV prevalence among referred VCT clients per at-risk category and gender. HIV prevalence among non-referred VCT clients per at-risk category and gender
	Impact	No. of PLHA diagnosed and referred No. of infections avoided[7]
Care & Treatment activities		

[6] Due to the nature of the research, it was not possible to measure the impact of that activity. Various teams from different programmes were operating in the same areas at the same time. Impact would have been impossible to establish

[7] Per say, it is not possible to measure directly the impact of VCT on HIV transmission. We used assumptions from the World Health Organisation (Hausler 2006, Sweat 2000) that the average number of infections avoided ranged from 1 to 24 per 100 negative tests, with an average of 10.

Pre-HAART stage	Provision	Hours of service; fees
	Utilisation	Average No. of patients at pre-HAART stage
	Coverage	CD4 level at the time of registration; drug-use past or current
	Impact	Drop-out ratio[8]
HAART stage	Provision	Hours of service, fees; geographic origin of the patient
	Utilisation	Average No. of active patients on HAART
	Coverage	CD4 level at the time of treatment initiation
	Impact	Mortality at +6 and +12 months after HAART initiation CD4 increase at +12 months CD4 increase of at least +100 points at +12 months[9]

[8] Because of the high drop-out level in the programme, mortality was not computed because of a massive information bias

[9] This is a definition used in the WHO guideline on HAART as an indicator of treatment success in the absence of viral load monitoring

Financial and economic analysis: using World Health Organisation-CHOICE initiative guidance

Another theoretical foundation of the research is a cost-effectiveness analysis guideline developed by the World Health Organisation (WHO).

In the year 2000, the WHO launched an initiative around cost-effectiveness analysis in an effort to harmonise methodologies, and to mainstream cost-effectiveness research. This is known as the CHOICE initiative (Murray 2000, http://www.who.int/choice/en/).

The WHO-CHOICE initiative includes cost-effectiveness ratios benchmarks, classified per region and type of intervention.

The methodology prescribed by the CHOICE initiative is based on some key factors, including:

- strict cost identification;
- valuation and analysis methods;
- the use of DALY[10]s as the final indicator for the calculation of ICER[11] over QALY[12] or HLY[13];
- the possibility of calculating ICER vs. the null-set scenario when no prior intervention is evaluated in a given field; and
- the conduct of a sensitivity analysis.

An additional external source of information that informs the method is the Global Burden of Disease report. The disability weight factors contained in the report are critical in calculating DALYs.

Insofar as this research is concerned, the costs-related methodology is the most critical input from the CHOICE guideline. This methodology is summarized in Table 2 , Table 3 and Table 4.

We use the World Health Organisation-CHOICE method among many (Guiness 2004, Walker 2001) to analyse the cost-effectiveness of the programme, because this method is internationally recognised and guarantees the transferability of the results to other sites and programmes. Production gains or losses are not to be included per CHOICE guideline, an essential factor in the context of Vietnam, in which the most important target populations in respect of HIV/AIDS are social outcasts.

The DALYs calculated in that research are DALYs (3,0), with a time discount of 3% and no age factor. This calculation was based on the need for comparability.

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10 Disability Adjusted Life Years = Years of Life Lost + Years of Life with Disability

11 Incremental Cost Effectiveness Ratio

12 Quality Adjusted Life Years

13 Healthy Life Years

Table 2 WHO-CHOICE recommendations on costs allocation

Cost of providing health interventions	All necessary resources to make the intervention available should be included
Cost of accessing health interventions	Patients transport costs should be included
	Time costs should not be included if not relevant
Production gains or losses	Should not be included, or reported separately if relevant
Health costs in extended years of life	Should not be included
Joint or overhead costs	Should be integrated and includes higher levels of the organisational system
Cost offsets or related health costs	Already integrated provided interventions upon analysis are mutually exclusive

Source: adapted from the World Health Organisation-CHOICE guideline

Table 3 Costs valuation per WHO-CHOICE (with Hutton 2005)

Economic prices		Should be at the base of the analysis, using ingredient approach
Transfer payment		Excluded, granted direct administrative costs are identified
Unit of account	Traded goods	Valued at the international price (CIF price if imported, COB price if exported)
	Non-traded goods	Scarce labour includes market wage+benefits+extra
		Non-scarce labour should be valued at the average income from original sector
		Building is discussed below
Transferability of costs across time		CPI and GDP are recommended as the most suitable inflation indicators
Transferability of costs across settings		Ingredient approach is the determinant
		Purchase power parities can be used to transfer costs across countries

Source: adapted from the World Health Organisation-CHOICE guideline

Table 4 Cost analysis per WHO-CHOICE

Discount rate and future cost	Using a 3% or 6% discount rate over 10 years
Annualisation of capital investment	Use of an annuity factor A(n,r)
Start up costs	Should be annualised over a proposed 10-year period
Capacity utilisation	WHO uses a typical 80%

Source: adapted from the World Health Organisation-CHOICE guideline

The step-down accounting method

The last piece of guidance comes from a well-known method to calculate unit costs in health care facilities, called step-down accounting. Step-down accounting is a simple and practical method widely described in methodology papers (Shepard 1998, Conteh 2004, Drummond 2005) to calculate unit costs at facility level. The method is based on the definition of the final product(s), and hence the cost centres incurred. Unit costs are calculated by integrating all direct and indirect costs necessary to the production (see Table 5).

Table 5 The steps of Step-Down accounting

Define the final product
Define cost centres
Identify the full cost for each input
Assign inputs to cost centres
Allocate all costs to final cost centres
Compute total and unit costs for each cost centre
Report results

Source: adapted from Conteh and Walker 2004

Using the ingredient method, all costs should be included, including those linked to the direct production of the activity measured, and the intermediate and indirect costs. SDCA defines three cost categories:

- Direct costs: directly linked to the activities related to the cost centres;
- Intermediate costs: operational support activities, such as laboratory, or the pharmacy of a hospital; and
- Indirect costs: administration, transport, laundry, catering, cleaning and maintenance.

Adaptation of step-down accounting to allocate programme and non-governmental organisation shared indirect costs.

Although step-down accounting is a gold standard method, its guidance remains incomplete in respect of indirect costs allocation, and especially when those are shared by different cost centres. This is often observed in an NGO-supported setting.

Typically step-down accounting would allocate indirect shared costs to cost centres according to staff interviews, or the use of logbook (Conteh and Walker 2004) to track staff's time allocation. The variation in these costing methods can lead to some shortcomings, especially when shared indirect costs represent a significant share of the total, as is often the case in NGO-supported programmes. The transferability of the results can be at stake (Adams 2006). Furthermore, it leaves little room for retrospective analysis because memory recollection can be subject to biases, and/or the use of logbook can be eluded or ignored. Moreover, work cycles can change over a given time period, especially at management level. Managerial and administrative time allocation can fluctuate wildly according to programme's constraints. This is

especially important in the domain of NGO-supported programmes in which life cycles give way to significant staff time allocation variations.

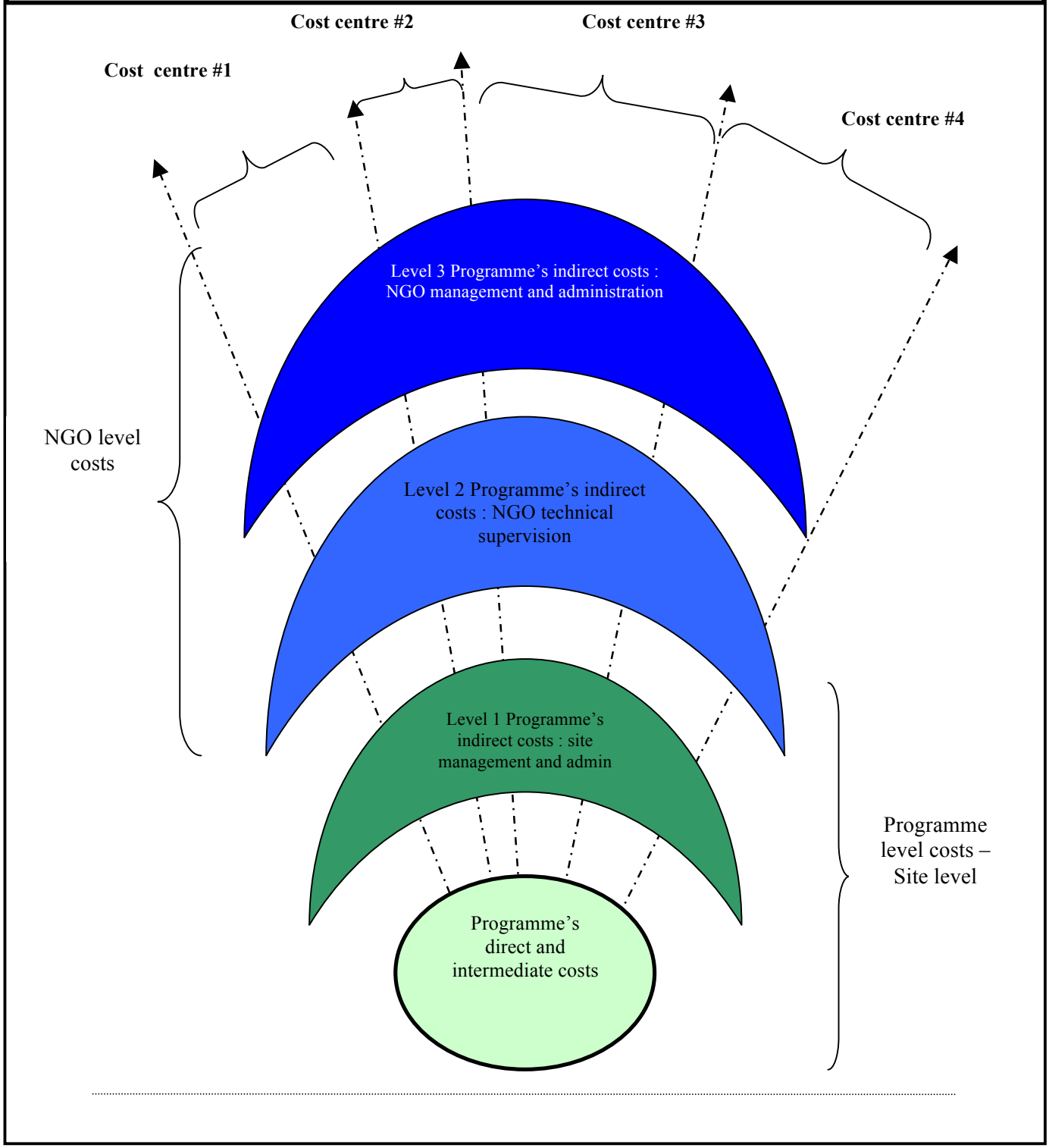
Therefore, we propose a systematic method to allocate shared indirect costs to cost centres: a method that we use consistently in the research to compute cost centres' unit costs by allocating indirect costs at programme and NGO level.

The method we call weighted-step-down accounting (WSDA) respects the bottom-up recursive approach of step-down accounting. It uses cost centres direct and intermediate costs as a rule to allocate programme's and NGOs' shared indirect costs.

WSDA separates the cost centre unit costs into four categories (see Figure 5):

1. Programme's direct and intermediate costs: these reveal the core process costs;
2. Level 1 programme's indirect costs: these disclose the supervision and administrative costs of a transferred programme;
3. Level 2 programme's indirect costs: these are the NGOs' technical assistance costs and they reflect the technical supervision requirements in the early phases of a programme; and
4. Level 3 programme's indirect costs: these are the NGOs' indirect costs and disclose the technical assistance afferent costs, and the interface role of the NGO in complex environments.

Figure 5 The principle of WSDA *: bottom-up approach from cost centres to general supervision*

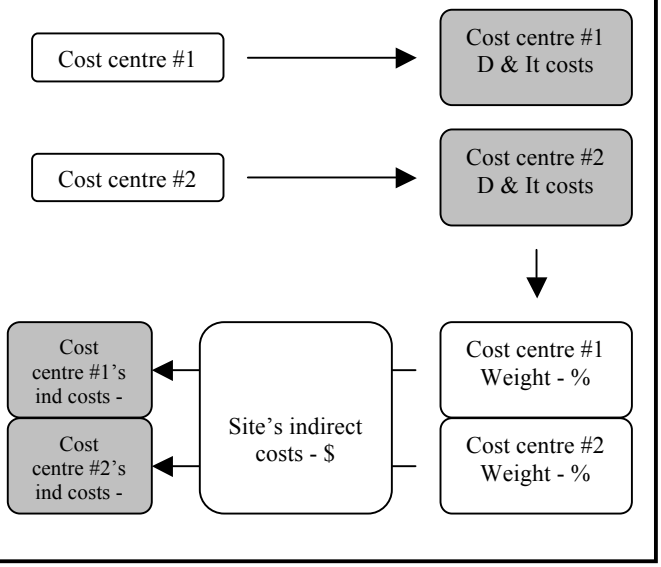


Source: PhD - VG

This allows for in-depth tracking of unit costs, information that reveals back-office costs of any given programme and that is useful in sustainability and affordability discussions.

The method takes several steps, using financial costs, to define and integrate shared indirect costs in the cost centres' unit costs (see Figure 6 and 7):

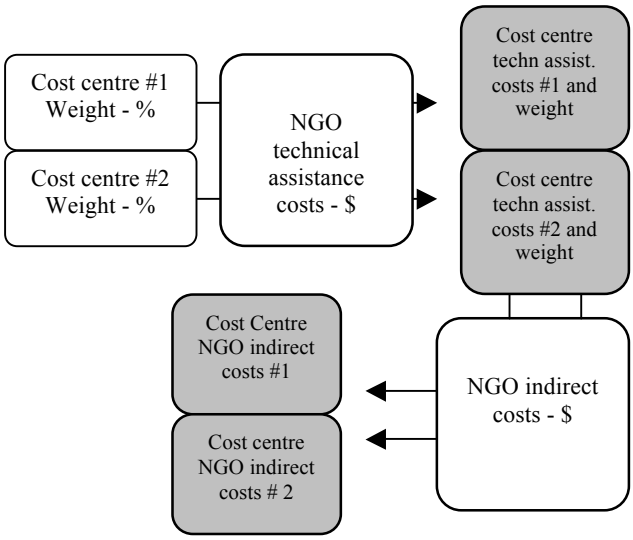
Figure 6 the SDWA steps – part 1/2



Source: PhD - VG

1. The programmes' cost centres direct and intermediate costs are calculated using the ingredient approach, which follows classic step-down accounting methodology. Concurrently, indirect costs are calculated using the same ingredient approach, whether they are shared or not. Non-governmental organisation's costs are broken down into technical assistance areas and managerial and administration costs.
2. Cost centres' direct and intermediate costs are individually reported to their respective global financial values to estimate their financial weight. This financial weight is the key determinant to allocate indirect costs at site level.
3. Level 1 shared indirect costs are distributed to cost centres according to each cost centre's financial weight.

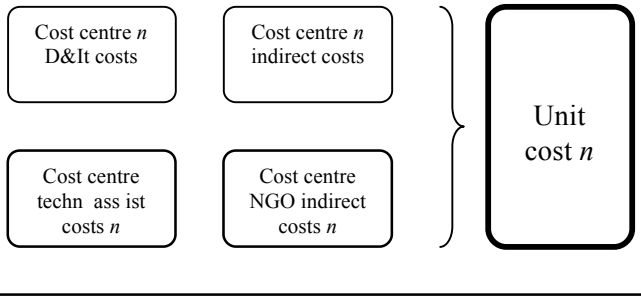
Figure 7 the SDWA steps - part 2/2



Source: PhD - VG

4. The same is performed for an NGO's shared technical assistance costs with respect to its areas. Otherwise, NGOs' technical assistance costs are fully allocated to their respective cost centres. So we obtain for each cost centre its technical assistance cost (Level 2 indirect costs).
5. Following the same logic, in which the financial weight of an activity acts as a rule to allocate its related indirect costs, the NGO's indirect costs (Level 3 indirect costs) are allocated to costs centres according to the cost centres' technical assistance weight (the financial weight of each technical assistance area reported to the global technical assistance costs).
6. Finally, all costs are added up to the cost centres (See Figure 7)

Figure 8 WSDA summary



Source: PhD - VG

Thus, the method produces unit costs with a great degree of flexibility in respect of the requirements of the analysis undertaken. It allows for greater understanding of the costs incurred in arriving at the final product(s).

The example given here is simple and linear. Although it might reflect the theoretical situation of many NGO-supported interventions, some complications can arise in practice, such as:

- a site might be the host of several interventions; or
- an NGO might support different interventions.

In such cases, the same logic must be applied, but with the definition of other cost centres, at site and/or programme level, linked to the other interventions to avoid double counting. This rule applies to cost centres intermediate and indirect costs, as well as costs borne by the NGOs.

The method relies on an assumption: that indirect costs should follow the financial value of a given activity, and that all supervising resources are optimally allocated at programme level to avoid the waste of resources. But because of temporary difficulties and variations in a programme, or for reasons of mismanagement, some supervision resources might have to be over-allocated to less worthy components. For instance, a programme officer might have to spend more time on certain activities though they are of little financial value. Such discrepancies are not captured in the method we propose.

Nonetheless, the methodology is useful for managers to identify those discrepancies: by conducting staff interviews to estimate their time allocation and compare it to what the method would predict as the optimum and to more easily identify gaps and/or problems. The comparison of the perception of the staff to the optimum allocation calculated using the method might also identify weaknesses in a programme's staffing mechanisms.

Table 6 Strengths and weaknesses of WSDA vs. Log book and staff interviews

	Strengths	Weaknesses
Weigthed Step-Down accounting	▪ Allows retrospective analysis ▪ Allocate indirect costs in a replicable and transferable manner	▪ Does not catch actual staff time allocation ▪ Might over-estimate the weight of an activity if high-costs items are incurred in that activity
Log Book	▪ Keeps track of staff actual time allocation	▪ Highly subject to the quality of log entries ▪ Does not allow retrospective analysis ▪ Results might not be transferable
Staff interview	▪ Keeps tracks of perceived staff time allocation	▪ Might be subject to information bias ▪ Considerable loss of information in case of staff turnover ▪ Limits the depth of a retrospective analysis ▪ Results might not be transferable

Using financial unit costs to track synergies, inform the field, and prepare ground for cost-effectiveness analysis

Sole economic costs allow for international comparisons and the full transferability of results. Yet, the use of financial unit costs in themselves provides an interesting perspective on project management and implementation to both the supervisor and the donor. Financial unit costs are sufficient in this case to look for potential synergies within the programme. Contextualised information does not hamper internal sensitivity analysis using key parameters variations.

By easing and systematising the production of financial unit costs in a given economic context, the method permits comparisons across programmes operating within a given market. It opens the possibility for managerial structure comparisons in a given context, provided economic factors are homogenous. A wide variety of financial unit costs might compensate for the difficulties of transferring the results to other contexts, assuming the financial unit costs production is mainstreamed in the NGO environment.

In any case, both financial and economic unit costs can be produced. The consistent use of the ingredient approach permits the transfer of financial costs to economic costs using the WHO-CHOICE guideline on cost valuation and analysis. And the comparison of financial and economic unit costs can be very informative. Major differences between them reveal some important market distortions because, for instance, of the scarcity of specialised labour or unusual tariffs on critical inputs.

Moreover, as costs are not annualised in a financial approach, the specificities of starting up a programme could be finally unveiled. Designing and implementing a programme in its early phase requires extra resources that a country, a state or an administration might not be able to mobilise. Economic costs are typically averaged and discounted over a 10-year period. Yet, simple financial analysis shows that implementing a new programme results in a surge in the use of resources, with financial unit costs decreasing as the project matures. Economic information might lose this dynamic aspect in the early phases of a programme through costs annualisation.

Finally, permitting the production of financial unit costs by NGOs in a systematic fashion mainstreams the use of cost-effectiveness analysis. For the purposes of this research, HIV-related cost-effectiveness evaluations are carried out on a large scale (for example, Goldie 2006, Creese 2002, Cleary 2006, Hogan 2005). They intend to analyse large programmes, or a collection of programmes at national or regional level. Little data is available in respect of micro-scale programmes, especially those operated by NGOs.

The complexity of carrying out a cost-effectiveness analysis in an NGO environment, the lack of guidance in terms of shared indirect costs allocation is a critical obstacle to the systematisation of cost-effectiveness analysis for obvious transferability reasons. We think the method we propose herein could be a way around this problem.

A by-product of the method: procedural intensity

Capital intensity is a term often used in economics to describe the concentration of physical capital invested in a production process. We deem money is not the sole gap in international aid. Management is critical as a way to channel funds and interface with complex environments. The legitimacy of NGOs is built on their expertise and practical experience in implementing solutions. They often work under international funding mechanisms. Their added-value is mostly technical, and their credibility often determined by the manner in which they manage funds. International NGOs, common partners to some important bi- and multilateral-funding mechanisms such as PEPFAR or the Global Fund, are often perceived automatically as strong technical and fund managers. Yet little is known about their actual role and participation in the aid process.

By offering a systematic method of shared-indirect costs allocation to calculate unit costs we think we could open a new field of investigation by measuring and revealing the interface role of the NGOs (Level 2 and 3 indirect costs – what we call procedural intensity).

We believe this information is critical to increase the possibility of scaling up or transferring a programme to local health authorities. Furthermore, monitoring this procedural intensity allows comparisons across interventions and/or implementers, using financial unit costs in a given economic context, or economic unit costs at international level.

Types of costs used in this research

For this research, we use:

- Financial unit costs to identify potential internal synergies between the programme's components and to calculate key programme's unit costs; and
- Economic costs to conduct the cost-effectiveness analysis of VCT and care and treatment services.

We also used financial costs to re-calculate the cost-effectiveness of the VCT and the care and treatment services to compare them to the results of the economic analysis.

Ethical concerns and clearance

The ethical clearance of that research has been given by the Hanoi Medical University Public Health Department.
No ethical concern has been raised by this research.

The restitution of the information at local level took place in July 2010 during an UNAIDS/PEPFAR sponsored event at the Hanoi School of Public Health

Part B Results

Programme's outputs analysis

Key findings 1

Programme performance analysis key findings
In the outreach component
▪ Taking night shifts, the Outreach team offered a relevant **provision** of services to target populations but the MSM. ▪ In term of **coverage**, the Outreach team managed to offer services in hotspots all over the city thanks to a dynamic mapping process. ▪ In term of **utilisation**, the outreach team contacted 1485, 1455 and 2376 at-risk persons in year 0, 1 and 2. The most important groups reached where male IDUs (47.9%), female sex-workers (10.3%) and male People Living with HIV/AIDS (10.2%) ▪ The MSM was not efficiently targeted with only 48 contacts in 3 years, probably because of the absence of MSM peer-educators in the team ▪ In term if indirect **impact**, the outreach team referred 137, 507 and 601 clients to VCT in years 0, 1 and 2 (23.4% of the total)
In the Voluntary Counselling & Testing component
▪ In term of provision, the VCT opening hours seemed adequate to the target population although it was not opened at night or on week ends ▪ As a fixed unit, VCT coverage was limited to clients with the financial means to be transported to the outpatient clinic (which could be equivalent from 10,000 VND to 40,000 VND – US$0.75 to US$2.5) ▪ In term of utilisation the VCT unit tested 1881 over 3 years (from 184 in year to 1058 in year 2), of which 66.2% were directly referred by the Outreach team. The average infection rate of referred clients was 43.9%, and 35.7% for non-referred clients ▪ In term of impact, we estimate the VCT helped advert 122 infections
In the care & treatment component
▪ As the service was available for free from Mondays to Fridays, the provision was deemed excellent ▪ As a result coverage of the unit was satisfactory with patients coming from the entire city ▪ Utilisation of the service was robust with 739 patients who registered to the clinic over the course of the 3 years, of which 419 started HAART. 89% of the registered patients went through the VCT department in the first place ▪ In term of impact, results seemed more fragile with 38.4% of HAART patients seeing a satisfactory increase in their CD4 level after 12 months of treatment
Conclusion
The model actually worked as a synergic flow from outreach to care & treatment activities with clients and patients belonging to the at-risk groups of populations with the exemption of MSM group.

Performance in the prevention component: outreach and Voluntary Counselling and Testing (VCT)

As described in the previous chapter, the prevention component consists of two main elements: a mobile outreach team and a VCT unit. The two work in parallel to reach the goals of reducing HIV transmission in at-risk populations in Hanoi, and helping identify PLHA in need of treatment.

The mobile outreach team

The performance of this team is evaluated in terms of provision, utilisation, and coverage. Direct impact is not assessed, however, because harm-reduction and prevention activities are too complex and subject to bias to be assessed in term of outcomes, so the actual impact of the team's prevention activities is not measurable. This is because other mobile outreach teams are operating concurrently in Hanoi, sometimes in the same neighbourhoods and targeting the same groups. Isolating the effect of the Tay Ho mobile outreach team might prove impossible, or at the very least present challenges to creating a sound statistic model to measure the incidence of HIV within hidden groups of population, Nevertheless, we propose to use the capacity of the team to convince at-risks persons to be tested as a proxy-indicator for this component.

Provision of services

- **Hours**: the mobile team's hours of service appear adequate to meet the needs, particularly to respond to night time street-based activity. Nonetheless a large share of the commercial sex work takes place during the day, mostly in massage parlours and some karaoke bars, which were not identified as a critical target in the first phase of the programme, and hence couldn't be addressed by the programme. As mentioned in the most recent survey (IBSS 2006), HIV impacts more particularly street-based CSW who operate at night. As for IDUs, based on the experiences of the mobile outreach peer-educators most of their "outdoor" activity – trading and 'hanging out' – also takes place at night. In any case, limited provision of outreach services at night lessens the impact of the outreach programme particularly among different sub-groups of the at-risk population, such as clients of CSWs in massage parlours, so-called invisible CSWs and the MSM population.
- The number of **districts** covered in the city ranged from three (3) at the beginning of the programme to twelve (12) after 24 months of operation. It is of course impossible to evaluate whether all hotspots of the city were being covered, because of the covert nature of commercial sex work. However, there was no geographical limitation to the mobile outreach team's work in the city other than its ability to identify new hotspots and to keep track of a highly volatile population**.**
- The team has an unlimited supply of condoms and needles. But, law enforcement in the city has created an extra-barrier to clean needle access. It has been near impossible to set up a needle-exchange programme because of policing activities and also because IDUs are a transient population, constantly on the move in efforts to avoid law enforcement officials. The result is that more needles are given away than are exchanged.

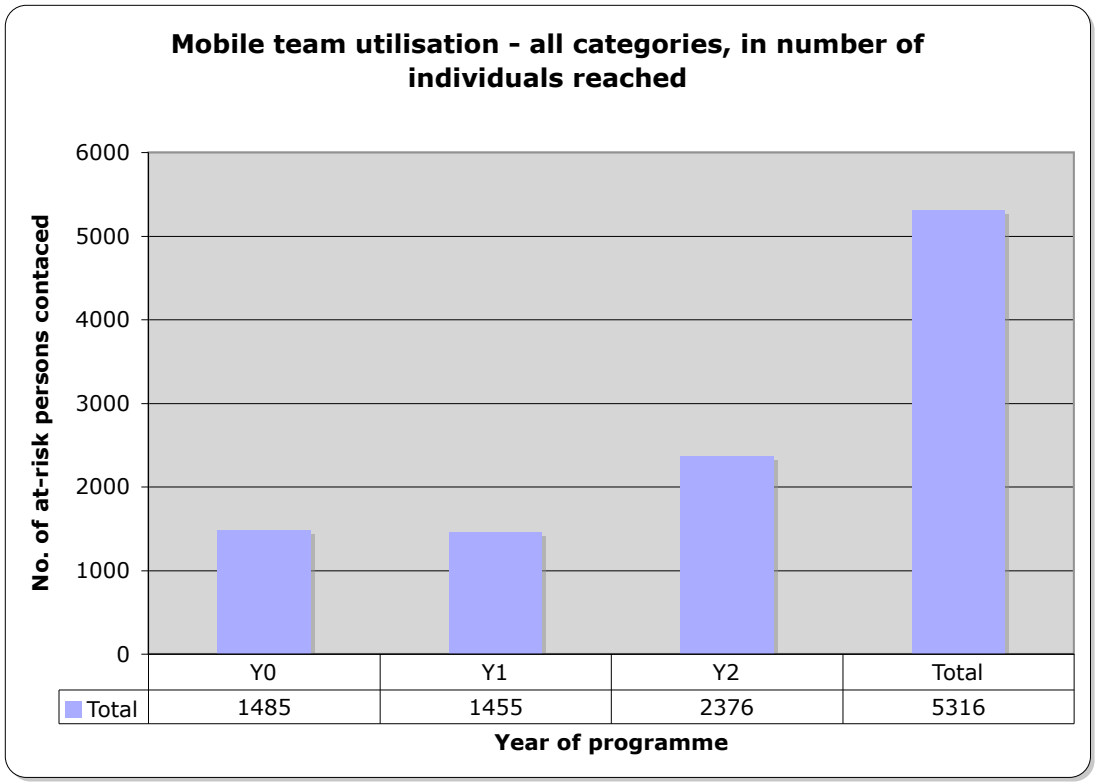
Although the provision of the outreach service to the two key target groups, IDUs and CSWs, appears to be adequate, the situation is less so for two other sub-groups: the bar/club-based CSWs and the MSM who do not engage in sex-work as described in the following sections.

Utilisation and coverage

The mobile outreach team, by definition provides an outreach service, a service that seeks beneficiaries utilisation and coverage (per Habicht definition) of the service are somewhat confounded. In that case, clients would not reach out for the service, but the service would look for them.

During the three (3) first years of programme implementation the mobile outreach team contacted 5,316 persons categorised at-risk, of whom 2,547 were male IDUs and 878 were female CSWs (see Figure 9).

Figure 9 Mobile team utilisation: *number of at-risk clients contacted by the Outreach team over the course of the programme*



Source: PhD - VG

The population of Hanoi is estimated to be about 4 million. But no accurate estimates of the numbers of CSWs or IDUs in the city are available because these groups of people are generally marginalised and therefore their numbers are underreported. Taking into account Hanoi's estimated HIV prevalence rate of 0.45%% of the general population (hence a PLHA population of about 18,000 persons), it is safe to say that

the mobile outreach team reaches about 0.13% of the general population, so probably a third of the potential target population.

Table 7 and Figure 10 show that the mobile outreach team's coverage is consistent with the programme's objectives.

Table 7 Mobile team – coverage: *distribution of at-risk clients contacted by the Outreach team per at-risk categories over the course of the programme*

Coverage – No. of at-risk persons contacted per risk category

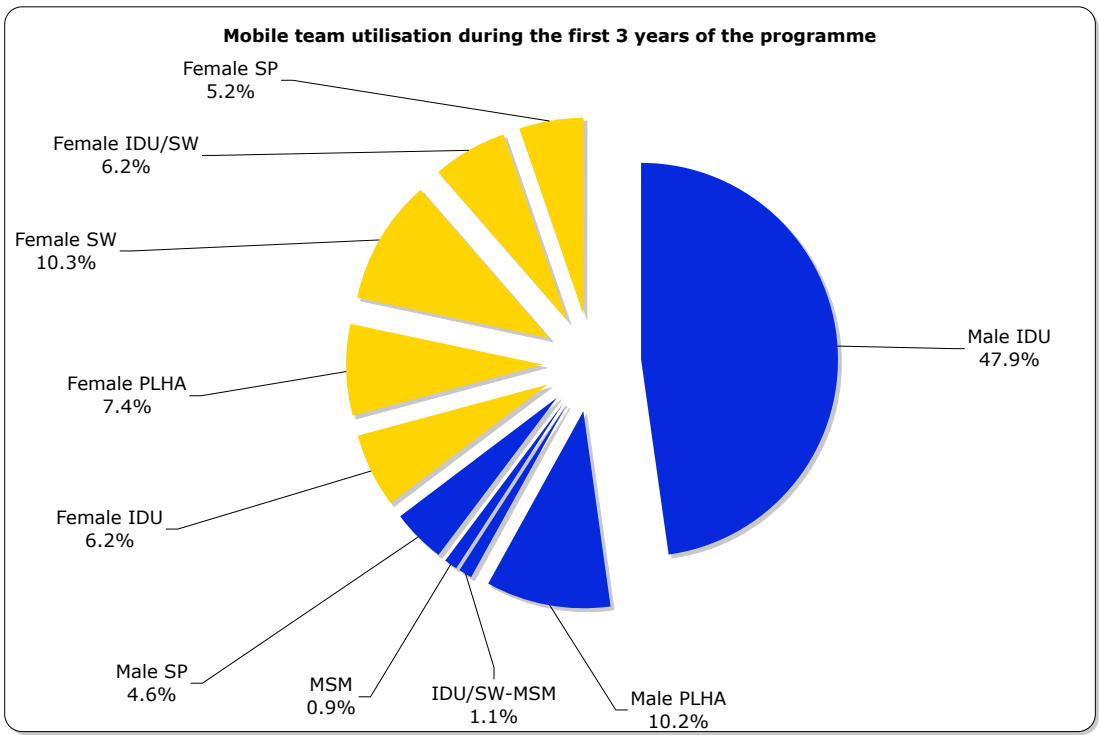
	Y0	Y1	Y2	Total
Total	**1485**	**1455**	**2376**	**5316**
Male	**988**	**732**	**1720**	3440
IDU	793	362	1392	2547
PLHA	141	233	168	542
IDU/SW-MSM	7	15	39	61
MSM	2	26	20	48
Sexual partners	45	96	101	242
Female	**497**	**723**	**656**	**1876**
IDU	0	124	203	327
PLHA	26	221	148	395
SW	230	224	95	549
IDU/SW	139	61	129	329
Sexual partners	102	93	81	276

Distribution of activity per risk category and gender

	Y0	Y1	Y2	Total
Male IDU	53.40%	24.88%	58.59%	47.91%
Male PLHA	9.49%	16.01%	7.07%	10.20%
IDU/SW-MSM	0.47%	1.03%	1.64%	1.15%
MSM	0.13%	1.79%	0.84%	0.90%
Male SP	3.03%	6.60%	4.25%	4.55%
Female IDU	0.00%	8.52%	8.54%	6.15%
Female PLHA	1.75%	15.19%	6.23%	7.43%
Female SW	15.49%	15.40%	4.00%	10.33%
Female IDU/SW	9.36%	4.19%	5.43%	6.19%
Female SP	6.87%	6.39%	3.41%	5.19%
TOTAL	100.00%	100.00%	100.00%	100.00%

Source: PhD - VG

Figure 10 Mobile team utilisation : *cumulative repartition of at-risk clients contacted by the Outreach team over the 3 first years of the programme*



Source: PhD - VG

During the first three (3) years of the programme, almost 50% of the at-risk persons reached were male IDUs. If we include male and female IDUs, and those IDUs engaging in sex-work that figure rises to almost 65%.

It is the MSM target group that is largely under-represented in the outreach programme. This is because MSM, apart from those engaged in commercial sex-work, do not frequent the same hotspots as other at-risk people. So the mobile outreach efforts among this group have been largely unsuccessful. A different approach is necessary to reach the MSM target group.

A sensitivity analysis of different team compositions is suggested, to explore how much the composition of the peer-educator teams influences their ability to identify at-risk populations different from their own. In the case of our research, the composition of the reached population is quite similar to that of the mobile outreach team, with male IDUs over-represented. Peer-educators are hired instead of health professionals because they are thought to be more efficient in developing adequate micro-outreach strategies to target specific population groups.

In this context, there are IDUs and street-based CSWs on the one hand and MSM on the other. And the term MSM encompasses a rather diverse and large population, so is in itself too vague. Interviews with members of the mobile outreach team reveal that the MSM group includes a heterogeneous population of male IDUs who engage in sex work but don't consider themselves as gay, of married men who pay for sex, and also

a more openly gay population either paying for sex or not. Although categorising the different target groups is helpful in defining macro-strategies for intervention, it can also blind one to the realities of social structures because it misses some elementary differences between groups that have little in common in terms of exposure to risk and social behaviour.

Another target group, the Sexual Partners (SP) of at-risk persons is also not adequately reached. The clients of commercial sex workers fall in this category. The design of the mobile outreach team obviously does not allow for engagement with CSW clients, despite the fact that the latter are active in the transmission of HIV. Peer education, however, is perhaps not the best way to reach this particular at-risk group.

The lack of outreach to MSM and SP is further understood when one considers:

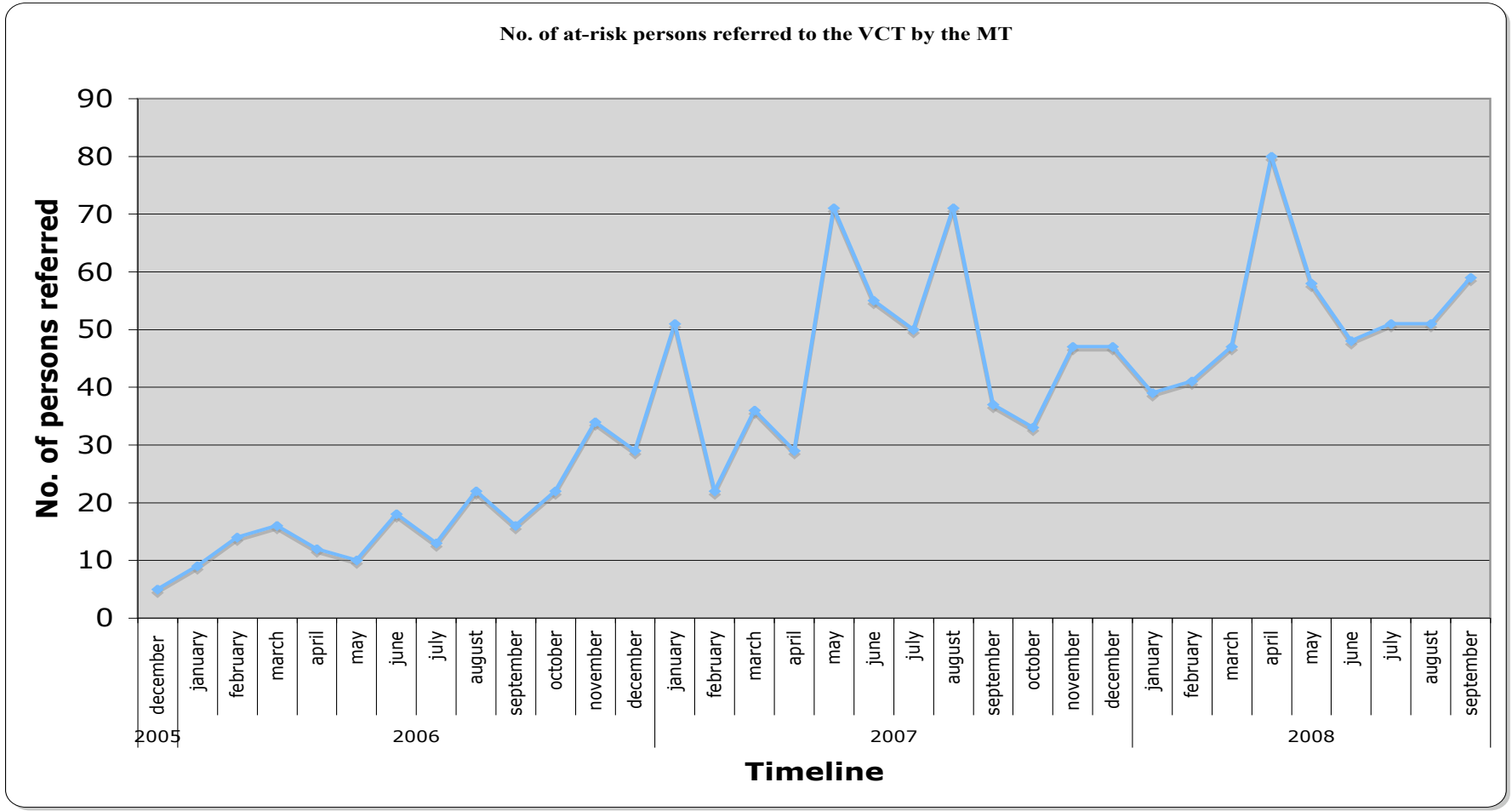
- the lack of coverage of non street-based CSW venues;
- the reluctance of CSW customers to be visible/contacted;
- the different social dynamics that influence MSM;
- the lack of MSM representation in the mobile outreach team, which results in weaker hotspot mapping for this particular at-risk group; and
- the team's primary focus on street-based activities.

Impact

There is no evidence that needles and condoms are consistently used by target populations that received them, or that sufficient quantities of these prevention tools are distributed to meet the needs of at-risk persons identified in the hotspots covered by the team. In light of these realities it is proposed to harness the team's capacity to refer at-risk persons for VCT as a proxy to estimate the team's efficacy in changing the behaviours of at-risk persons.

During the three-year period, the capacity of the team to refer clients to the VCT has gradually improved (see Figure 11)

Figure 11 Mobile team referral activity *: number of at-risk persons referred to the VCT by the Outreach team over the course of the programme*

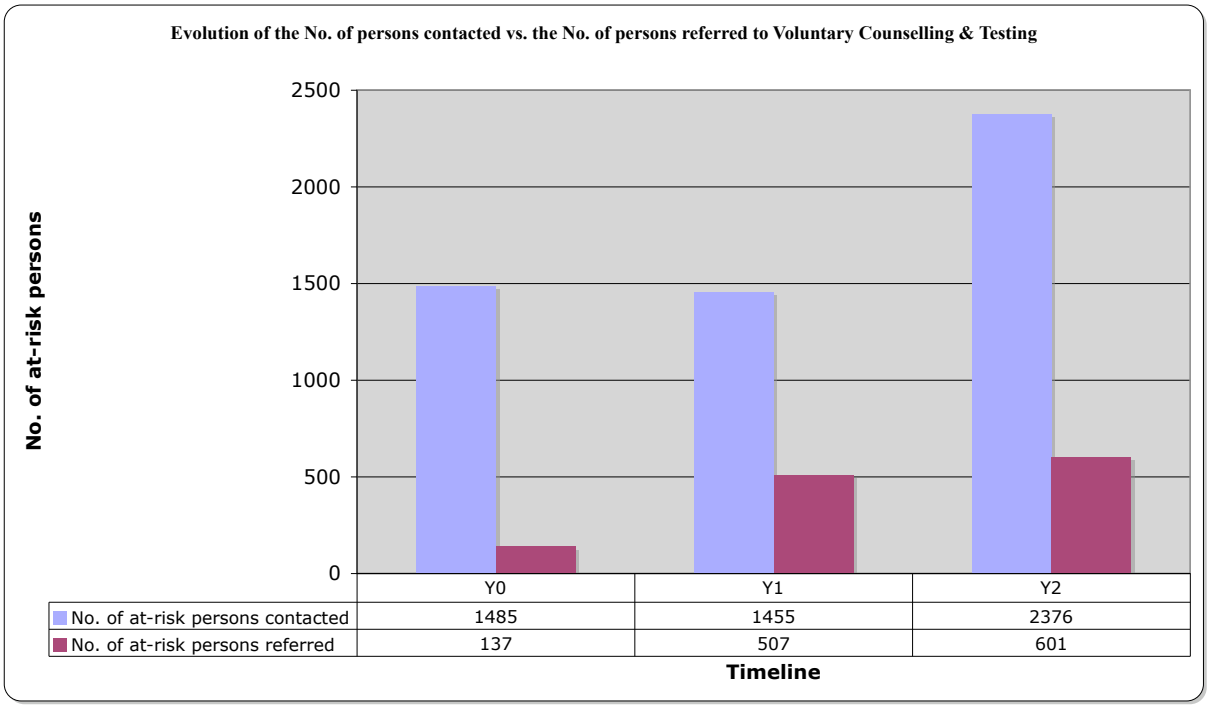


Source: PhD - VG

The data shows a linear progression in the number of clients referred to the outpatient clinic's VCT unit. The increase does not appear to be connected to the number of at-risk persons reached by the mobile outreach team (see Figure 12), but rather appears to be time-dependant. Whereas the number of persons contacted is fairly stable during the three (3) years, there is a constant increase in the number of clients referred by the mobile outreach team for VCT services. The convergence of a number of different factors could explain this pattern, including:

- the improvement of team communication skills combined with limited turnover in staff;
- the favourable response to VCT following mass-media communication plans by NGOs and public authorities
- the generalisation of prevention activities in the city;
- increased motivation among mobile team members; and
- a dynamic mapping process that identified a pool of at-risk persons targeted by the team.

Figure 12 Referred vs. Non-referred: *comparison of the number of referred and non-referred clients attending an HIV test at VCT level over the course of the programme*



Source: PhD - VG

The ratio of the number of at-risk persons contacted to the number of VCT clients referred by the mobile team varied from 9.2% in Year 0 (Y0), to 34.8% in Y1, and 25.2% in Y2, with absolute values increasing over the three years.

Concurrently, other VCT sites opened in the city and mobile outreach team members would provide clients with information about all active VCT centres. It is therefore possible that some at-risk persons reached by the mobile team decided to access services at a VCT centre other than the one running at the outpatient clinic.

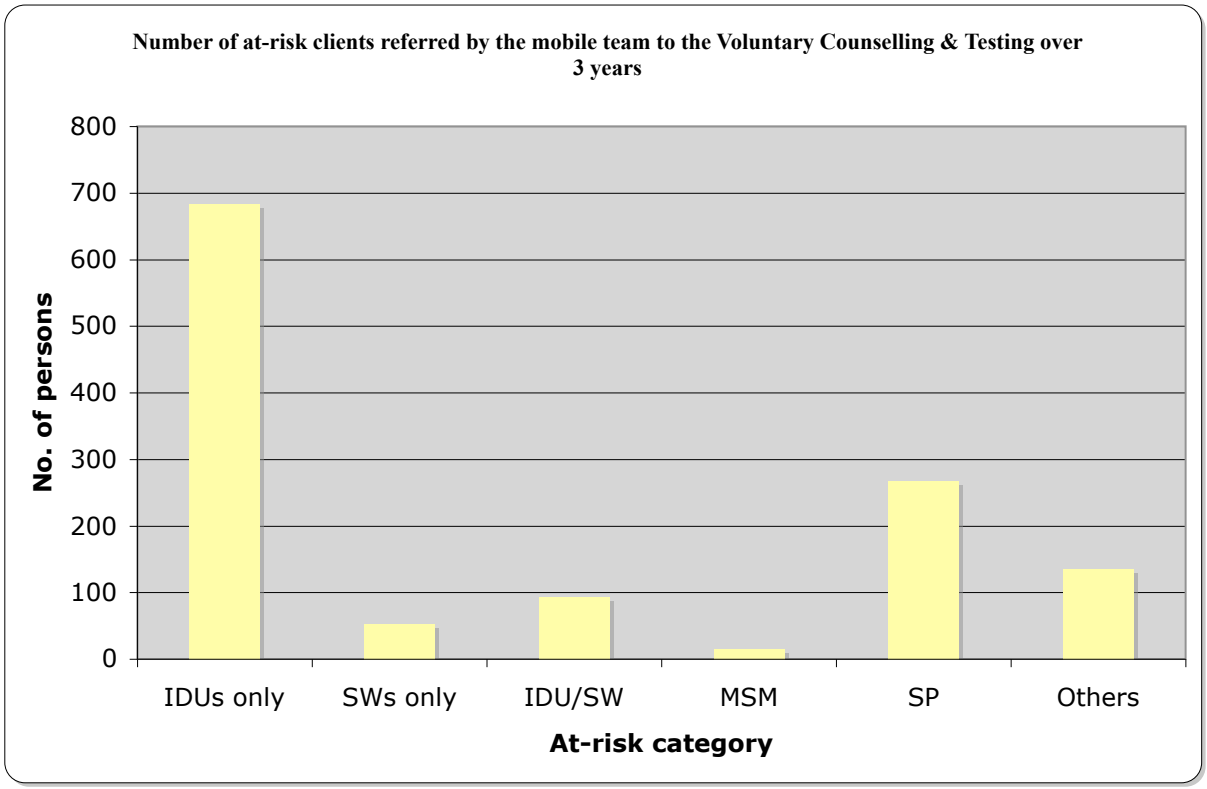
In any case, the mobile outreach team was efficient in referring clients to the clinic's VCT site and improved its overall performance during the first three (3) years of the programme (see Table 8 and Figure 13).

Table 8 The dynamic of referral by the Mobile team : identifying 3 phases over the course of the programme in function of the average number of referred clients to the VCT

	Phase 1	Phase 2	Phase 3
Time period	Dec 2005- April 2006	May 2006 –April 2008	May 2008 – Sept 2008
Average of referral cases per month	11 cases	38 cases	53 cases
No. of cases referred per MT member per month	1.4 cases	4.7 cases	6.6 cases

Source: PhD - VG

Figure 13 At-risk categories referred: *cumulative number of referred clients over 3 years classified in function of their risk category*



Source: PhD -VG

It should be noted that the information presented in Figure 12 is drawn from the records of the VCT unit, where clients were self-reporting risky behaviours. Logically, the risk pattern of the VCT clients is similar to the population's contacted by the mobile outreach team. Notably, the numbers of MSM presenting for VCT is extremely low (about 1%), particularly when compared to IDUs (more than 50%).

The HIV prevalence among the referred clients in the VCT unit is discussed in the following section.

The VCT unit

Provision of service

The operating hours of the VCT unit are not necessarily suited to the life-style of the targeted population. The VCT unit operates during business hours and therefore cannot accommodate persons who work or are active from late afternoon and through the night. However, the outpatient clinic records show that this does not present major obstacles to access. The fact that the unit has only one dedicated counsellor is also not as problematic as would be assumed. During the first three (3) years of the programme the counsellor conducted between two (2) and 12 consultations (on average 20 minutes each) per day.

The fact that the outpatient clinic offers a care and treatment service in addition to VCT might well have boosted the perceived quality of the service, particularly because in many VCT sites in Hanoi are stand-alone and have no formal or direct connection to a medical programme.

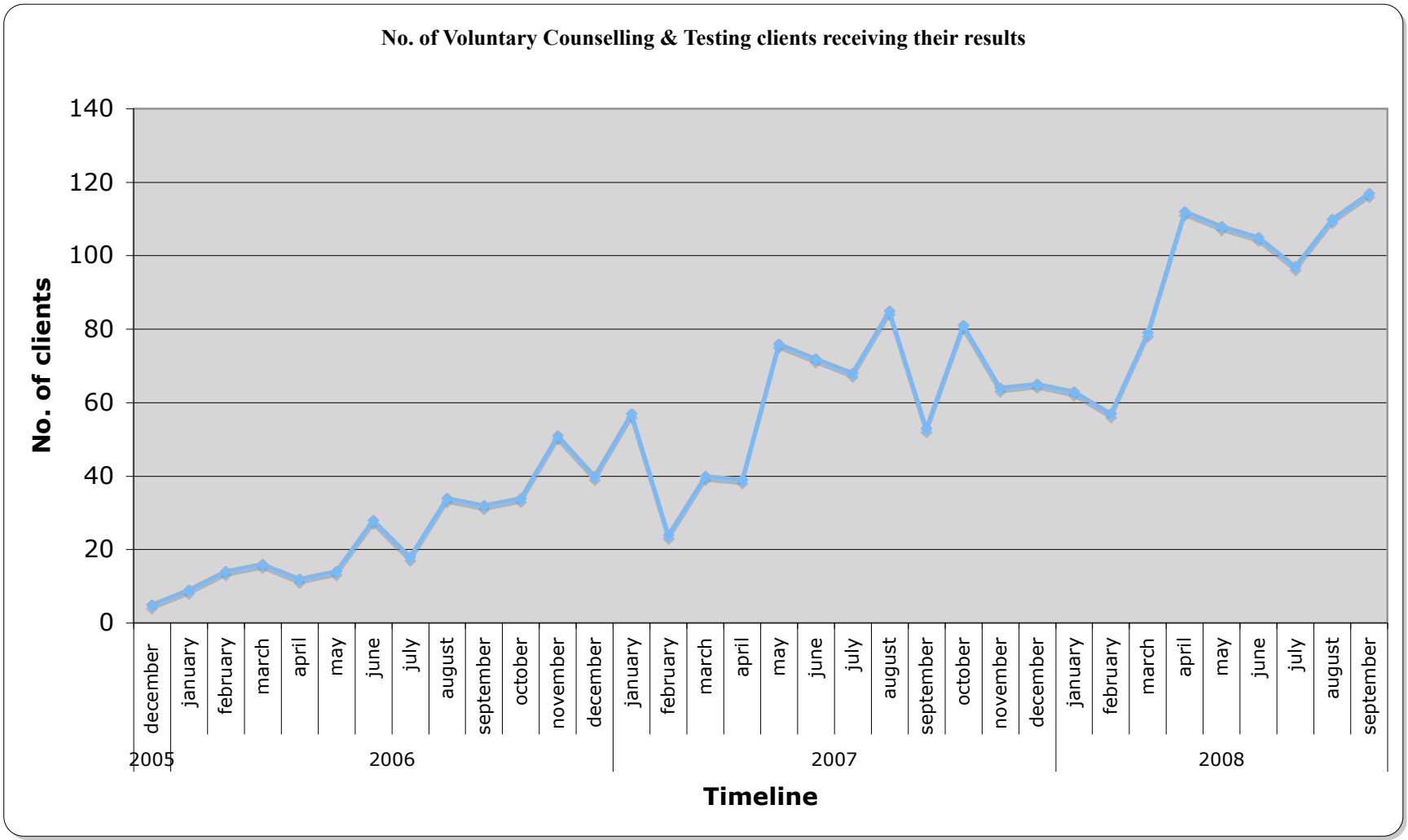
Coverage

The VCT unit is open to anyone and the services are free. Yet, for some poor clients transportation costs impact access because transport costs to and from the clinic range from VND10,000 to VND40,000. The staff at the clinic avoided asking clients their geographic origin in order to establish trust and create a "comfort zone" for the at-risk and vulnerable target audience. Yet, based on registration information, about 50% of the clients came from three districts surrounding the clinic.

Utilisation

During a 33 month-period, the VCT site in Tay Ho tested 1,881 clients. From a meagre 184 clients tested in its first year of implementation (nine months), a total of 1058 tested cases were reported in Y3, a five-fold increase. Men were slightly better represented among clients who used the VCT site (57%). Two at-risk categories showed a clear gender split: the Injected-Drug Users, with a sex-ratio of 79.9%, and the Sexual Partner to an at-risk person with 26.2%.

Figure 14 The VCT activity: *evolution of the number of VCT clients receiving a full VCT service over the course of the programme*

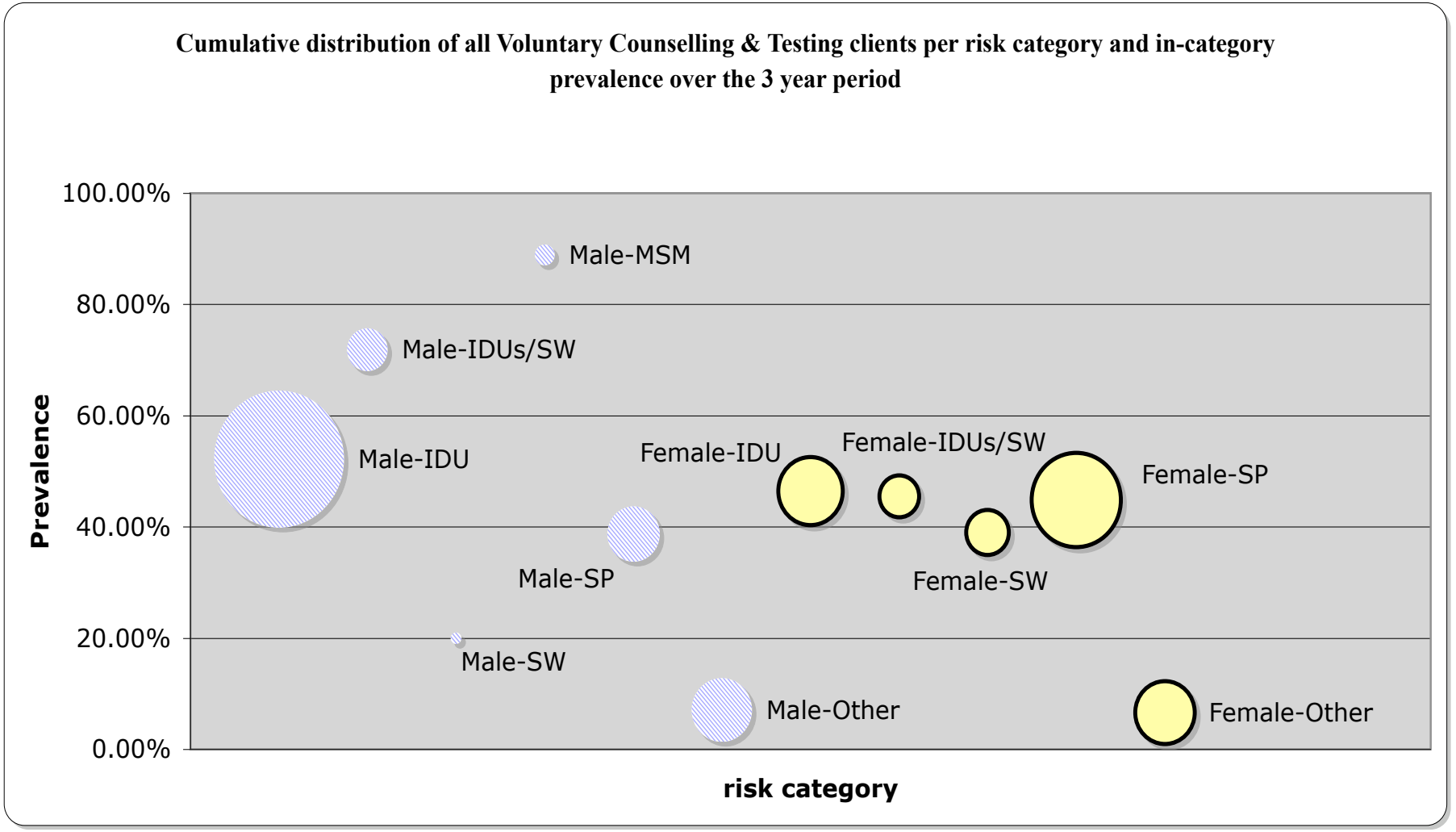


Source: PhD - VG

On the whole, clients presenting at the VCT unit define themselves as belonging to an at-risk group. Only 16.3% would declare being otherwise.

The largest group attending the VCT unit is the IDUs, whose members constituted 46.9% of the total (54.2% when IDU/CSWs are included). They are followed by the SP of an at-risk person group, who made up 24% of attendees during the first three (3) years. The third largest group was that of "other", specifically persons who declare that they fit into no at-risk category. Notably, this category recorded the greatest increase in attendees during the three (3) years – from eight cases in Y1 to 190 in the Y3, a 24-fold increase in attendance and possibly a sign of the successful mainstreaming of VCT. The target group with the lowest recorded attendance is the MSM, which again is not surprising considering the level of stigma suffered by this population group and the limited success of the mobile team to reach it.

Figure 15 VCT clients typology: *distribution of VCT clients in function of their at-risk group, group size and HIV infection rate, with discs on the graph proportional to group size and heights depending on their specific HIV infection ratio, all 3 years combined*



Source: PhD - VG

Thanks primarily to the work of the mobile outreach team, the VCT unit is well utilised and meets the objectives set for the site.

Table 9 Referral in the VCT activity: *share of referred clients in the VCT activity over the course of the programme*

		2005-2006	2006-2007	2007-2008
Total of clients tested		184	639	1058
Referred	number	137	507	601
	share	**74.46%**	**79.34%**	**56.81%**
Non-Referred	number	47	132	457
	share	25.54%	20.66%	43.19%

Source: PhD -VG

The mobile team was of critical support to the efficacy and sustainability of the VCT unit. During the first 33 months of the programme, the mobile team was responsible for about 66.2% of the unit's client activity. The link with the mobile team proved essential to the success of the unit

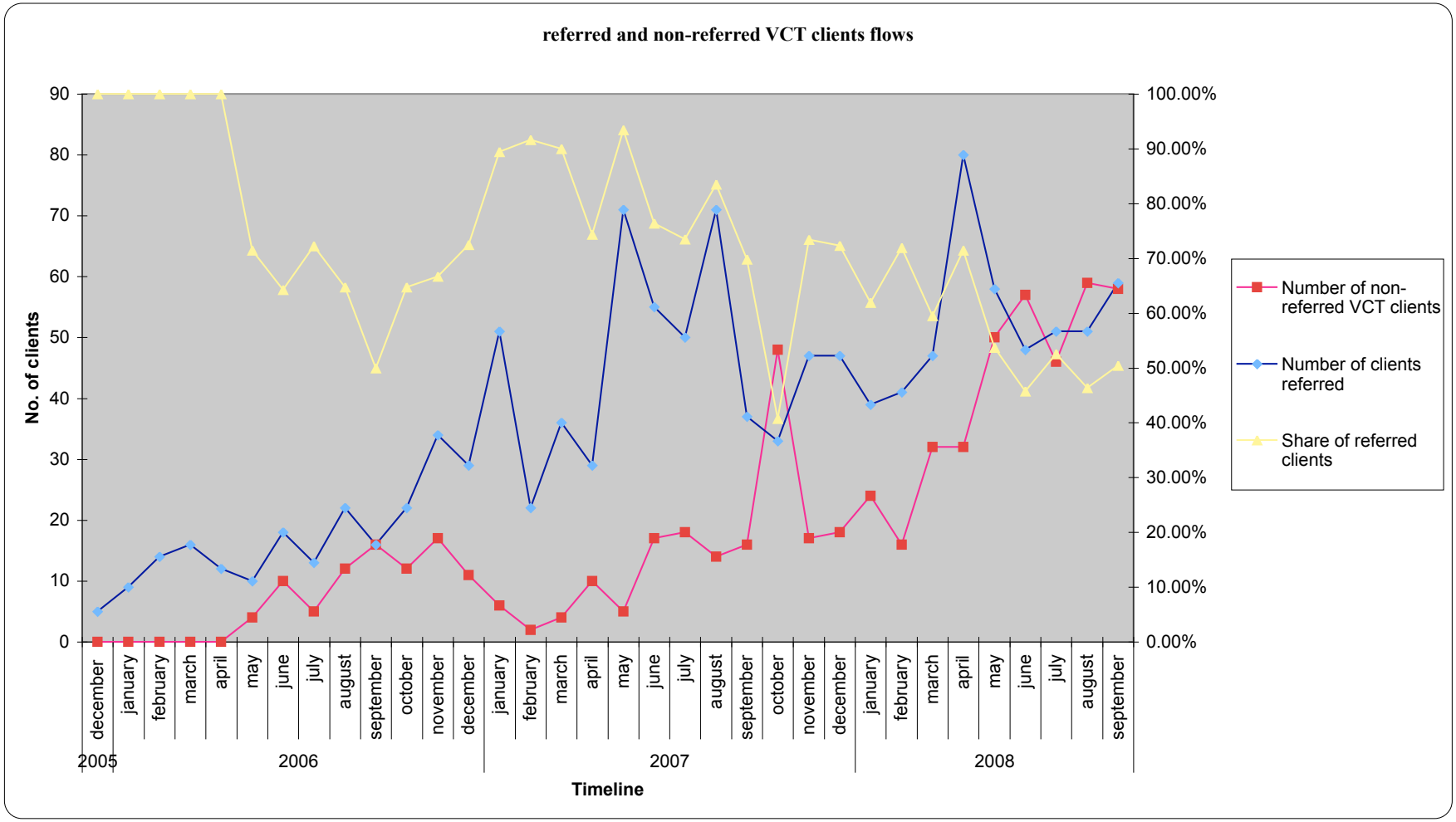
The link between the mobile team and the VCT unit developed over three phases as set out in Figure 16 and Table 10.

Table 10 The Mobile team - VCT link dynamic: *identification of 3 phases in the Mobile team – VCT relation in term of at-risk clients referral*

	Phase 1	Phase 2	Phase 3
Time period	Dec 2005-April 2006	May 2006 –April 2008	May 2008 – Sept 2008
Average of referral cases per month	11 cases	38 cases	53 cases
Share of the VCT activity	100%	72%	50%
No. of cases referred per MT member per month	1.4 cases	4.7 cases	6.6 cases

Source: PhD - VG

Figure 16 VCT in-flows: *evolution over the course of the programme of the number of referred and non-referred clients attending VCT, and the share of referred clients in the total VCT activity*



Source: PhD - VG

Those 3 phases are:

- Phase 1 (five [5] months): The VCT unit's client base is comprised entirely of those referred by the mobile outreach team. The number of referrals is initially quite low, with about 11 cases a month, or an average of 1.4 cases per peer-educator. This is likely due to the lack of knowledge of the service among at-risk populations. At this stage the mobile team is also still in its infancy and so it is not performing optimally.
- Phase 2 (24 months): While non-referred clients begin to access the VCT unit spontaneously, the cases referred through the work of the mobile team grows to 38 a month (4.7 per peer-educator). The mobile outreach team receives more training on communication, and over time develop a better understanding of its intervention environment. Moreover, the service is also promoted through word-of-mouth by VCT clients, initiating a snowball effect.
- Phase 3 (five (5) months): During this time non-referred clients account for 50% of those accessing the VCT unit. Clients referred by the mobile outreach team average 53 a month (6.6 cases per month per peer-educator).

Clearly, the mobile team has a remarkable effect on the work of the VCT unit. It contributes to the "start up" of the programme and likely contributes to indirect referrals from at-risk persons belonging to the same social networks. Awareness of the VCT unit is promoted solely by the mobile outreach team until June 2008. Thereafter the Tay Ho outpatient clinic is marketed by the NGO Population Service International (PSI), but the trend of self-referrals has gathered steam long before this campaign.

Table 11 Referred and non-referred clients risk categories: *cumulative distribution of referred and non-referred VCT clients over the 3 years of the programme*

3 years	Referred clients		Non-referred clients		Share of clients
	Number	Distribution	Number	Distribution	referred by the OMT
IDUs only	683	54.9%	200	31.4%	77.3%
SWs only	52	4.2%	30	4.7%	63.4%
IDU/SW	93	7.5%	44	6.9%	67.9%
MSM	15	1.2%	3	0.5%	83.3%
SP	267	21.4%	187	29.4%	58.8%
Others	135	10.8%	172	27.0%	44.0%
ALL	1245	100.00%	636	100.00%	66.2%

Source: PhD - VG

The data in Table 11 shows clearly the active recruitment undertaken by the mobile outreach team among all at-risk groups. Only 10.8% of the referred clients declare that they belong to the "other" category, compared to 27% of those who are non-referred. Injectable drug users and CSWs constitute the target populations most referred by the mobile outreach team (77.3% and 63.4% respectively).

The qualitative contribution of the mobile outreach team is even clearer when one considers the HIV prevalence statistics for each category in Table 12, Table 13 and Figure 17.

Table 12 HIV infection rate in referred and non-referred clients: *HIV infection rate in VCT clients in function of their at-risk category and their referred or non-referred status over the 3 years of the programme*

	Referred clients		Non-referred clients		Share of positive cases referred by the OMT
	Number of HIV positive tests	Ratio	Number of HIV positive tests	Ratio	
IDUs only	317	46.4%	111	55.5%	74.1%
SWs only	22	42.3%	9	30.0%	71.0%
IDU/SW	56	60.2%	25	56.8%	69.1%
MSM	13	86.7%	3	100.0%	81.3%
SP	127	47.6%	69	36.9%	64.8%
Others	11	8.1%	10	5.8%	52.4%
ALL	**546**	**43.9%**	**227**	**35.7%**	**70.6%**

Source: PhD - VG

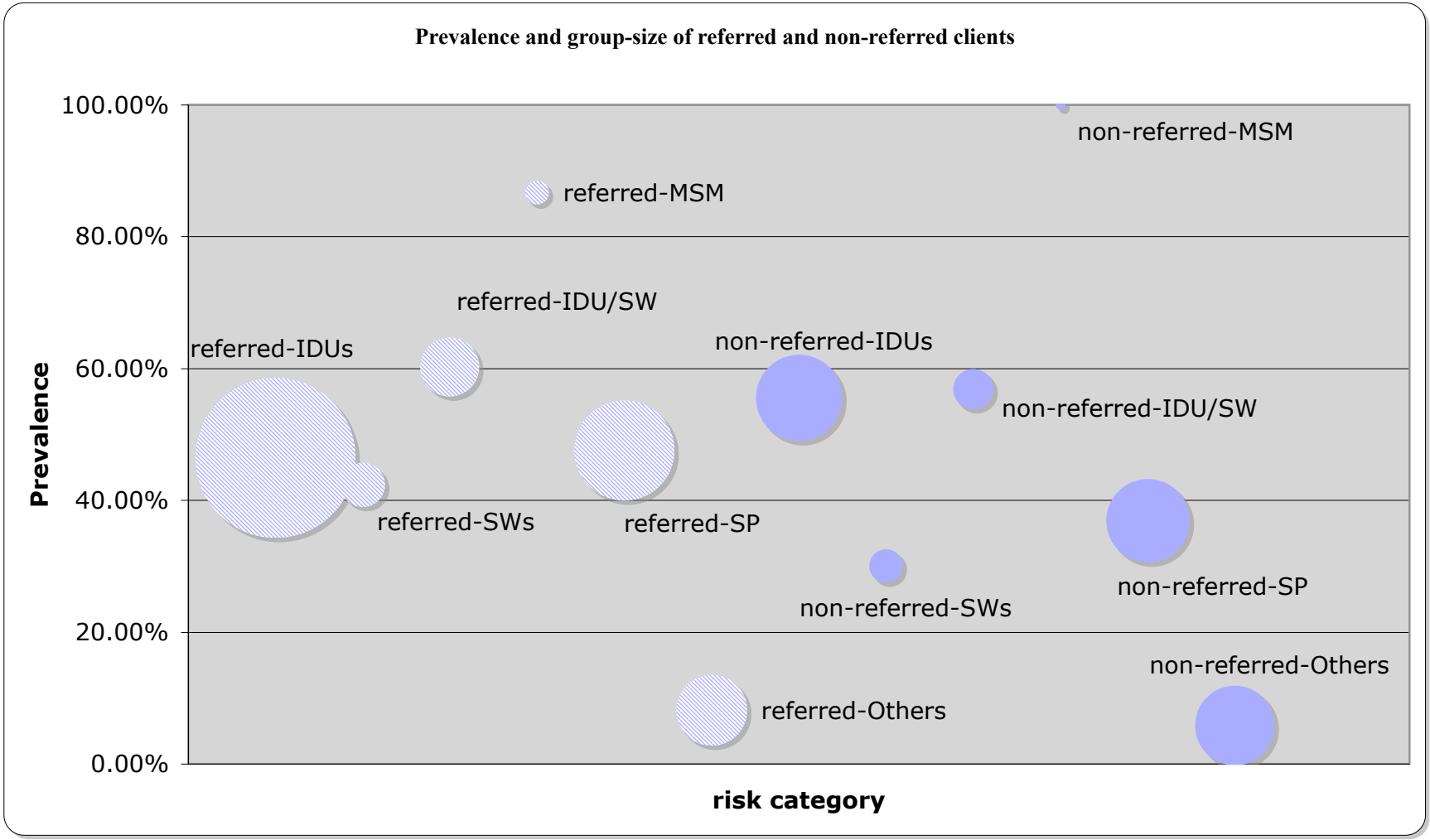
Table 13 Evolution of the HIV infection rate among VCT clients*: comparison of the HIV infection rate between referred (R) and non-referred (NR) VCT clients over the 3 years of the programme in function of their at-risk category*

	Year 0		Year 1		Year 2		All	
	R	NR	R	NR	R	NR	R	NR
IDUs	95.83%	100.00%	50.72%	50.00%	32.13%	48.95%	46.41%	55.50%
SWs	100.00%	75.00%	44.00%	28.57%	15.79%	21.05%	42.31%	30.00%
IDU/SW	100.00%	83.33%	50.00%	78.57%	55.56%	37.50%	60.22%	56.82%
MSM	100.00%	0.00%	100.00%	100.00%	66.67%	100.00%	86.67%	100.00%
SP	78.79%	63.64%	48.39%	57.14%	39.72%	32.26%	47.57%	36.90%
Others	42.86%	0.00%	7.55%	10.71%	5.33%	3.48%	8.15%	5.81%
ALL	**89.78%**	**85.11%**	**46.15%**	**37.12%**	**31.45%**	**30.20%**	**43.86%**	**35.69%**

Source: PhD – VG

Globally the prevalence is higher for referred-clients. Nonetheless, this pattern is not absolute, as is apparent in the statistics related to non-referred IDUs.

Figure 17 Referred vs. non-referred clients: *comparison in term of group size and HIV infection rate between referred and non-referred clients attending VCT over the 3 years of the programme*



Source: PhD - VG

Considering prevalence rates and numbers of clients it is clear that the mobile outreach team referred the majority (70.6%) of those tested positive for HIV at the clinic.

Notably, the prevalence rate decreased at the same pace during the three years for both referred and non-referred clients. As noted previously, a combination of effective prevention and harm-reduction activities, and the depletion of an initial pool of highly at-risk persons are the likely explanation for this phenomenon.

Impact

In a paper Hausler (2006) cites the WHO's validation of the findings of a research study conducted in Kenya to assess the impact of a VCT programme, combined with TB and ProTEST initiatives (Sweat 2000). It was found that for 100 clients who tested negative, between 1 to 24 infections could be averted, with an estimated average of 10.

If we apply that rationale to the Tay Ho site, with 21, 356 and 731 clients tested negative respectively in Y0, Y1 and Y2, the VCT unit helped avert 2, 36 and 74 infections in the corresponding years (with a minimum of 0, 4 and 7 and a maximum of 5, 85 and 175 infections respectively).

We will refer to these figures later in the cost-effectiveness analysis section dedicated to VCT.

The Care and treatment component

The OPC offered a comprehensive service to registered patients, from adherence training and support and Home-Based Care to HAART. All services were provided free of charge to patients including routine biological tests, and morphological tests (ultrasound, X-Ray, scanner) alike. The programme did not deal with cases of severe opportunistic infections that required hospitalisation, unless exceptional cases arose.

Performance

The four units of the programme: he pharmacy, the laboratory, the Home-Based Care unit and the medical team worked in synergy and for the purposes of this study have been evaluated as an integrated component.

Provision

The care and treatment service opened in the second quarter of Year 0.

The service was accessible to any patient living in Hanoi inner city. All services were provided free of charge, but not anonymously. On registration, patients had to disclose their identity and proof of residence in the city. This last regulation was enforced with some flexibility to accommodate some migrant workers and/or patients with no official residence in Hanoi (residency is tightly regulated in the country, in order to administer access to public services).

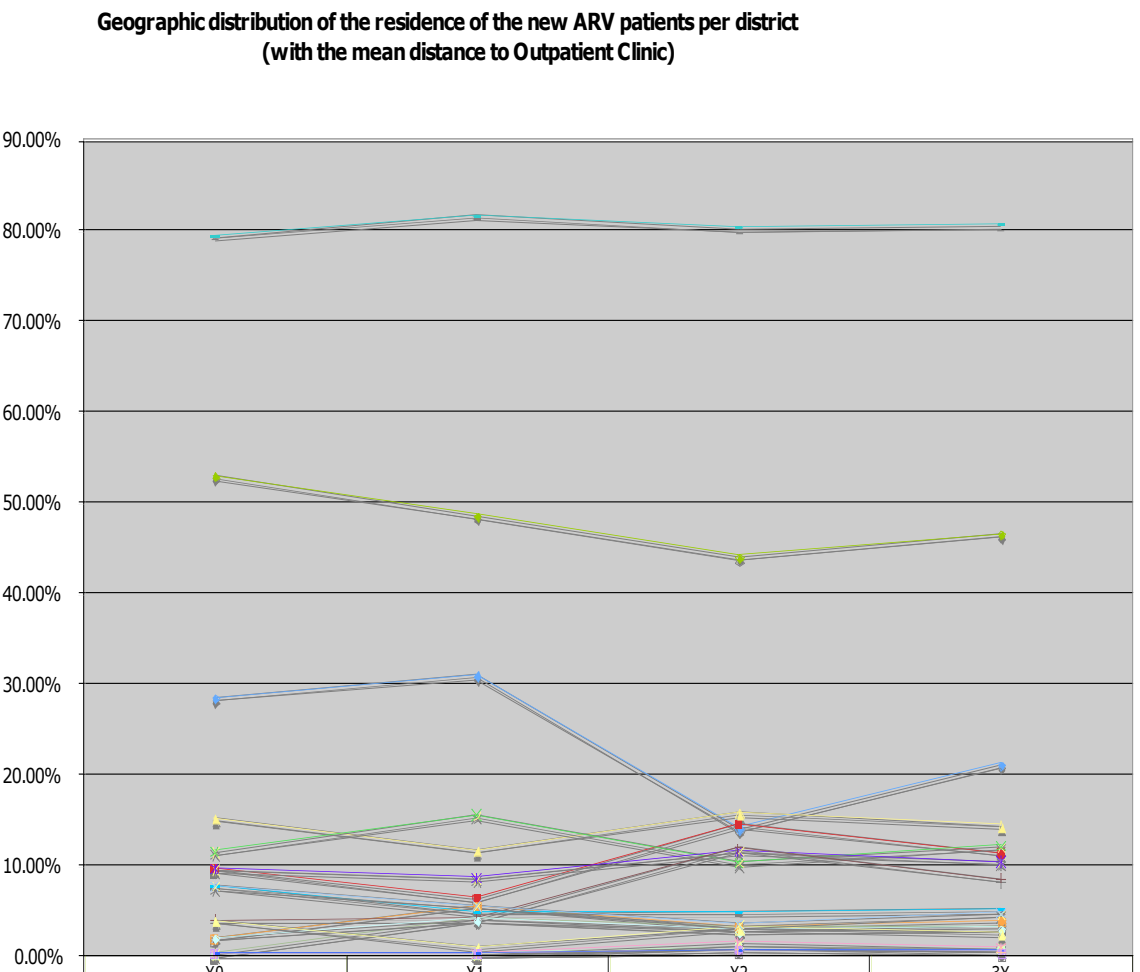
The care and treatment unit was accessible during office hours. No direct service was provided after 5pm or at weekends... A hotline was available to deal with emergencies and to ensure a continuum of service on public holidays.

For the first 12 months, the programme was initially dedicated in three (3) inner-city districts (Tay Ho, Hoan Kiem and Ba Dinh). Thereafter, the cover area of the programme was extended to the 12 districts of the city. Surrounding provinces were not covered by the programme because this would have stretched the HBC team beyond capacity, though some exceptions were made on a case by case basis by the OPC management team.

Coverage

Here we propose a map locating the patients' district of origin to be compared to the initial target population of the programme. As shown in figure 18, though the programme was initially designed to cover only 3 districts, the majority of the patients were residents of other districts of Hanoi

Figure 18 Patients geographic origin: *distribution over the 3 years of the programme of the registered patients in function of their district of residence, with the average distance from district to the outpatient clinic*



	Y0	Y1	Y2	3Y
Tay Ho (2.5 km)	28.30%	30.77%	13.92%	20.95%
Hoan Kiem (3 Km)	9.43%	6.15%	14.35%	11.19%
Ba Dinh (3.5 Km)	15.09%	11.54%	15.61%	14.29%
Dong Da (4.5 Km)	11.32%	15.38%	10.13%	11.90%
Hai Ba Trung (5.5 Km)	9.43%	8.46%	11.39%	10.24%
Cau Giay (6 Km)	1.89%	5.38%	2.95%	3.57%
Long Bien (6 Km)	3.77%	3.85%	11.81%	8.33%
Thanh Xuan (7 Km)	0.00%	3.85%	2.95%	2.86%
Hoang MAI (10 Km)	7.55%	4.62%	4.64%	5.00%
Tu Liem (10 Km)	1.89%	3.85%	2.53%	2.86%
Ha Dong (12 Km)	0.00%	0.00%	0.84%	0.48%
Dong Anh (14 Km)	3.77%	0.77%	2.95%	2.38%
Gia Lam (15 Km)	7.55%	5.38%	3.38%	4.52%
Thanh Tri (15 Km)	0.00%	0.00%	1.27%	0.71%
Thuong Tin (26 Km)	0.00%	0.00%	0.42%	0.24%
Bac Ninh (34 Km)	0.00%	0.00%	0.42%	0.24%
Hung Yen (34 Km)	0.00%	0.00%	0.42%	0.24%
Withing a 6 Km radius	79.25%	81.54%	80.17%	80.48%
3 first districts	52.83%	48.46%	43.88%	46.43%

Source: PhD - VG

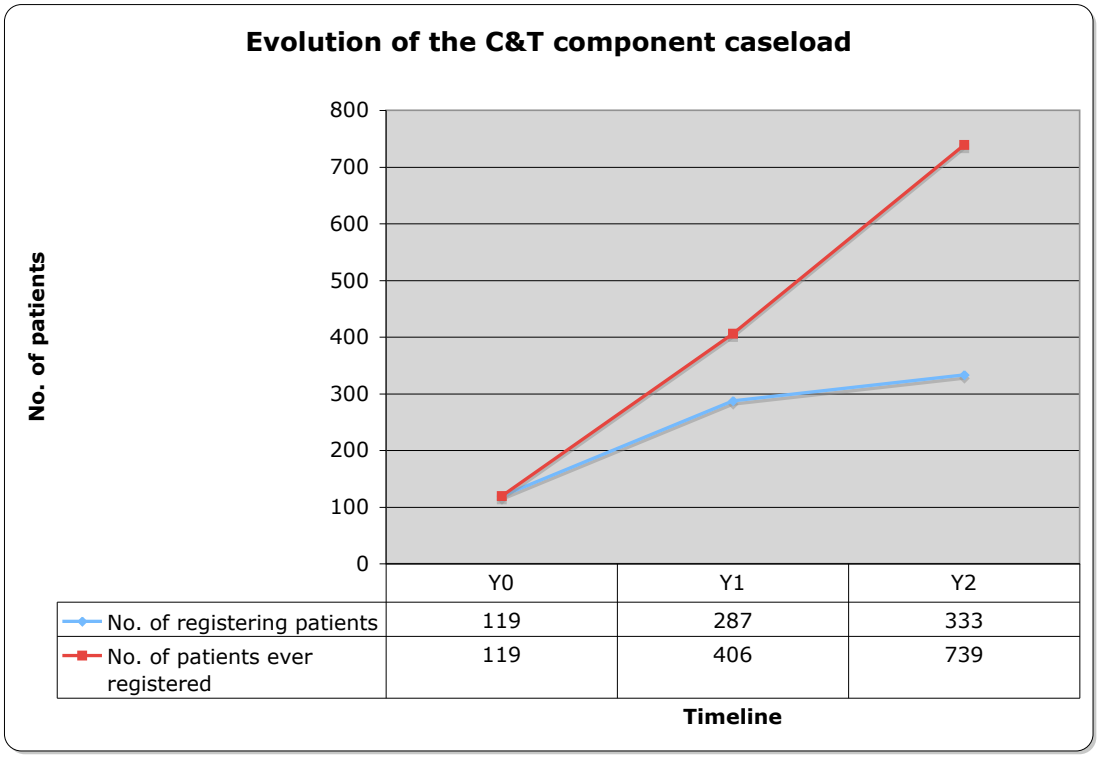
Most patients resided near to the Outpatient Clinic. Just over 44% of the patients registered at the clinic resided in the three (3) districts initially targeted by the programme. That percentage rose to almost 77% when patients from the next three most immediate districts (Dong Da, Hai Ba Trung and Long Bien) were included.

Proximity to the clinic appears to have been an important factor in the patients' decision to access services. Patients on average travelled 30 minutes on motorbike (main mode of transport in Hanoi) to reach the clinic, though some travelled up to an hour. For those travelling more than an hour to reach the clinic, anonymity was stated as the main factor in their decision to access services at this site.

Utilisation

General

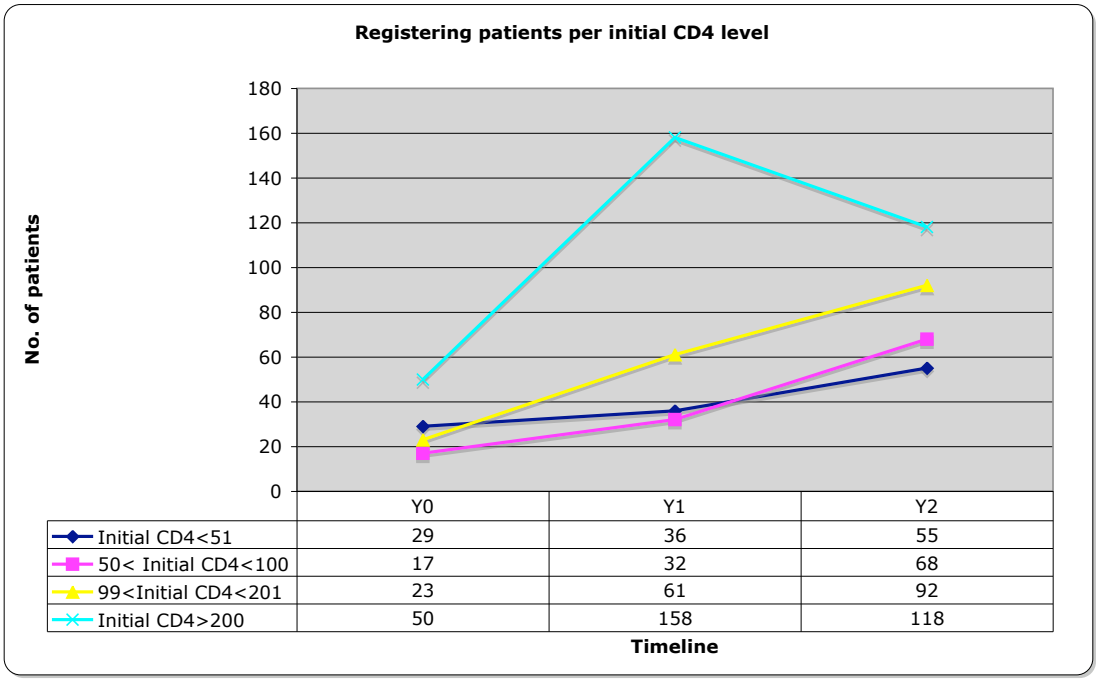
***Figure 19 Medical caseload**: evolution of the number of patients registering and registered in the outpatient clinic over the course of the programme*



Source: PhD - VG

Over the course of the programme, there was a constant increase in the number of patients registering at the Outpatient Clinic. In total, 739 registered at the clinic and had a first medical examination and staging of their infection. Not until 12 months into the programme did we see a significant number of patients registering each quarter (less than 20 per month in the first quarter of Y0). Considering the estimated HIV prevalence among the general population in Hanoi of 0.45%, these initial registration figures are quite low. They translate to a pool of PLHA in need of medical supervision of about 18,000.

Figure 20 Registering patients' biological stage: *number of registering patients to the outpatient clinic in function of their initial CD4 count, with 4 categories of CD4 count: [0;50], [51;100], [101;200], [>200], with CD4 count expressed in number of cells per mm3*

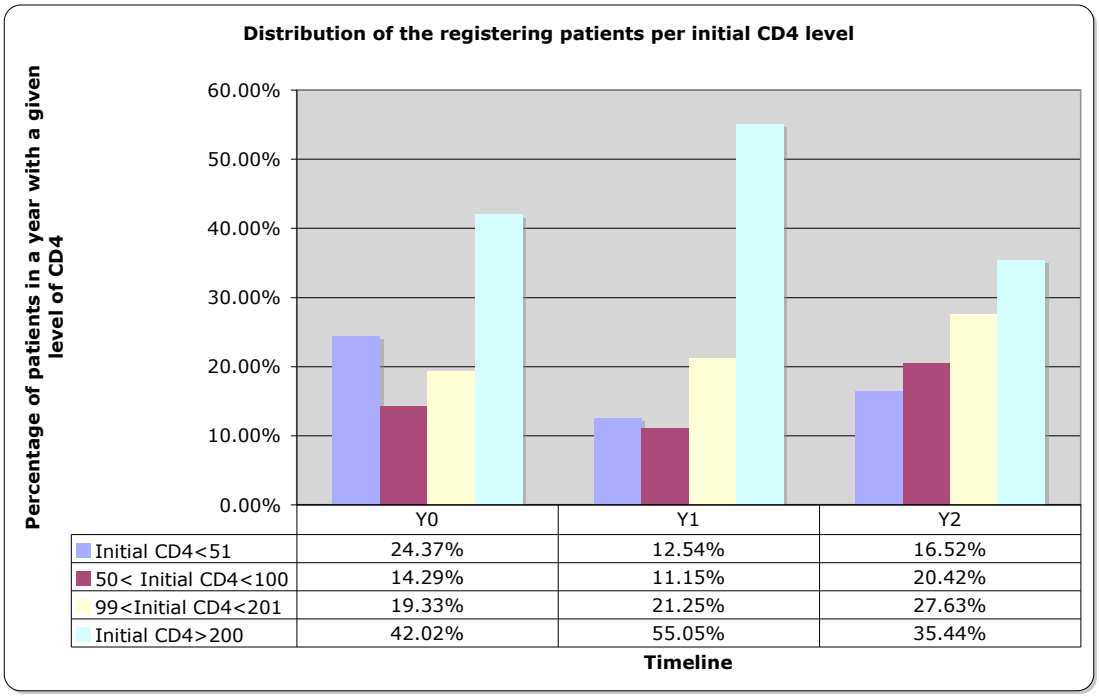


Source: PhD -VG

The data in Figure 20 and 21 provides a more detailed understanding of the "stage category" of the patients registered at the clinic. It is clear that patients presenting in a very advanced stage (CD4<100/mm3) of the disease constituted a consequent share of flow of patients.

Almost 56% of the patients registering at the clinic had already developed severe immune depression, with a CD4 count lower than 200 cells/mm3. This could be the result of limited accessibility of the general HIV/AIDS services in the city, limited awareness among target populations of the existing and available services, and possibly the fear among a largely young and drug dependent population to deal with the disease. This is certainly another argument for the use of a mobile outreach team to identify and refer people for treatment before they reach a serious stage of illness, as well as to raise awareness at community level of existing services. Mobile outreach certainly had a dramatic effect on the general medical outcomes of the programmes as related to mortality, as we will see later on in this section.

***Figure 21 biological stage at registration**: distribution of registering patients to the outpatient clinic over the course of the progamme in function of their initial CD4 count with 4 categories of CD4 count: [0;50], [51;100], [101;200], [>200], with CD4 count expressed in number of cells per mm3*

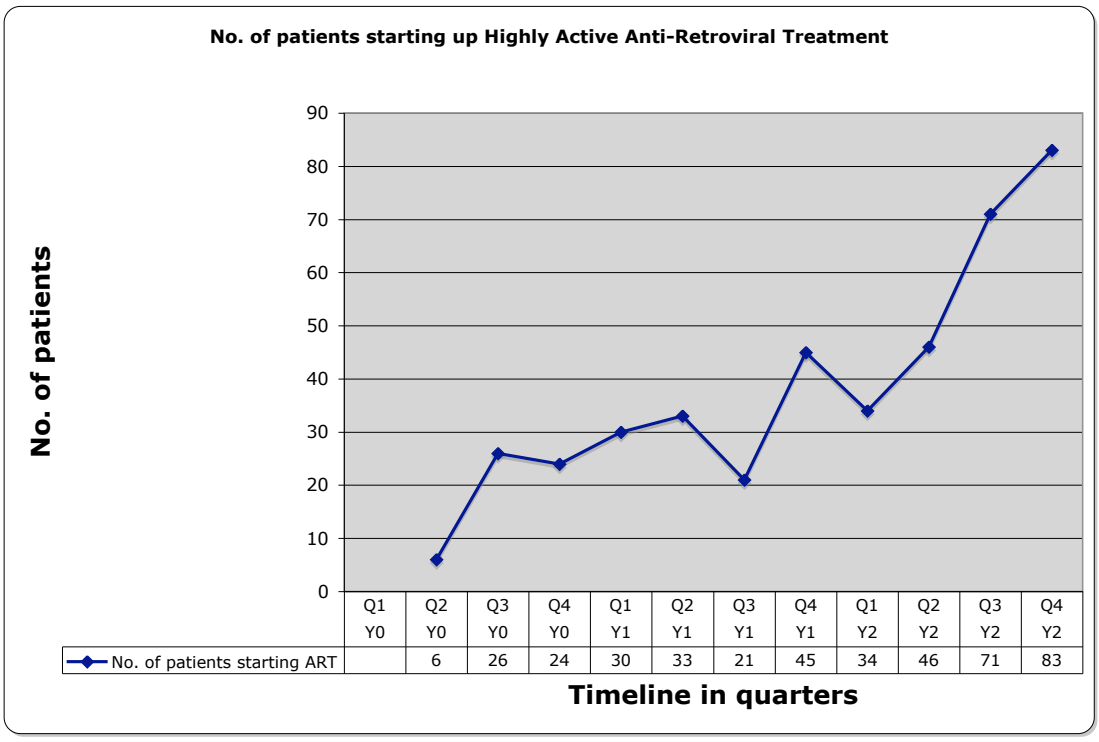


	Y0	Y1	Y2
Initial CD4<51	24.37%	12.54%	16.52%
50< Initial CD4<100	14.29%	11.15%	20.42%
99<Initial CD4<201	19.33%	21.25%	27.63%
Initial CD4>200	42.02%	55.05%	35.44%

Source: PhD - VG

Highly Active Anti-Retroviral Treatment

***Figure 22 New HAART patients:** number of newly started Highly Active Anti-Retroviral Treatment patients over the course of the progamme*



	Q1 Y0	Q2 Y0	Q3 Y0	Q4 Y0	Q1 Y1	Q2 Y1	Q3 Y1	Q4 Y1	Q1 Y2	Q2 Y2	Q3 Y2	Q4 Y2
No. of patients starting ART		6	26	24	30	33	21	45	34	46	71	83

Source: PhD - VG

Not surprisingly, the number of patients starting up Highly Active Anti-Retroviral Treatment followed a similar trend as shown in Figure 21. In total, the OP clinic initiated 419 patients on Highly Active Anti-Retroviral Treatment during the three-year period, 56% of those during the last year. The ARV treatment component of the programme was largely "fed" by the work of the mobile team and the VCT unit (about 80% of the case load). Individuals with CD4 counts below 50 constituted 25.8% of the total, and patients below 100 CD4/mm3, 51.6%, during the three-year period.

Impact

Intermediate impact

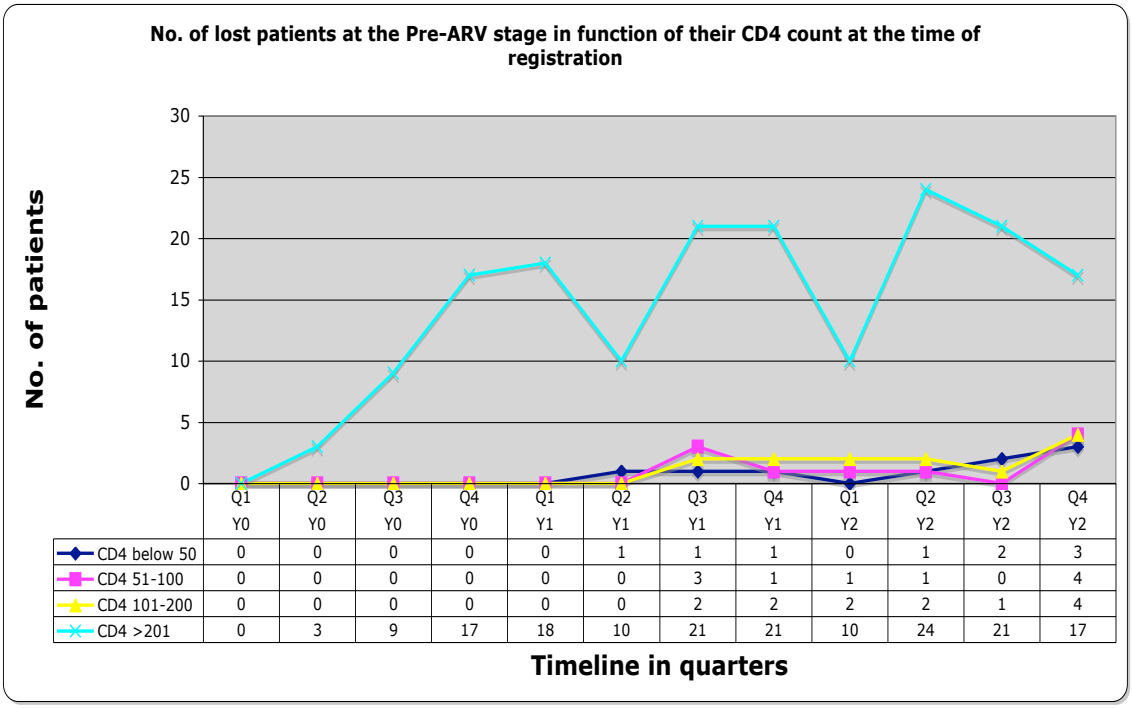
The long-term objective of the Highly Active Anti-Retroviral Treatment is to increase CD4 counts, prevent opportunistic infections and finally add life-years to patients. Yet, part of the design of that the OPC programme was to ensure the follow-up of the patients, who were more often than not social outcasts dealing with major uncertainties in their lives. A Home-Based Care team and a separate adherence unit were added to the medical core of the unit, as a way to improve the global adherence of the patients not only to the treatment, but also to the various protocols in place.

Keeping pre-Anti-Retroviral patients active in the programme

A major obstacle was to retain the so-called pre-ARV patients in the programme and have them adhere to the protocol of the OPC. Here we will look specifically at the ability of the centre to achieve this objective.

The Tay Ho Outpatient Clinic had limited resources to keep track of patients with limited medical issues. Most of the extra activities, such as the work of the HBC and adherence teams, were dedicated to the patients on ARVs. The initial medical staging of the patient and the six-monthly medical check-up (biological and clinical), were aimed at involving the patient in the process.
As is clear from the data in Figure 23, however, success in this regard was limited.

***Figure 23 Pre-ARV patients LTF**: number of lost-to-follow up pre-Anti-Retroviral patients over the course of the programme per initial CD4 count, with 4 categories of CD4 count: [0;50], [51;100], [101;200], [>200], with CD4 count expressed in number of cells per mm3*



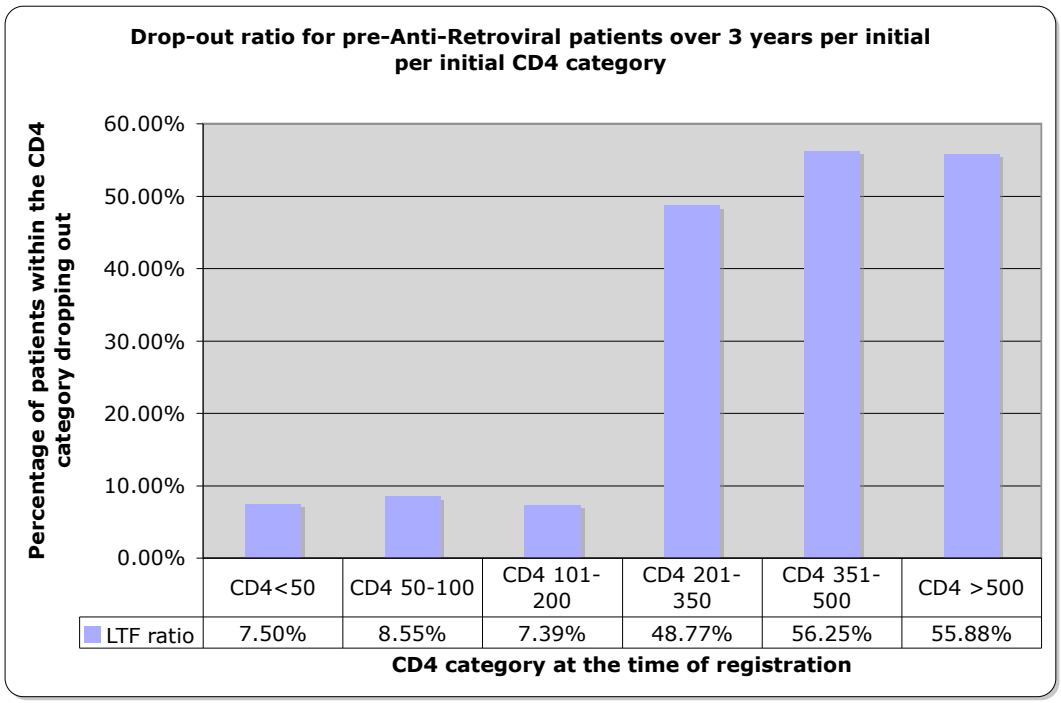
	Q1 Y0	Q2 Y0	Q3 Y0	Q4 Y0	Q1 Y1	Q2 Y1	Q3 Y1	Q4 Y1	Q1 Y2	Q2 Y2	Q3 Y2	Q4 Y2
CD4 below 50	0	0	0	0	0	1	1	1	0	1	2	3
CD4 51-100	0	0	0	0	0	0	3	1	1	1	0	4
CD4 101-200	0	0	0	0	0	0	2	2	2	2	1	4
CD4 >201	0	3	9	17	18	10	21	21	10	24	21	17

Source: PhD - VG

Patients with initially "high" CD4 counts (Above 200 cells/mm3) were the most prone to leave the programme, whereas patients with borderline or low counts (below 200 cells/mm3) were likely to stay the course of treatment.

During the three years of programme operation, the LFT (lost-to-follow-up) ratio followed a remarkable trend according to the initial level of CD4 of the patients, as shown in Figure 24.

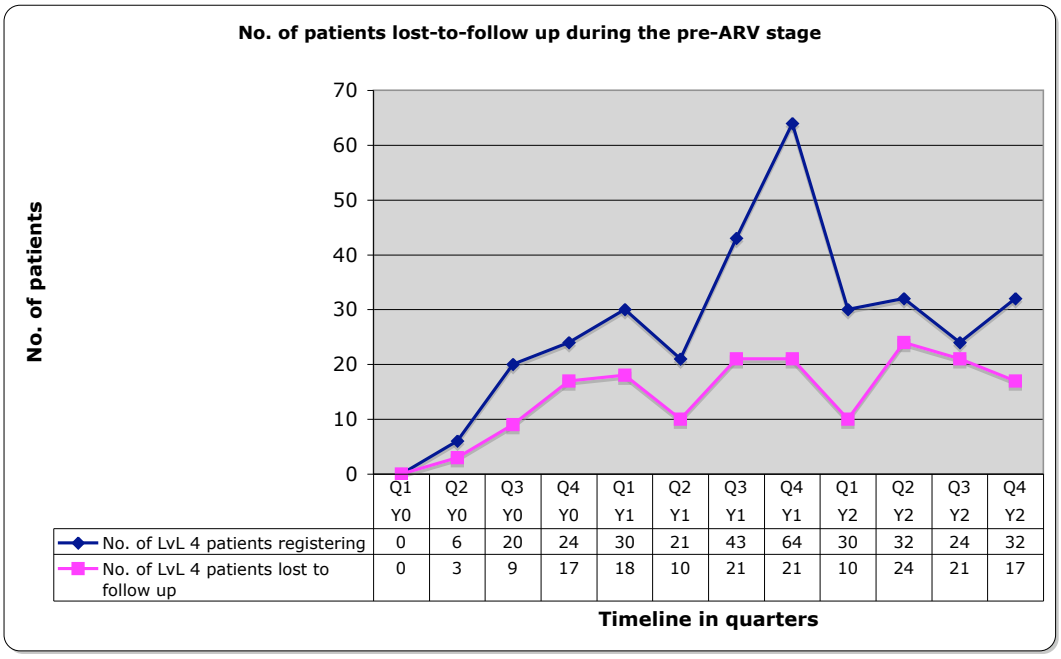
***Figure 24 LTF in pre-ARV patients**: proportion of patients lost-to-follow up in each CD4 category, with 4 categories of CD4 count: [0;50], [51;100], [101;200], [>200], with CD4 count expressed in number of cells per mm3*



Source: PhD - VG

The determinant here appears to be the access to HAART, and most likely the early access to such treatment. A majority of patients who were not immediately eligible for HAART did not return their scheduled regular check-ups, thus missing the chance to start ARV treatment at a stage of the disease when their health status was still reasonably good (see Figure 25).

***Figure 25 LTF in high-CD4 pre-ARV patients:** number of patients with initial CD4 level above 200 cells per mm3 lost-to-follow up over the course of the programme*



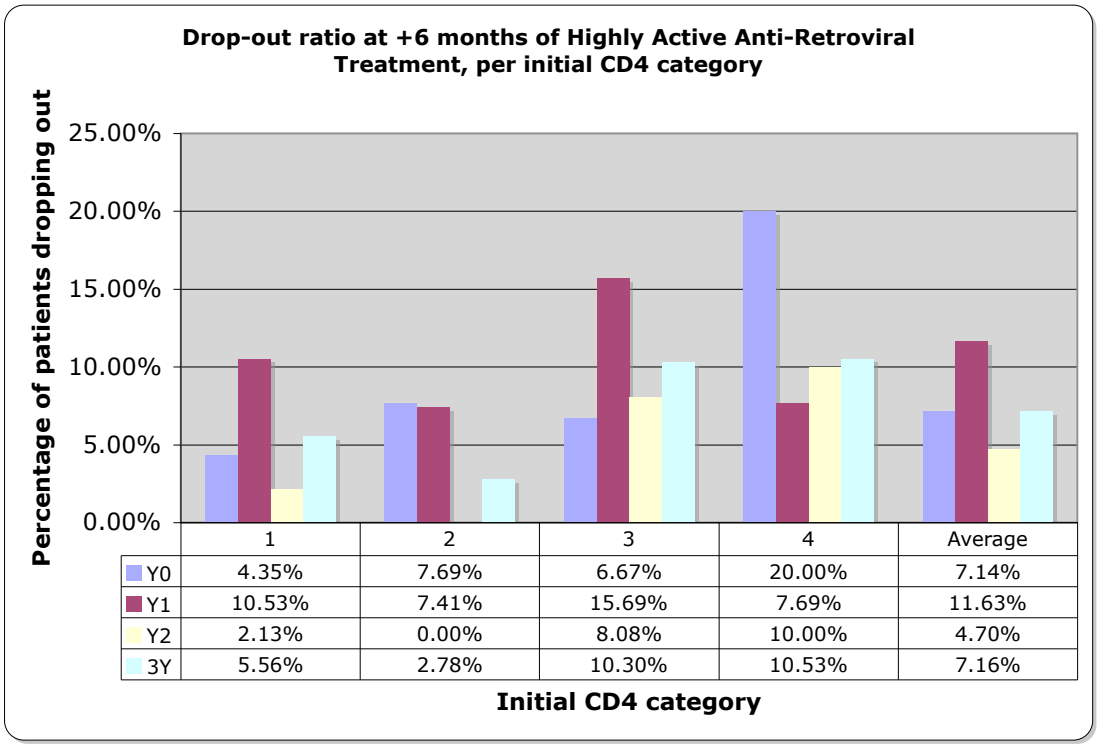
Source: PhD - VG

As a result the programme lost, at least temporarily about 52.4% of its patients with high CD4 counts. This loss was serious in terms of the medical impact because most of those patients would often only present again when they had developed severe opportunistic infections.

This raises questions about the value of limiting access to HAART to patients with low CD4 counts (under 200 cells/mm3), because the benefits of this approach might well be offset by the additional costs generated by returning patients with more severe conditions, and possibly a higher morbidity and mortality risk.

Keeping Anti-Retroviral Treatment patient active in the programme
The drop-out of patients was also a problem within the Highly Active Anti-Retroviral treatment component of the programme.

Figure 26 LTF in HAART patients at +6months: *lost-to-follow up ratio in each CD4 category after 6 months of HAART over the course of the programme, with 4 categories of CD4 count: category 1= [0;50], category 2 = [51;100], category 3 =[101;200], category 4 = [>200], with CD4 count expressed in number of cells per mm3*



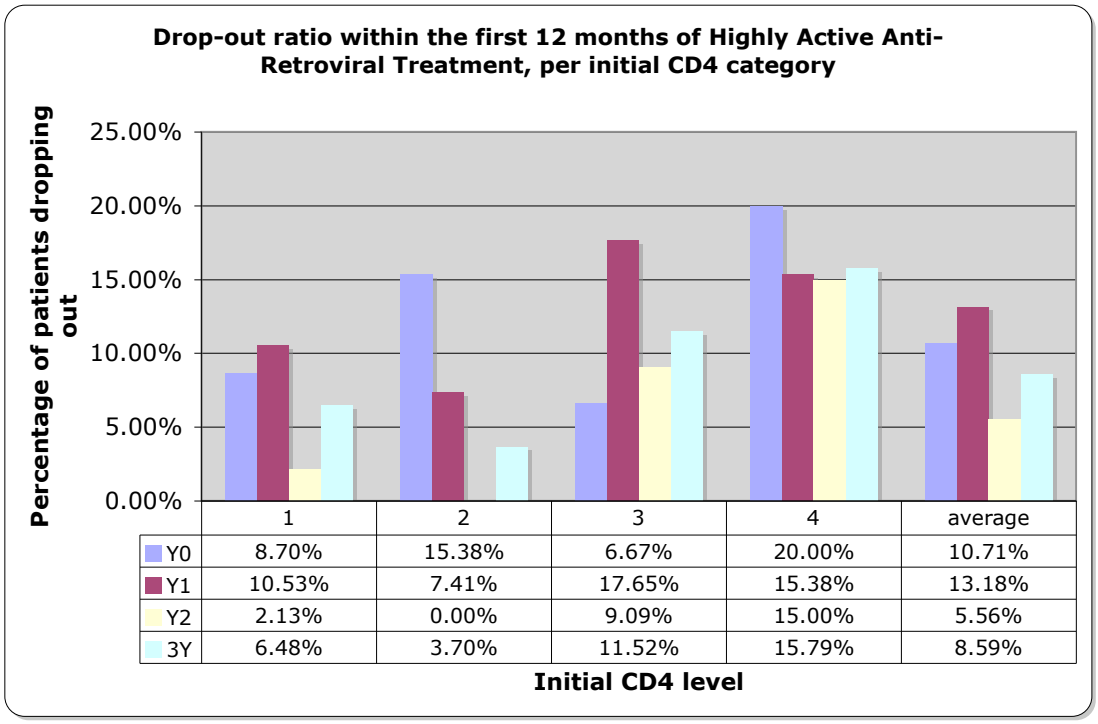
	1	2	3	4	Average
Y0	4.35%	7.69%	6.67%	20.00%	7.14%
Y1	10.53%	7.41%	15.69%	7.69%	11.63%
Y2	2.13%	0.00%	8.08%	10.00%	4.70%
3Y	5.56%	2.78%	10.30%	10.53%	7.16%

Source: PhD - VG

Within the first six months of HAART, an average of 7.2% of patients dropped out, primarily patients who recorded relatively high CD4 counts at the onset of the treatment. It is difficult to explain that result. It is possible that the combination of the side-effects of the therapy combined with increased confidence might have

encouraged patients to discontinue treatment. The threat of an imminently serious condition would likely motivate patients to overcome barriers to HAART.

Figure 27 LTF in HAART patients at +12months*: lost-to-follow up ratio in each CD4 category after 12 months of HAART over the course of the programme, with 4 categories of CD4 count: category 1= [0;50], category 2 = [51;100], category 3 =[101;200], category 4 = [>200], with CD4 count expressed in number of cells per mm3*



	1	2	3	4	average
Y0	8.70%	15.38%	6.67%	20.00%	10.71%
Y1	10.53%	7.41%	17.65%	15.38%	13.18%
Y2	2.13%	0.00%	9.09%	15.00%	5.56%
3Y	6.48%	3.70%	11.52%	15.79%	8.59%

Source: PhD - VG

After 12 months of treatment, the average drop-out ratio increased only marginally from 7.2% to 8.59%, and the global pattern remained the same, with "high" CD4 count patients more prone to leave the programme than those with more threatening levels. The first six months of treatment were critical and it was during this time that the majority of drop-outs (62.8%) occurred.

In total, the general drop-out ratio (any patients stopping treatment for non-medical reasons) reaches 11% of the total initiated patients.

Table 14 LTF in HAART patients analysis: *lost-to-follow up ratio in some selected patients categories, over the 3 years of the programme*

	No. of starting up patients	Dropped-out patients		Patients with initial CD4>200	
		Number	Ratio	Starting number	Dropped-out ratio
Injected-Drug Users	291	35	12%	25	20% (n=5)
Non-naïve patients	83	8	9.6%	21	23.8% (n=5)
Male	309	32	10.3%	28	7.1% (n=2)
Female	110	13	11.8%	10	40% (n=4)
Initial CD4 count 100 - 200	165	21	12.7%		
Initial CD4 count > 200	38	6	15.8%		
Total of starting up patients	419	46	11%	38	15.8% (n=6)

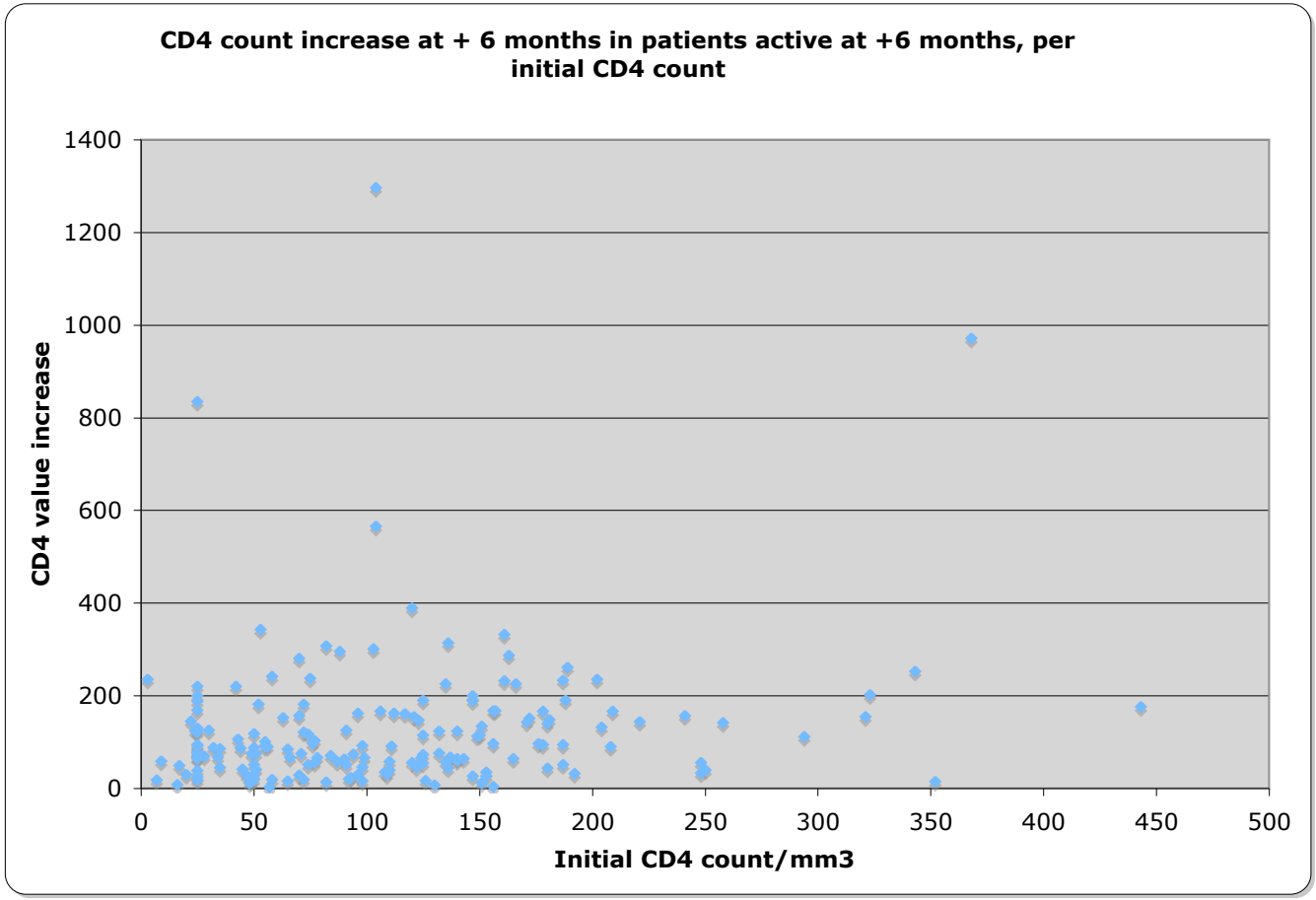
Source: PhD -VG

Improving the health status of the Anti-Retroviral Treatment patients

CD4 impact at +6 months

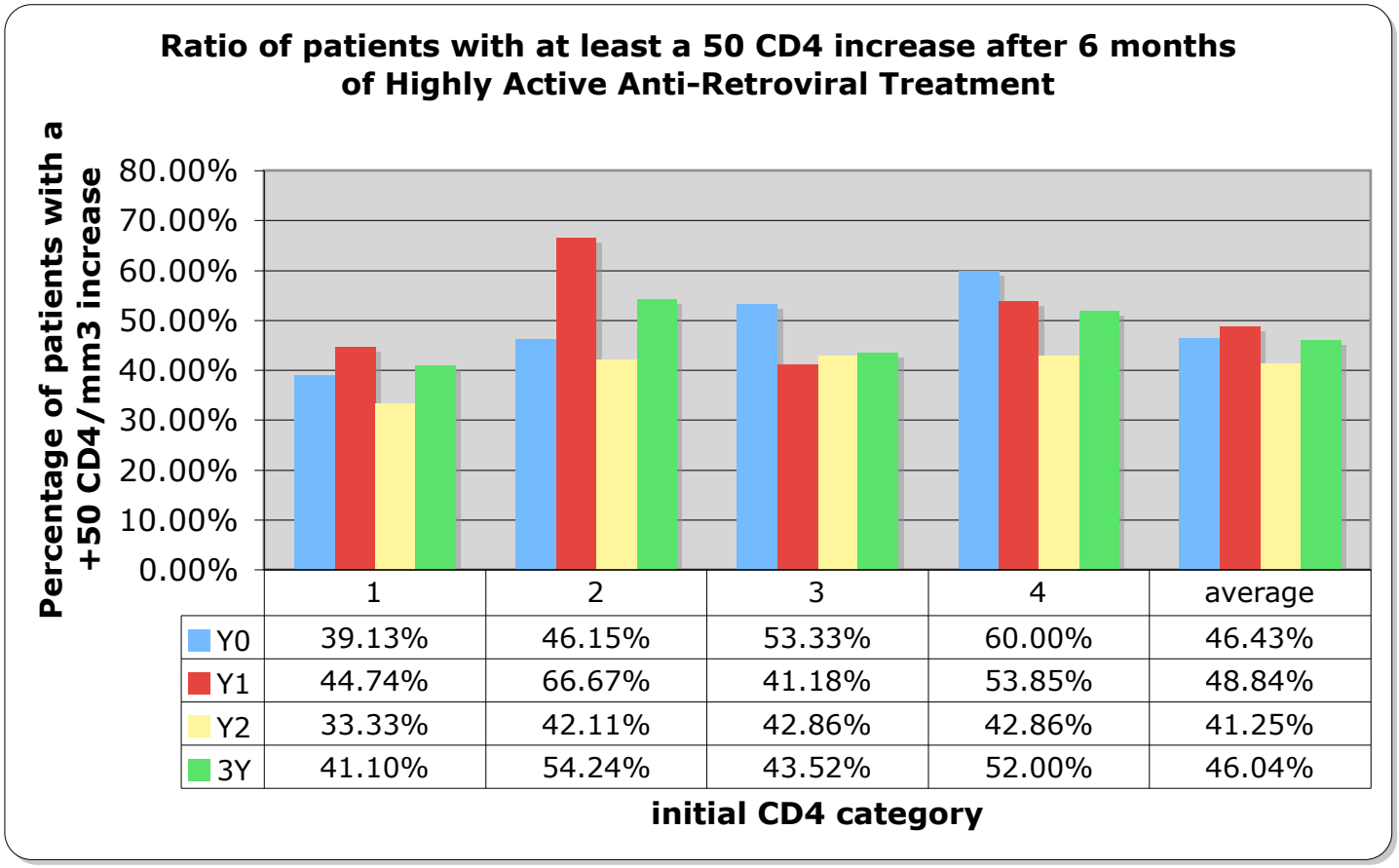
Six months after the initiation of HAART, 41.5% of the patients, regardless of their initial CD4 status, had a net increase in their CD4 count, with an average of 128 points and a median of 90. Yet, the results are heterogeneous with a standard deviation of 150 points (see Figure 28 and Figure 29).

Figure 28 CD4 increase at +6 months: *net increase in active Highly Active Anti-Retroviral Treatment patients 6 months after the onset of treatment per initial CD4 level, with CD4 count in number of cells per mm3*



Source: PhD – VG

Figure 29 Minimum increase of +50 CD4: *ratio of patients in each initial CD4 category with a net increase of 50 cells per mm3 6 months after the onset of treatment, with 4 categories of CD4 count: category 1= [0;50], category 2 = [51;100], category 3 =[101;200], category 4 = [>200], with CD4 count expressed in number of cells per mm3*

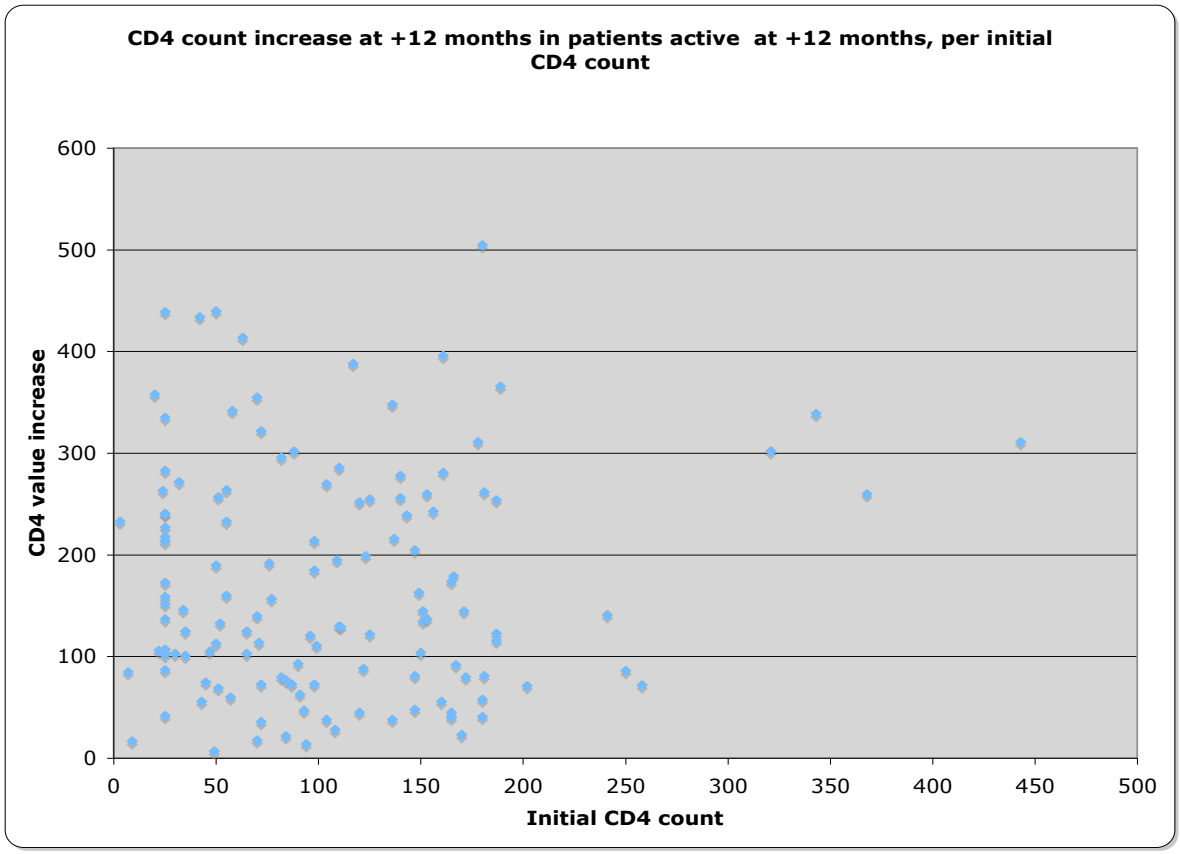


	1	2	3	4	average
Y0	39.13%	46.15%	53.33%	60.00%	46.43%
Y1	44.74%	66.67%	41.18%	53.85%	48.84%
Y2	33.33%	42.11%	42.86%	42.86%	41.25%
3Y	41.10%	54.24%	43.52%	52.00%	46.04%

Source: PhD - VG

CD4 impact at +12 months

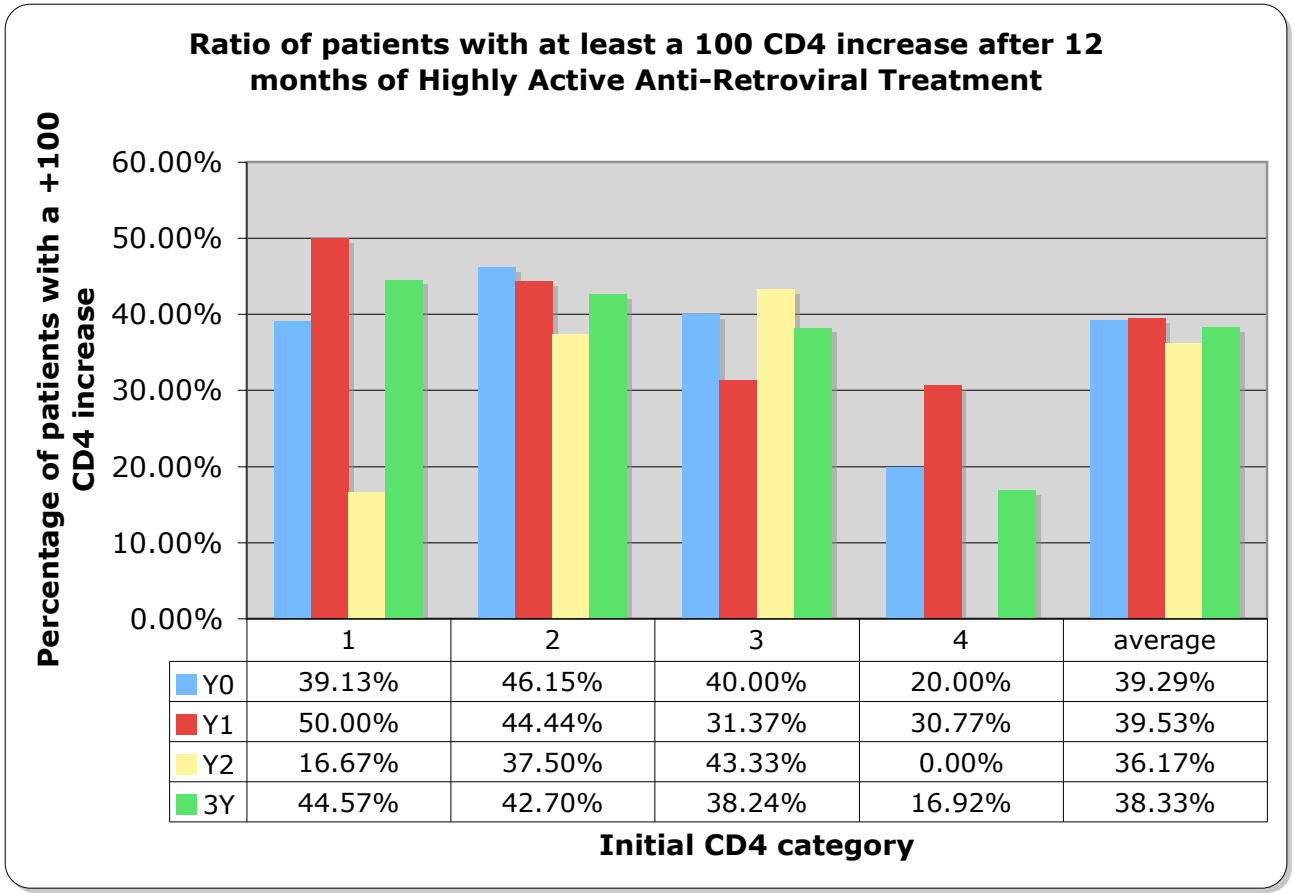
Figure 30 CD4 increase at + 12 months: *net increase in active Highly Active Anti-Retroviral Treatment patients 12 months after the onset of treatment per initial CD4 level, with CD4 count in number of cells per mm3*



Source: PhD - VG

Twelve months after the initiation of HAART, 49% of the patients recorded a net increase in their CD4 counts, with an average of 172.5 points, a median of 141, and standard deviation of 112 points (see Figure 30 and Figure 31).

Figure 31 Minimal CD4 increase of +100: *ratio of patients for each initial CD4 category with a net increase of 100 cells per mm3 12 months after the onset of treatment, with 4 categories of CD4 count: category 1= [0;50], category 2 = [51;100], category 3 =[101;200], category 4 = [>200], with CD4 count expressed in number of cells per mm3*

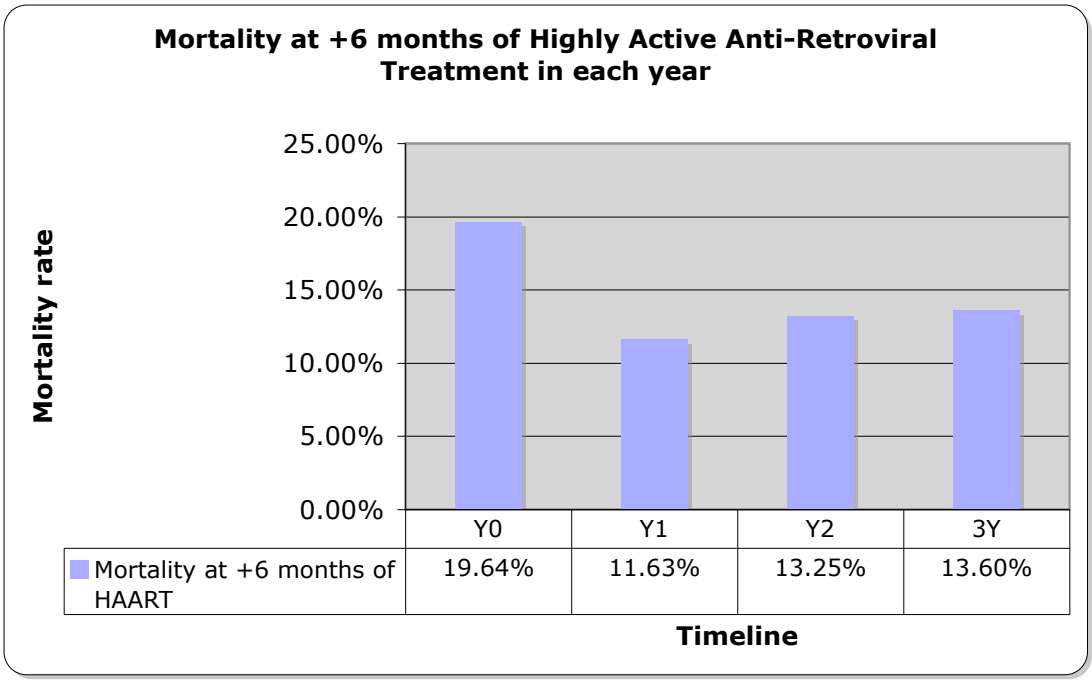


	1	2	3	4	average
Y0	39.13%	46.15%	40.00%	20.00%	39.29%
Y1	50.00%	44.44%	31.37%	30.77%	39.53%
Y2	16.67%	37.50%	43.33%	0.00%	36.17%
3Y	44.57%	42.70%	38.24%	16.92%	38.33%

Source: PhD-VG

About 38% of the initiated patients would record a significant increase in their CD4 count (+100) after a full year of treatment (see Figure 31). Another 15% would succumb to AIDS, 8.5% would drop out, and almost 45% would not record a significant increase in their CD4 counts.

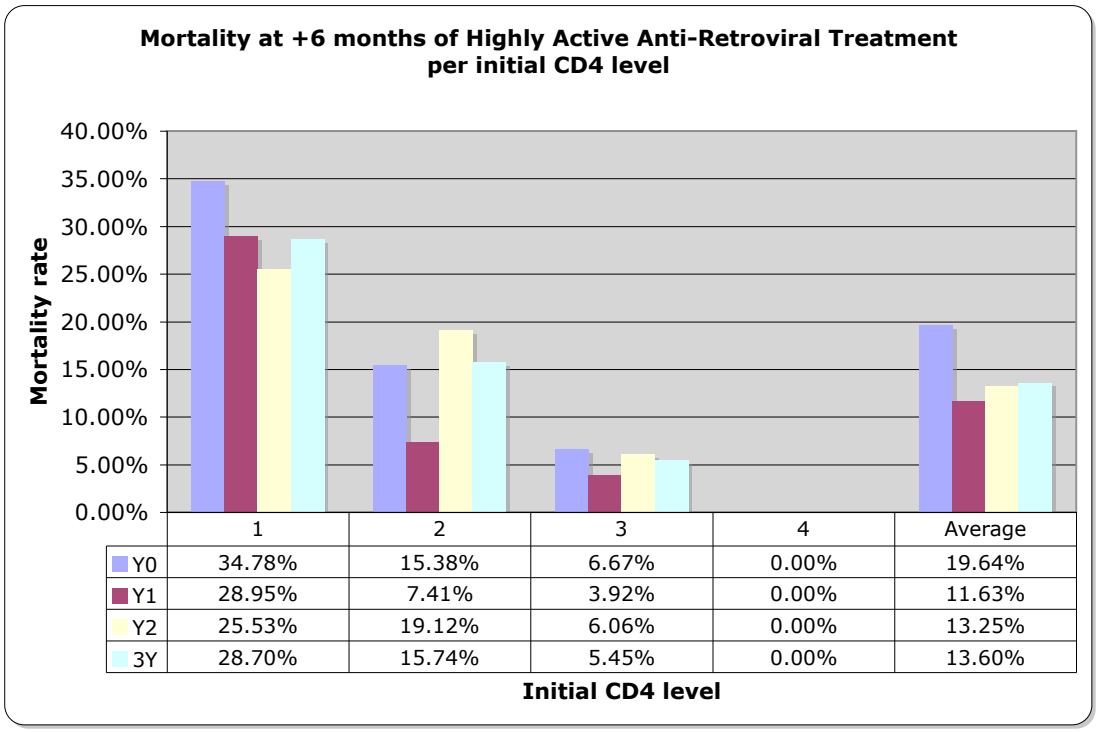
Figure 32 Mortality at +6 months: *mortality in Highly Active Anti-Retroviral Treatment patients within the first 6 months of treatment over the course of the programme*



Source: PhD - VG

Mortality figures within the first 6 months are quite high, averaging 13.6%. This period of treatment is likened to a "red zone" because as many as 81.4% of all the deaths recorded in the programme, occurred in this time period.

Figure 33 Mortality and initial CD4 count at + 6 months: *mortality over the course of the programme in Highly Active Anti-Retroviral Treatment patients within the first 6 months of treatment per initial CD4 category, with 4 categories of CD4 count: category 1= [0;50], category 2 = [51;100], category 3 =[101;200], category 4 = [>200], with CD4 count expressed in number of cells per mm3*



	1	2	3	4	Average
Y0	34.78%	15.38%	6.67%	0.00%	19.64%
Y1	28.95%	7.41%	3.92%	0.00%	11.63%
Y2	25.53%	19.12%	6.06%	0.00%	13.25%
3Y	28.70%	15.74%	5.45%	0.00%	13.60%

Source: PhD - VG

Deaths were concentrated among patients who presented with extremely low CD4 counts (below 50 cells/mm3). No deaths were recorded during this period among patients presenting with CD4 counts about 200.

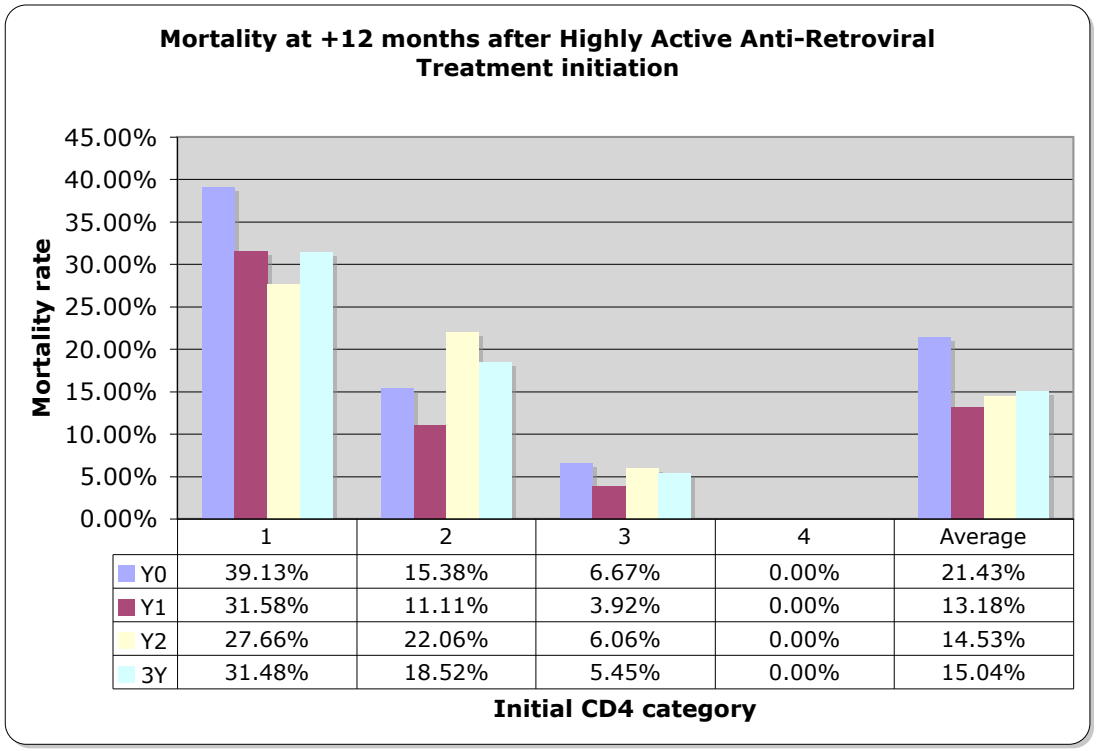
Notably, tuberculosis was a contributing factor. Almost 35% of registered patients had a history of TB. In Y2, 60% of patient deaths were directly attributable to TB as is clear from the data in Table 15.

Table 15 Tuberculosis as a co-factor: *ratio of Highly Active Anti-Retroviral Treatment patients presenting a current or past TB event*

All patients	*All*	*Initial CD4 level*			
		<50	*50-100*	*101-200*	*>200*
TB history	*34.8%*	*56.5%*	*34.25%*	*23%*	*26.3%*
Dead patients	*All*	*Initial CD4 level*			
		<50	*50-100*	*101-200*	*>200*
TB history	*81.4%*	*81.6%*	*85%*	*75%*	*No death*

Source: PhD - VG

Figure 34 Mortality at + 12 months*: mortality over the course of the programme in Highly Active Anti-Retroviral Treatment patients within the first 6 months of treatment per initial CD4 category, with 4 categories of CD4 count: category 1= [0;50], category 2 = [51;100], category 3 =[101;200], category 4 = [>200], with CD4 count expressed in number of cells per mm3*



	1	2	3	4	Average
Y0	39.13%	15.38%	6.67%	0.00%	21.43%
Y1	31.58%	11.11%	3.92%	0.00%	13.18%
Y2	27.66%	22.06%	6.06%	0.00%	14.53%
3Y	31.48%	18.52%	5.45%	0.00%	15.04%

Source: PhD – VG

Not surprisingly, the mortality pattern remains the same, with no death for level 4 patients (patients with an initial CD4 count > 200 cells/mm3), and most deaths occurring among patients with low CD4 counts.

Level 1 (initial CD4 count below 50 cells/mm3) patients accounted for 54.3% of all deaths, and Level 2 (initial CD4 count in between 51 and 100 cells/mm3) patients for 28.6%. Deaths did not increase substantially in the period between six and 12 months. Of the 419 patients that began HAART, 70 died, 81.4% of these within the first six months of therapy.

The research suggests that patients with low CD4 counts were those who succumbed early in the programme, and most often with TB as a mortality co-factor.

Financial unit-costs and Cost-effectiveness analysis

Unit –costs
Cost-effectiveness analysis
Synergies
Sensitivity analysis

Key findings 2

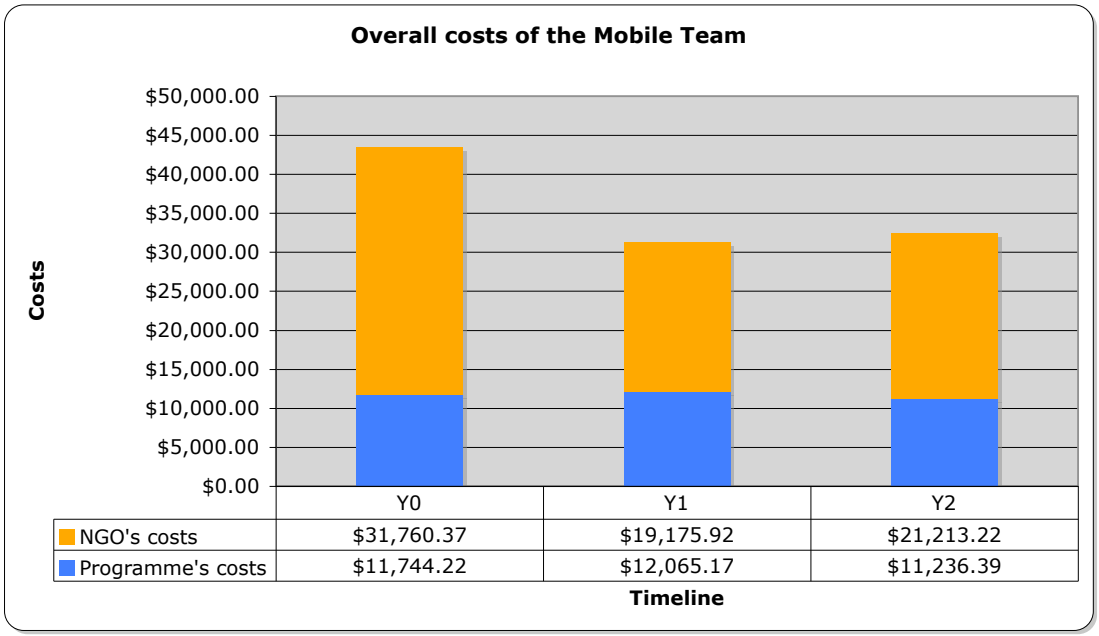
Model cost-effectiveness analysis key findings
VCT component cost-effectiveness
▪ The VCT component proved cost-effective with an average ICR vs. the null set scenario of I$12 per DALY(3,0) averted. ▪ Utilisation of capital investment seemed critical.
Care & treatment component cost-effectiveness
▪ The care & treatment component proved cost-effective with an average ICR vs. the null set scenario of I$252 per DALY(3,0) averted in term of real activity, and I$166 per DALY(3,0) averted with a theoretical occupation rate of 80%. ▪ A limit of the model was essentially a late identification of People Living with HIV/AIDS registering to the clinic with advanced stage of HIV/AIDS, probably because of the social barriers mentioned in the introduction ▪ Again, the utilisation of capital investment was critical in this result
Synergies within the model
▪ The return on capital items was critical and highly dependent on the utilisation of the structure ▪ The outreach team by referring more than 66% of the clients tested helped bringing down dramatically unit-costs at VCT level, virtually offsetting its own costs. ▪ The same was observed in between the VCT and the care & treatment component, especially in the early stage of the model implementation
Conclusion
Each analysed component is cost-effective when compared to international standards. This is mostly thanks to robust synergies within the outreach team, the VCT and the care & treatment components. The initial flow of clients generated by the outreach team helped drastically decreased unit-costs in the VCT and the care & treatment components. It appears that those synergies have limits. There are the HIV prevalence within the targeted population and the number of self-referred clients at registered at VCT level. Besides, the care & treatment component saw its cost-effectiveness level hampered by a low performance in term of medical outcome for the patients, mostly because of the late identification of PLHA registering to the clinic with advanced HIV/AIDS stages.

Financial unit costs analysis

Mobile outreach team

Operating costs

Figure 35 Mobile team costs: *financial cost of the Outreach team over the course of the programme, with NGO's and programme's costs breakdown, in current US$*



Source: PhD - VG

The annual operating costs of the mobile outreach team at programme level amounted to about US$11,500. Capital investment was minimal (motorbikes being the main expense incurred) and the team was set up quickly.

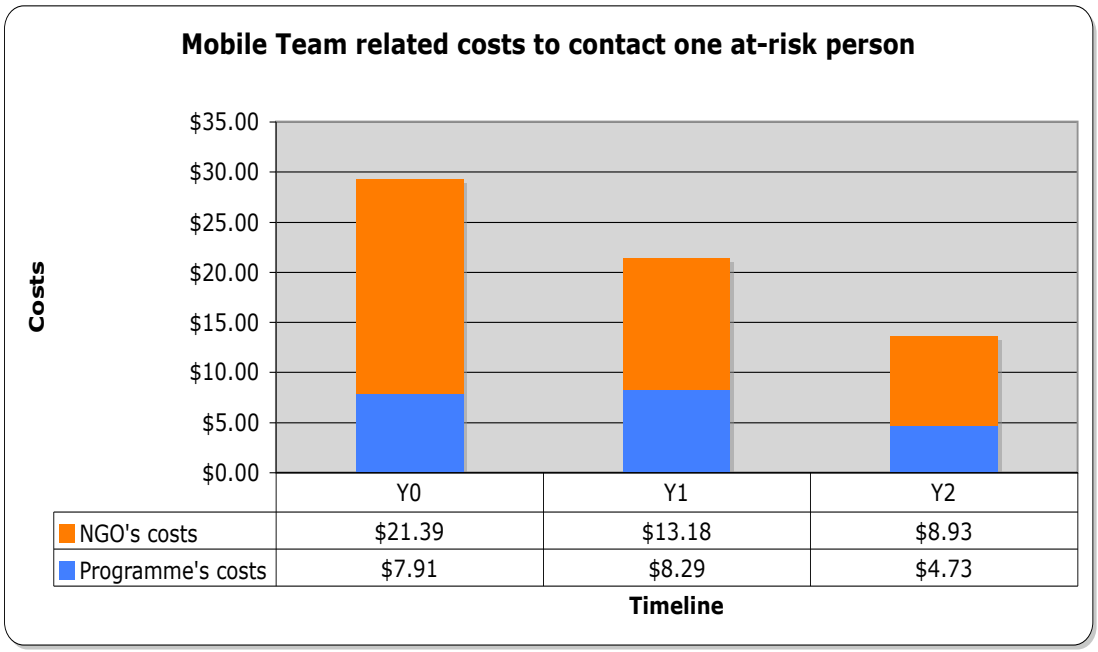
The related costs incurred by MDM, however, were relatively high – on average twice the programme-level costs. In the first year of implementation the costs incurred by MDM were in fact three times that at programme-level.

Unit costs

- *Cost to contact one at-risk person*

Marginal costs (the extra cost needed to produce one extra "unit", for instance to complete a testing procedure) were low and unit costs decreased quite dramatically over time from US$7.9 per contact to US$4.7 at the end of the three-year period (see Figure 36).

Figure 36 Mobile team's unit cost - cost per contact: *financial cost in current US$ to contact one at-risk person, with NGO's and programme's costs breakdown*



Source: PhD -VG

- *Cost of referral: the three perspectives*

There are different ways to look at this unit cost, depending on the standpoint of the researcher. We propose three perspectives, each valid with regards to the angle of the analysis.

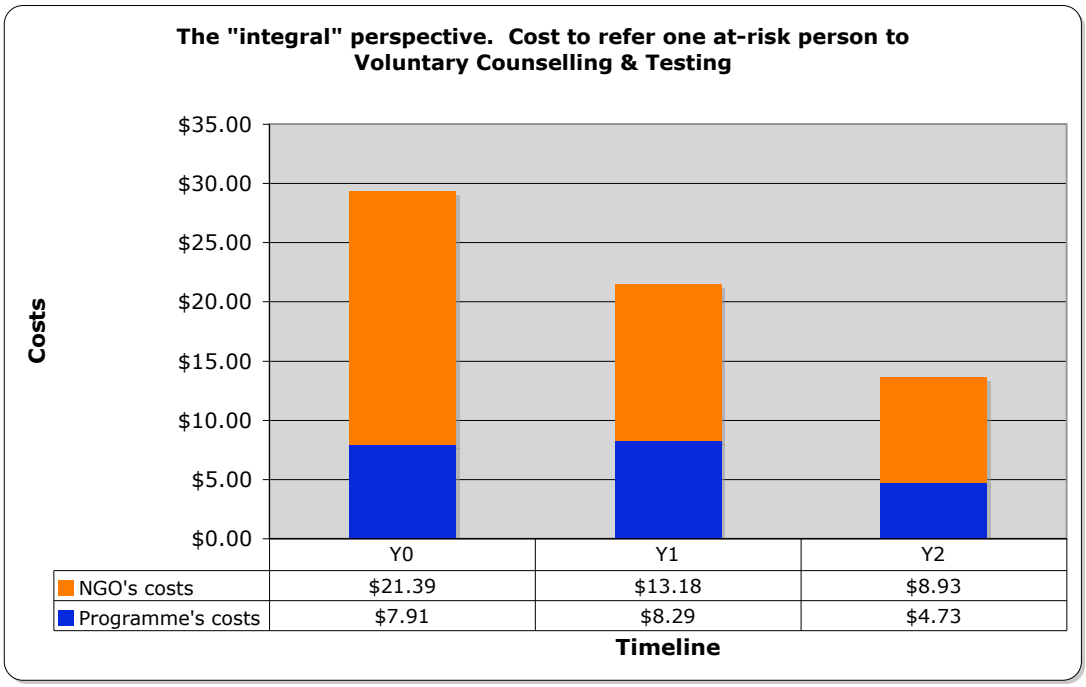
Perspective 1 (Integral): in which the cost to refer a client for VCT is equivalent to the cost of contacting one at-risk individual. This unit cost reflects the combined tasks of the mobile outreach team prevention and harm reduction, and VCT referral activities. Because peer-educators are tasked with convincing at-risk persons to get a test when they contact them, prevention activities and referral are part of the same process, with a successful referral being a by-product of the general IEC process.

Perspective 2 (VCT): in which the mobile outreach team's costs are related only to referred clients, as a way to calculate the extra cost generated as a result of the limited accessibility of the VCT service in the context of an alienating social climate. The mobile outreach team, in this perspective, contributes to boosting the activity of the VCT unit through attracting at-risk persons who wouldn't otherwise access the service.

Perspective 3 (medical). In this scenario, costs are spread among referred and positive clients, (in other words, future patients), as a way to reflect the additional costs generated by the necessity to identify people living with HIV and putting them on treatment in the context of limited social accessibility.

Unit costs vary significantly depending on which perspective is being applied as is clear from the data in Figure 37, Figure 38 and Figure 39.

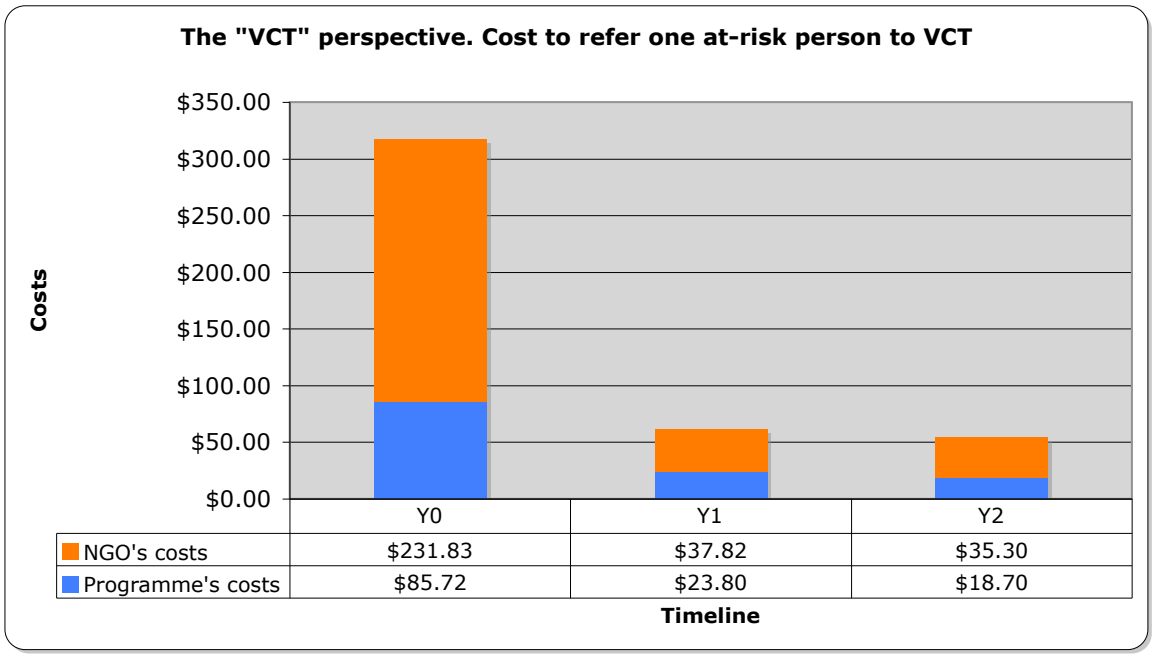
Figure 37 The integral perspective: *outreach team's financial cost in current US$ to refer one at-risk person to the VCT, with all Outreach's costs spread over all contacted clients*



Source: PhD - VG

The unit cost to refer one case to VCT is US$4.7 in Y2. In the context of the limited financial resources available this is a significant sum.

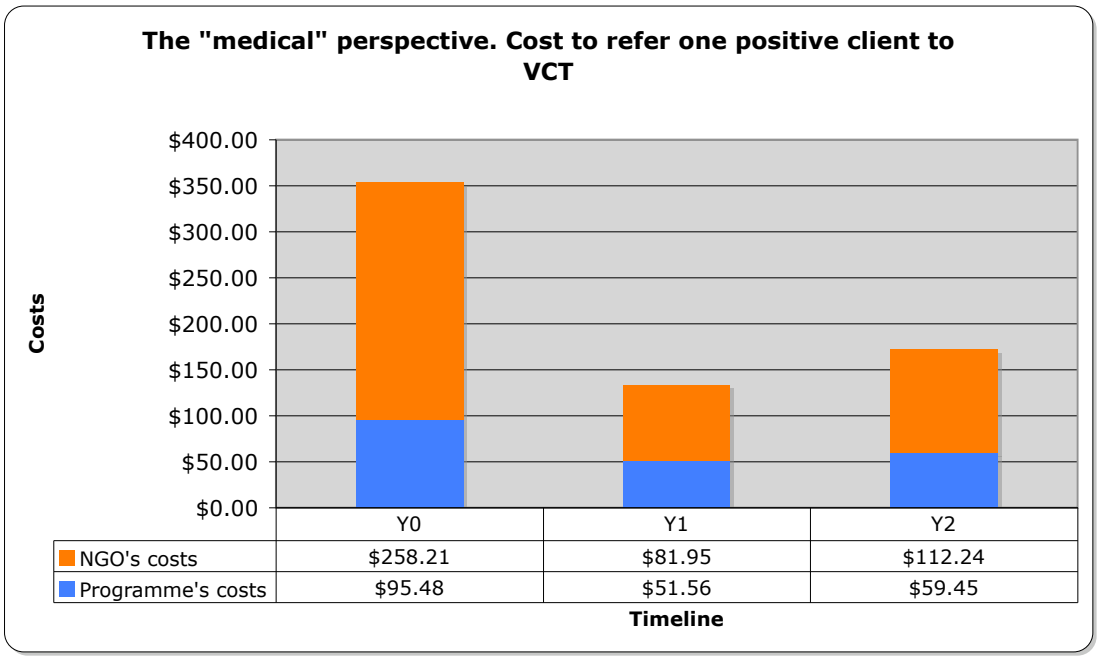
Figure 38 The VCT perspective: *outreach team's financial cost in current US$ to refer one at-risk person to the VCT, with all Outreach's costs spread over referred clients*



Source: PhD - VG

When the VCT perspective is considered, unit costs quadruple. The cost of referring one person for VCT in Y2 was US$18.70. Unit costs were influenced by the mobile outreach team's ability not only to contact at-risk persons, but also to convince them to get tested. As discussed previously, though the mobile outreach team was efficient in contacting clients from the programme's inception, it was later and following more training that the team recorded greater numbers of referrals to the VCT unit. Arguably, experience and training contribute to cost-efficiency in the long term. The data in Figure 18 clearly supports this: the unit cost to refer one client to VCT is almost US$86 in Year 0, while the average salary of a peer-educator is about US$90 per month. We can conclude from these statistics that skilled peer-educators are critical to cost-efficiency.

Figure 39 The medical perspective: *outreach team's financial cost in current US$ to refer one at-risk person to the VCT, with all Outreach's costs spread over all positive-tested referred clients*



Source: PhD -VG

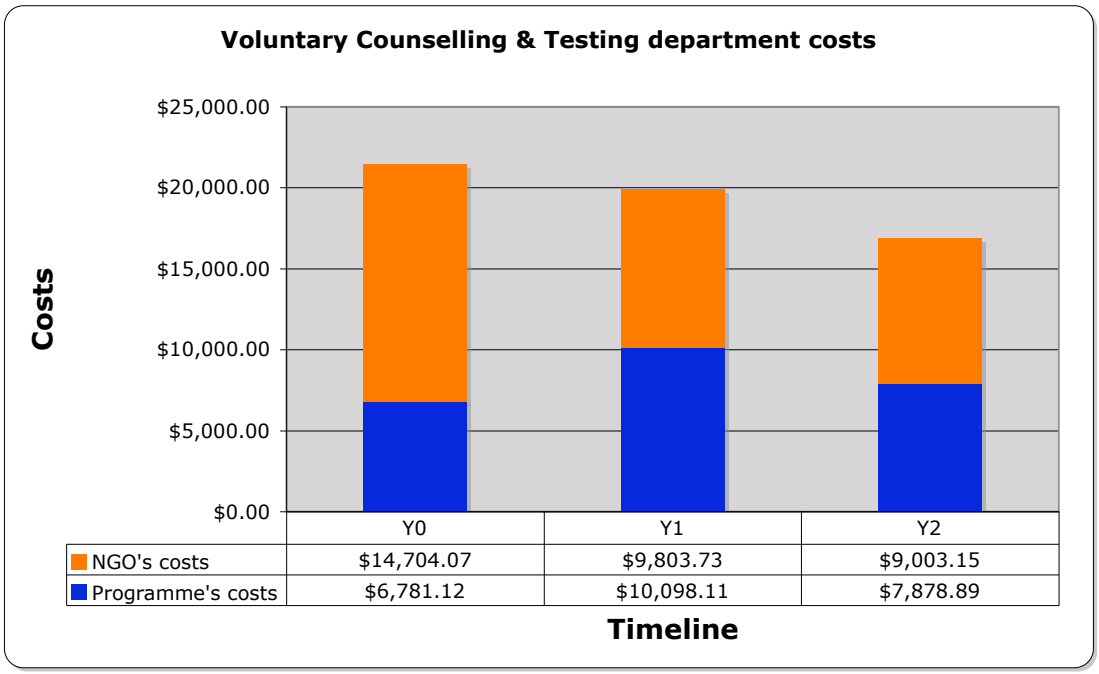
When considering the third, "medical", perspective (figure 39), costs appear extravagant. Surprisingly, in this context, the unit cost hits its lowest point not in Y2, when the project is nearing maturity, but in Y1, when both the numbers of clients referred and the HIV prevalence among them is high. As the prevalence diminishes among at-risk persons, the cost to identify one person living with HIV increases. The option of combining mobile outreach and VCT as one process might be considered but from a medical perspective this might well drive the unit cost higher as the prevalence rate decreases because of prevention efforts. However, the cost of US$50-$60 represents less than half the unit cost to treat one patient on ARVs for one year. This needs to be carefully balanced with the excellent outcome of HAART in a country in which only 25% of the PLHA have been diagnosed.

VCT

Operating costs

Total costs of the VCT unit are lower than those of the mobile team. This is attributable to the fact that VCT is much less labour-intensive. The slight increase in the costs in Y1 was the result of a renovation to the outpatient clinic (a financial cost which was not annualised).

Figure 40 VCT costs: *VCT financial cost in current US$ over the course of the programme, with NGO's and programme's costs breakdown*

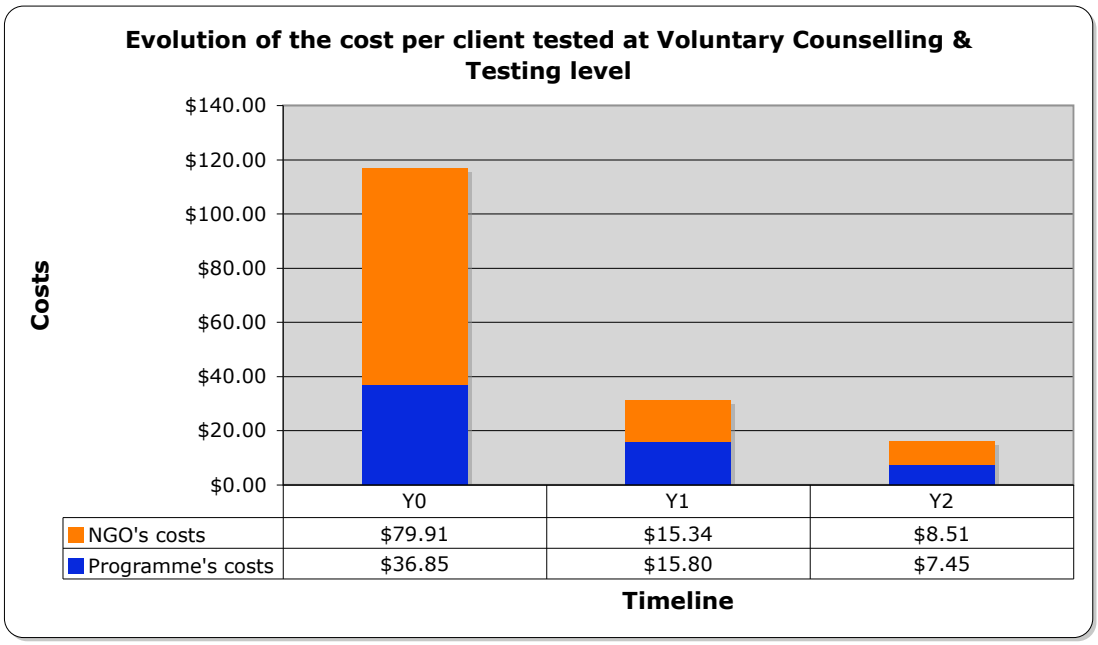


Source: PhD - VG

Unit costs

Cost to test one client

Figure 41 Cost per test: *financial cost in current US$ to proceed VCT on one client over the course of the programme, with NGO's and programme's costs breakdown.*



Source: PhD - VG

Unit costs are quite low at the VCT level. A confirmation test, for example, averages about US$8.5 on average vs US$1.5 for a rapid-test. Of course the cost per client tested depends on the infection rate among clients tested because the Vietnamese National Guideline on VCT requires an ELISA test to confirm the initial quick-test.

Testing a positive client cost out at an average of US$10 over the three-year period. The marginal cost for one positive test in the VCT unit is equivalent to the test cost itself. Taking into account the average level of activity in the VCT unit (about 40% of capacity) no additional capital or human resources are necessary. Of course the cost could be decreased were the protocol to be changed and a double rapid test scheme adopted. This would bring down the cost to about US$3 per positive case detected.

Table 16 The share of the direct costs in testing: *evolution of the financial cost in current US$ to proceed VCT with one positive client over the course of the programme*

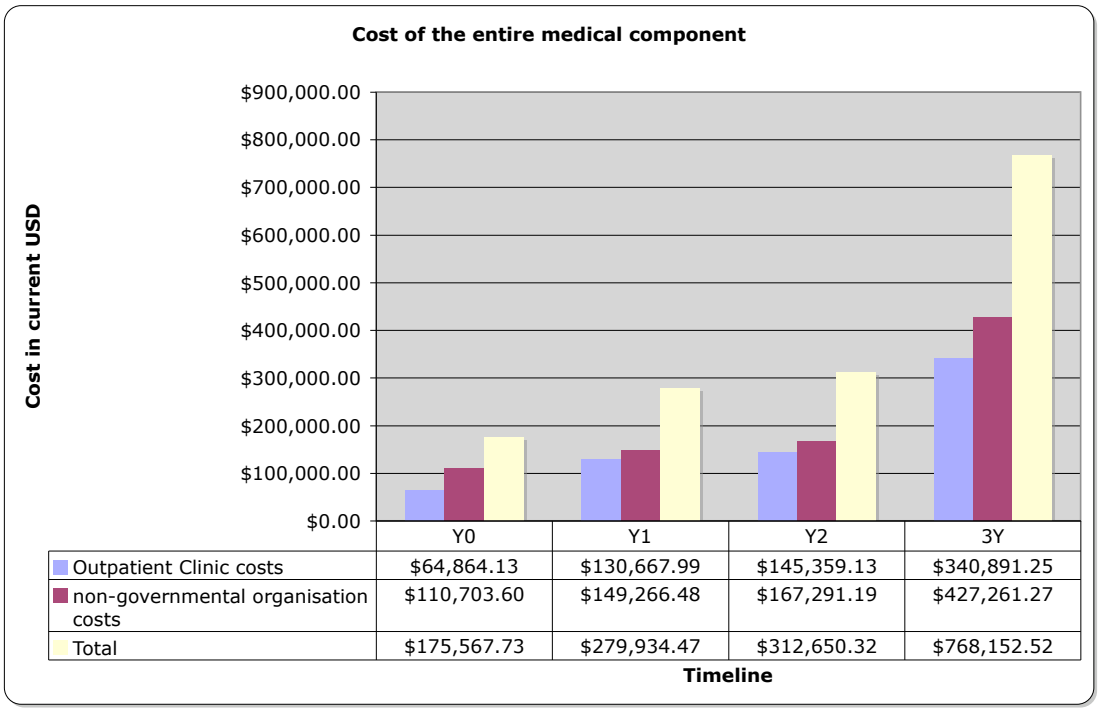
Cost to test one positive client		Y0	Y1	Y2	*Average*
Programme	Direct costs	$35.61	$21.57	$12.86	*$23.34*
	Indirect costs	$1.56	$1.10	$0.67	*$1.11*
	Sub-total	$37.17	$22.67	$13.53	*$24.45*
NGO	Technical support cost	$14.79	$6.90	$5.77	*$9.15*
	NGO management and admin cost	$69.34	$16.35	$10.83	*$32.18*
	Sub-total	$84.13	$23.25	$16.61	*$41.33*
TOTAL		**$121.30**	**$45.92**	**$30.13**	*$65.78*

Source: PhD - VG

Care & treatment

Operating costs

Figure 42 C&T operational costs: *financial cost in current US$ to run the care & treatment component over the course of the programme, with NGO's and programme's costs breakdown*



	Y0	Y1	Y2	3Y
Outpatient Clinic costs	$64,864.13	$130,667.99	$145,359.13	$340,891.25
non-governmental organisation costs	$110,703.60	$149,266.48	$167,291.19	$427,261.27
Total	$175,567.73	$279,934.47	$312,650.32	$768,152.52

Source: PhD - VG

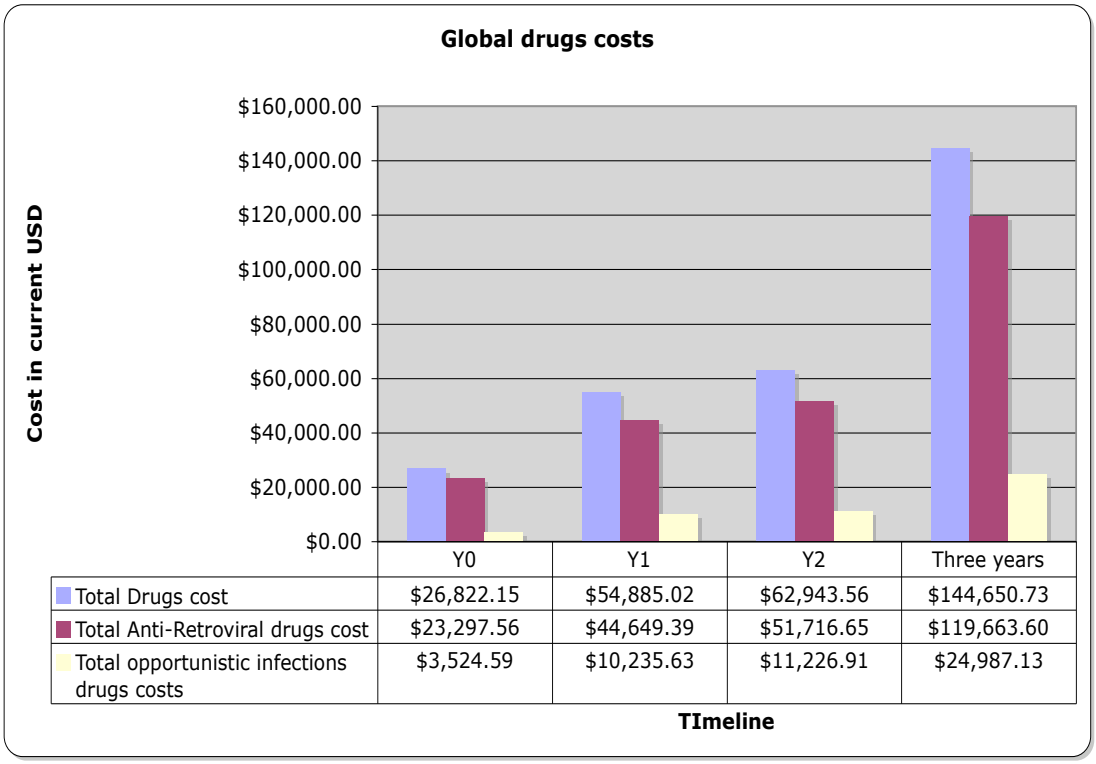
The global cost of the medical component of the programme was directly linked to the caseload of the clinic. A key marginal cost was medicines, such as ARVs and those used to treat aggressive opportunistic infections.

Human resources were stable during the three-year period of programme implementation. There was some streamlining of the nutrition and adherence teams at the end of Y1, but otherwise no significant costs associated with staffing issues. One extraordinary cost was incurred because of the renovation of the OPC facility at the end of Y0, which accounts for the considerable increase in costs between Y0 and Y1, despite only a slight increase in caseload.

High costs

Medicines are the critical component in HAART and these have contributed to increasing the cost of the care and treatment aspect of the programme (see Figure 43).

Figure 43 Medicines cost: *evolution of the financial cost in current US$ of all medicines used at outpatient clinic level over the course of the programme*



	Y0	Y1	Y2	Three years
Total Drugs cost	$26,822.15	$54,885.02	$62,943.56	$144,650.73
Total Anti-Retroviral drugs cost	$23,297.56	$44,649.39	$51,716.65	$119,663.60
Total opportunistic infections drugs costs	$3,524.59	$10,235.63	$11,226.91	$24,987.13

Source: PhD - VG

As the data in Figure 43 makes clear, the total expenditure for medicines tripled in three years, which is a lesser factor than expected considering the considerable increase in the number of active patients, this because of a major decrease in medicines market price. Medicines alone (but not their handling at clinic level) accounted for 44.5% of the total cost in Y0, and 48.7% in Y2.

In Table 18 we outline the cost of selected regimens and drugs (per patient/per year) over the three-year period.

***Table 17 Various medicines and regimens costs**: examples of the evolution of the financial cost in current US$ of some selected HAART regimens over the course of the programme*

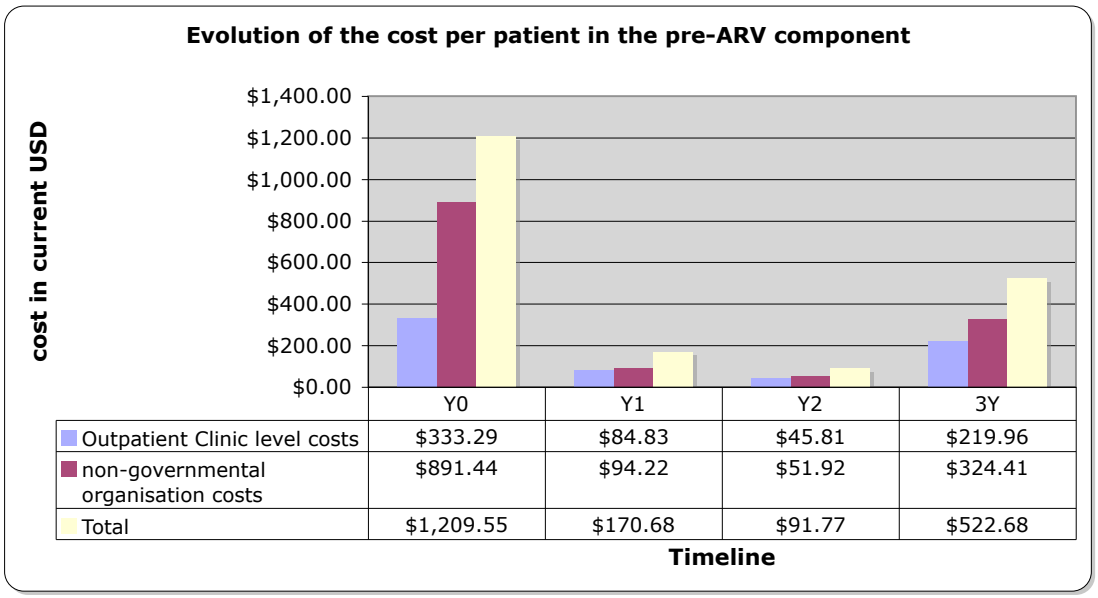
Cost for a one-year treatment	Year 0	Year 1	Year 2
D4T/3TC/NVP in fixed-dose combination	Not available	101.29 USD	101.29 USD
ZDV/3TC/NVP in fixed-dose combination	Not available	239.53 USD	239.53 USD
EFV 600 mg	1,533 USD	450.7 USD	239.31 USD
3TC 150 mg	69.35 USD	50.97 USD	42.8 USD
D4T 40 mg	58.66 USD	52.14 USD	52.14 USD
NVP 200mg	438 USD	55.57 USD	43.44 USD

Source: PhD - VG

Cost per patient per year

Unit costs at patient level show a very interesting evolution, with a constant decrease overtime as the caseload of the clinic goes up and the price of medicines goes down.

***Figure 44 Pre-ARV patients costs:** financial cost in current US$ of treating a pre-Anti-Retroviral patient over the course of the programme, with NGO's and programme's costs breakdown*

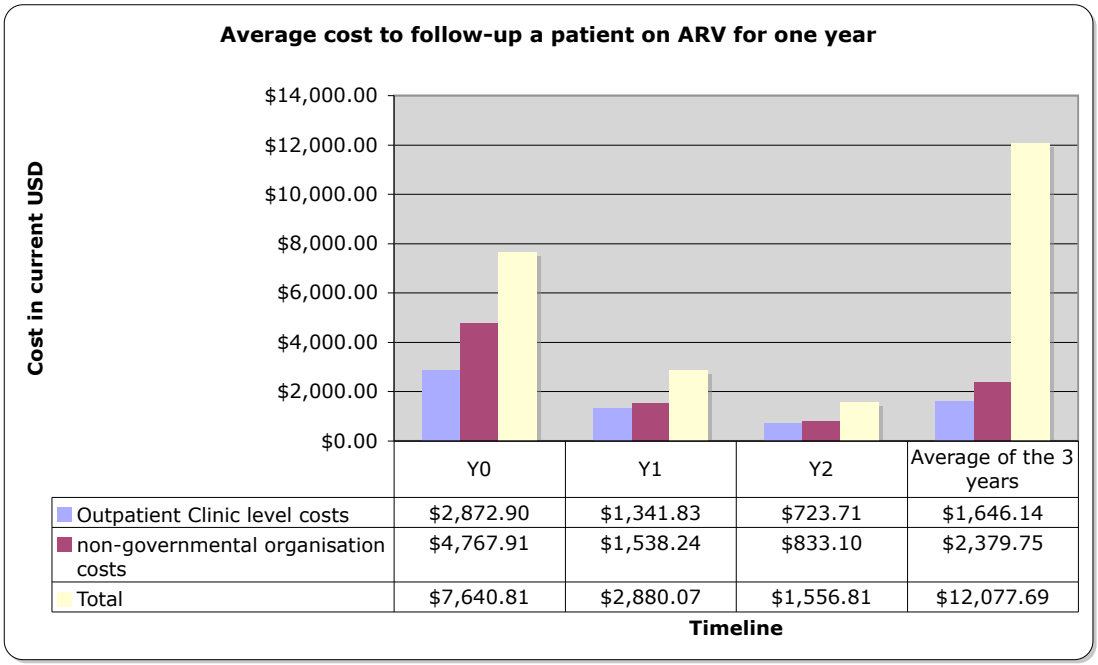


	Y0	Y1	Y2	3Y
Outpatient Clinic level costs	$333.29	$84.83	$45.81	$219.96
non-governmental organisation costs	$891.44	$94.22	$51.92	$324.41
Total	$1,209.55	$170.68	$91.77	$522.68

Source: PhD - VG

Patients in the pre-ARV programme received little care from the clinic. Hence it is not surprising that the cost at OPC level was set quite low, (about US$46 in Y2, when the caseload allowed for a better return on the capital costs incurred (see Figure 45).

Figure 45 ARV patient cost: *financial cost in current US$ of treating a HAART patient over the course of the programme, with NGO's and programme's costs breakdown*



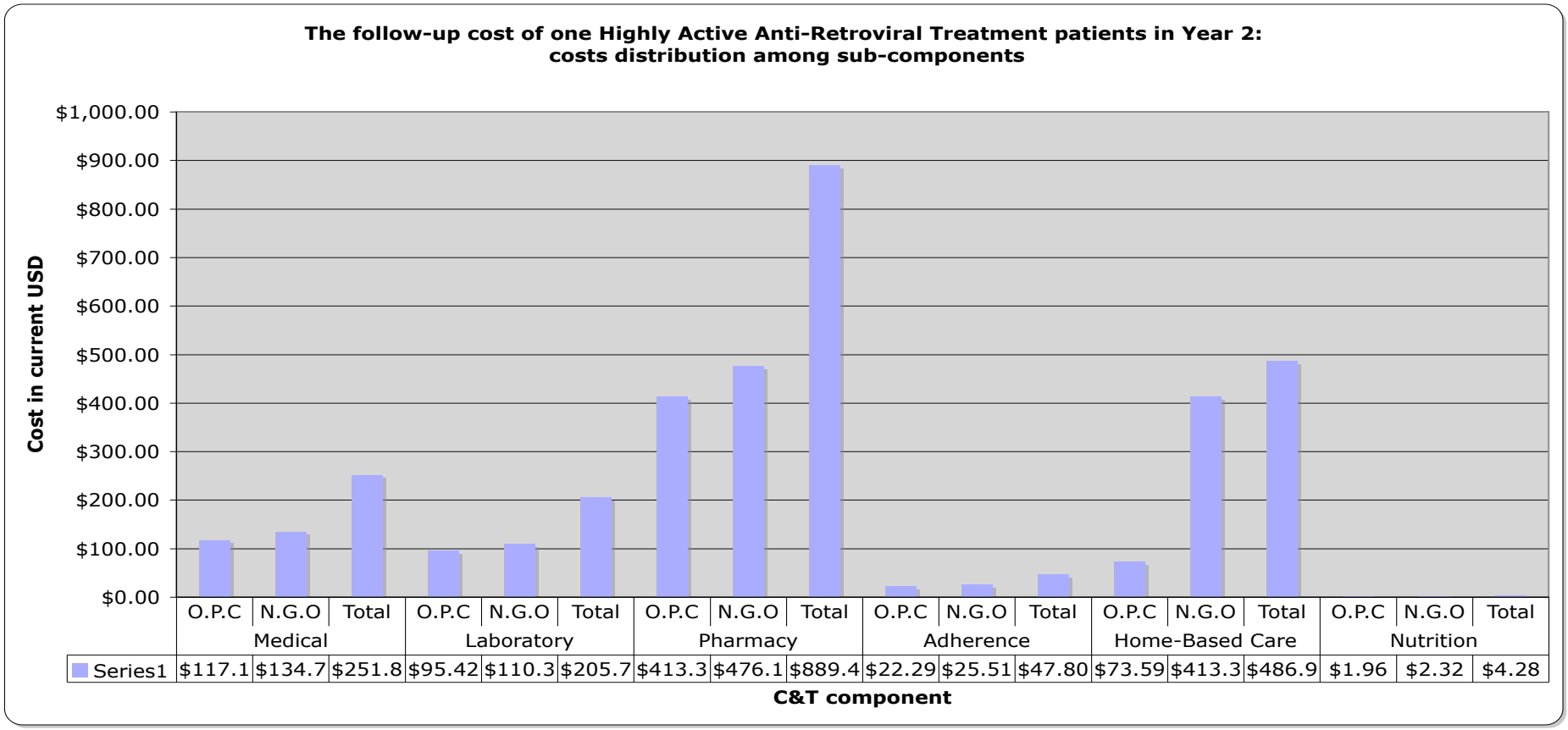
	Y0	Y1	Y2	Average of the 3 years
Outpatient Clinic level costs	$2,872.90	$1,341.83	$723.71	$1,646.14
non-governmental organisation costs	$4,767.91	$1,538.24	$833.10	$2,379.75
Total	$7,640.81	$2,880.07	$1,556.81	$12,077.69

Source: PhD - VG

The cost per HAART patient per year is extremely high considering the context. Notably, the cost decreased significantly during the three-year implementation period. Still, during Y2, considered the best year in terms of cost, the amount spent on following up just one patient amounted to US$723.

A closer look at the structure of the unit cost in Y2, as presented in Figure 46, reveals how critical was the pharmacy's financial weight.

Figure 46 HAART patient cost breakdown: *HAART patient follow-up and treatment yearly financial cost breakdown and structure in the last year of the programme, in current US$*



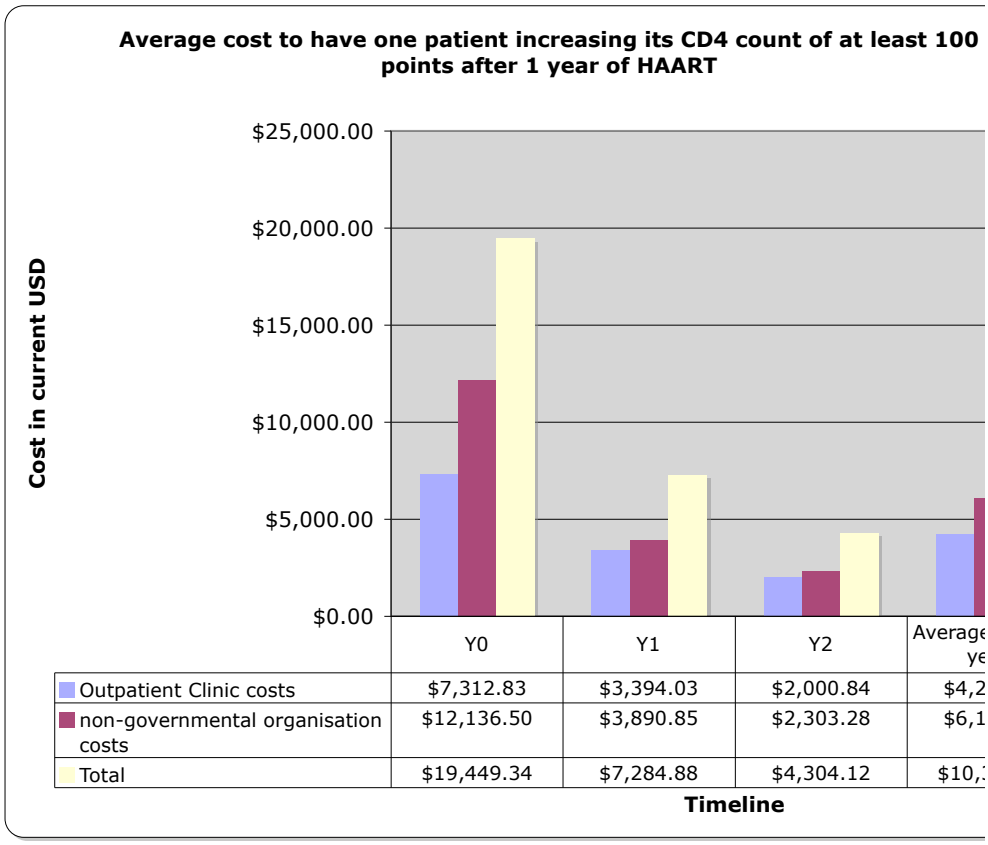
Source: PhD - VG

Hence the cost of drugs amounts to about half of the final cost of follow patient for one year.

The second cost by importance was the medical team itself, followed laboratory (a CD4 count was worth 20 USD, viral load and virus genotype available in Hanoi at that time), the Home-Based Care, the adherence team nutrition support component.

Herein we simulated the cost of a patient whose CD4 count increases at points after one year of HAART. We calculated this unit cost based "performance ratio" of the programme for each year, meaning its ability three-year period to raise the CD4 count significantly. This encompasses not impact of the ARVs, but also the capacity of the programme to limit mort deter inconsistent behaviour in patients during follow-up. On average, 38.3 patients who began HAART recorded such positive results (see Figure 48).

Figure 47 The cost of an average performance: *yearly financial cost in cur to have one patient seeing its CD4 count increases of at least 100 cell per n 12 month of treatment, with all HAART medical costs spread over "suc patients*



	Y0	Y1	Y2	Average ye
Outpatient Clinic costs	$7,312.83	$3,394.03	$2,000.84	$4,2
non-governmental organisation costs	$12,136.50	$3,890.85	$2,303.28	$6,1
Total	$19,449.34	$7,284.88	$4,304.12	$10,1

Source: PhD – VG

This result is staggering considering the limited financial resources in the Vietnamese context. But it is the consequence of the combined constraints outlined in previous sections, and moreover to late referral/detections, CD4 counts that rendered patients ineligible for HAART and the lack of direct links between HIV and TB programmes in Vietnam.
The research framework did not allow for the performance evaluation of either the HBC unit or the adherence team because of a lack of comparative programmes.

Cost-effectiveness analysis of the model's key components: VCT and care & treatment

Cost-effectiveness analysis of the VCT unit

In this section we propose to calculate the cost per DALY(3,0) averted by the VCT unit, following WHO-CHOICE guidelines.

Costs are computed:

- using the ingredient approach;
- capital items are annualised using a 3% discount rate;
- local human resources costs are corrected using local minimal wages for unskilled labour;
- international human resources costs are corrected using a standard rate corresponding to an average yearly cost of between US$72,000 and US$84,000 (2008 rates of exchange). These figures correspond to I$58,775 and I$68,571) per staff (which is the most important variation from financial costs). All costs are presented in 2000 International USD. All costs incurred to run the unit are included, not only costs corresponding to the testing of negative clients as we assume that testing both negative and positive clients is required to identify negative cases.

We ran the simulation using the following variables:

- No. of clients tested negative: 731 (result in Y2), corresponding to about 80% capacity use;
- Sex-ratio: 56% (average in Y2);
- Odds of any client becoming infected in the future: 30% (estimated rounded average prevalence according to the literature);
- Disability weight factor for AIDS: 0.505;
- Average life span after infection: 3 years;
- Discounted life span (3%): 2.82;
- Average age of the clients: 30 years;
- Maximum life expectancy for a male: 80 years;
- Maximum life expectancy for a female: 82.5 years;
- Discounted remaining life expectancy for a male: 26.01 years;
- Discounted remaining life expectancy for a female: 26.59 years; and
- Ratio of avoided infections : 1%, 10%, and 24%.

The results are presented in Table 18.

Table 18 Cost per DALY averted by the VCT*: in function of the number of infection averted*

731 negative cases identified	**Null set**	**Intervention – VCT**			**DALY(3,0) averted**		
		Avoided infection ratio			Avoided infection ratio		
		1%	10%	24%	1%	10%	24%
YLL	5134	4963	3423	1027	182	1815	4357
YLD	312	302	208	62			
DALY(3,0)	5446	5265	3631	1089			
Cost per DALY(3,0) averted							
With Outpatient Clinic level costs	Avoided infection rate of 1%	**47 I$/DALY(3,0) averted**					
	Avoided infection rate of 10%	**5 I$/DALY(3,0) averted**					
	Avoided infection rate of 24%	**2 I$/DALY(3,0) averted**					
All costs included Outpatient Clinic + non-governmental organisation	Avoided infection rate of 1%	**121 I$/DALY(3,0) averted**					
	Avoided infection rate of 10%	**12 I$/DALY(3,0) averted (mean assumption)**					
	Avoided infection rate of 24%	**5 I$/DALY(3,0) averted**					

Source: PhD - VG

The reality lies somewhere between these figures. The avoided infection ratio is based on an analysis operated in Africa (Kenya and South Africa), where the epidemic and social dynamics are quite different from those in Vietnam. Kenya and South Africa are experiencing a generalised epidemic, whereas Vietnam's is concentrated among particular at-risk groups. Yet, we could transfer, though cautiously, the African experience, particularly in the case of the Tay Ho Clinic's VCT unit, where there is, on average, an extremely, regardless of whether clients belong to an at-risk group or not.

Comparison to international results

The World Health Organisation-CHOICE offer sets of indicators on its website[14]. The index for VCT is: *HIV-14: Voluntary counselling & testing [VCT] at 95% coverage.* Its value is 40 I$/DALY averted. With an interval ranging from 5 to 121 I$, the Tay Ho VCT unit has the potential to meet WHO standards, especially considering its mean value of 12 I$/DALY(3,0) averted.

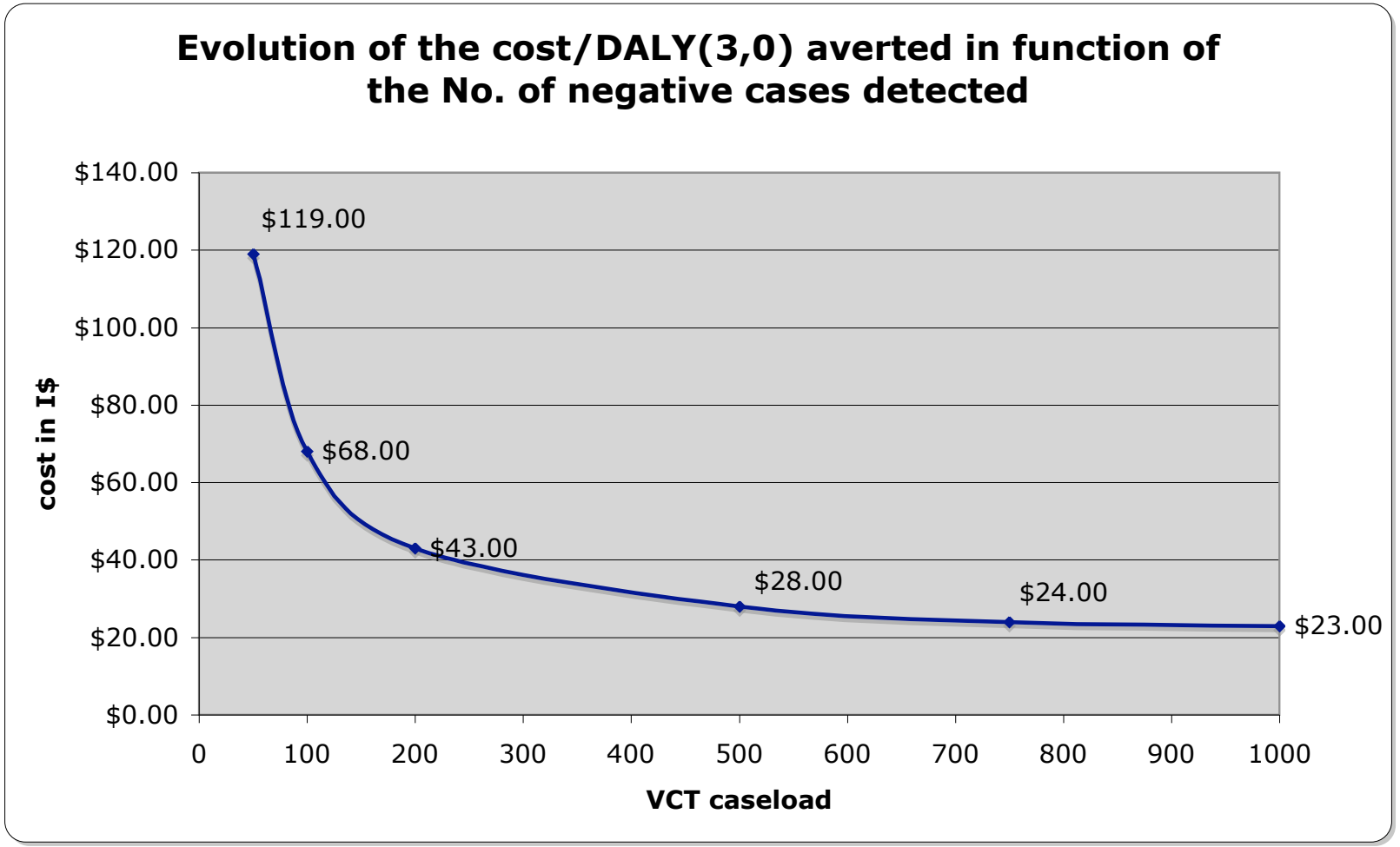
As for the for the international literature, we find few comparable references:

- a study in Tanzania and Kenya (Sweat 2000), demonstrates a range in Kenya of 5.16 to 27.36$ per DALY averted, and 6.58$ to 45.03$ in Tanzania;
- a study performed in Tanzania (Thielman 2006) demonstrated a range from 4.72$ to 8.72$ per DALY averted; and
- a study (Hogan 2005) reviewing different programmes in Asia and Africa reported an ICR of 40 I$/DALY averted for the World Health Organisation-SEAR (most likely the figure retained for World Health Organisation-CHOICE)

It appears the Tay Ho model is comfortably in line with international standards, though, because of a lack of information in the papers cited, it is difficult to know how costs are allocated at managerial level, and/or what type of discount is used or not used in other research studies. Nonetheless, as demonstrated in the financial unit-cost discussion, the VCT unit largely benefits from the work of the mobile outreach team, especially during the first two years of the programme. And it is very likely the client-base created by the mobile team continues to boost the cost-effectiveness of the model by decreasing fixed-costs per client (see Figure 48).

[14] http://www.who.int/choice/results/hiv_seard/en/index.html for results on HIV in the South-East Asia region.

Figure 48 Evolution of the cost-effectiveness of the VCT unit: *economic cost in I$ to avert one DALY(3,0) based on the number of negative cases detected*



Source: PhD - VG

Cost-effectiveness analysis of the care & treatment component

In this section we calculate the cost per DALY (3,0) averted by the care and treatment unit using the World Health Organisation-CHOICE approach.

Costs were computed using the ingredient approach and followed those costs allocation and analysis methods:

- Capital items were annualised using a 3% discount rate;
- Local human resources costs were corrected using local minimal wages for unskilled labour;
- International human resources costs were corrected using a standard rate corresponding to an average yearly cost of between US$72,000 and US$84,000 (2008 exchange rate - which translates to I$58,775 USD and I$68,571 respectively) per staff ; and
- Medicines costs were integrated using CIF costs, but without the cost of transport and storage at central level. All final costs are presented in International Dollars.

To calculate years lived with disability (YLD), the disability weight for AIDS status was 0.505, and 0.167 for HIV + Highly Active Anti-Retroviral Treatment (Burden of Disease 2005).

To calculate years life lost (YLL), we considered the maximum life expectancy for both males and females aged 30 years old using a time discount rate of 3% resulting in a YLL of 26.01 years for males and 26.59 for females. No age weight was used. The average life expectancy for AIDS patients without treatment was set at three years.

The Immunology Case Registry was calculated versus the null set scenario.
To determine the number of DALY averted we used the average caseload in Y2, with an annual performance from the programme of 38%. Thus, we considered only the patients who recorded CD4 counts above 200 OR with a net increase of 100 cells/mm3 after one year of treatment as a positive outcome.

Table 19 DALYs averted by the C&T unit*: economic cost in I$ to avert one DALY(3,0) in the care & treatment component*

General performance of 38%, 135 males, 48 females	Null set	Programme	DALY (3,0) averted
YLL	4239	2606	
YLD	260	470	
DALY (3,0)	4499	3076	1423
Cost per DALY (3,0) averted			
With OPC level costs	98 I$/DALY (3,0) averted		
With Outpatient Clinic level cost + non-governmental organisation costs	252 I$/DALY (3,0) averted		

Source: PhD - VG

It is worth noting that the number of YLD is higher in the case of treatment. This is due to the fact that HAART bears a significant disability weight and a successful Highly Active Anti-Retroviral Treatment prolonged life adding Years of Life with Disability to the total.

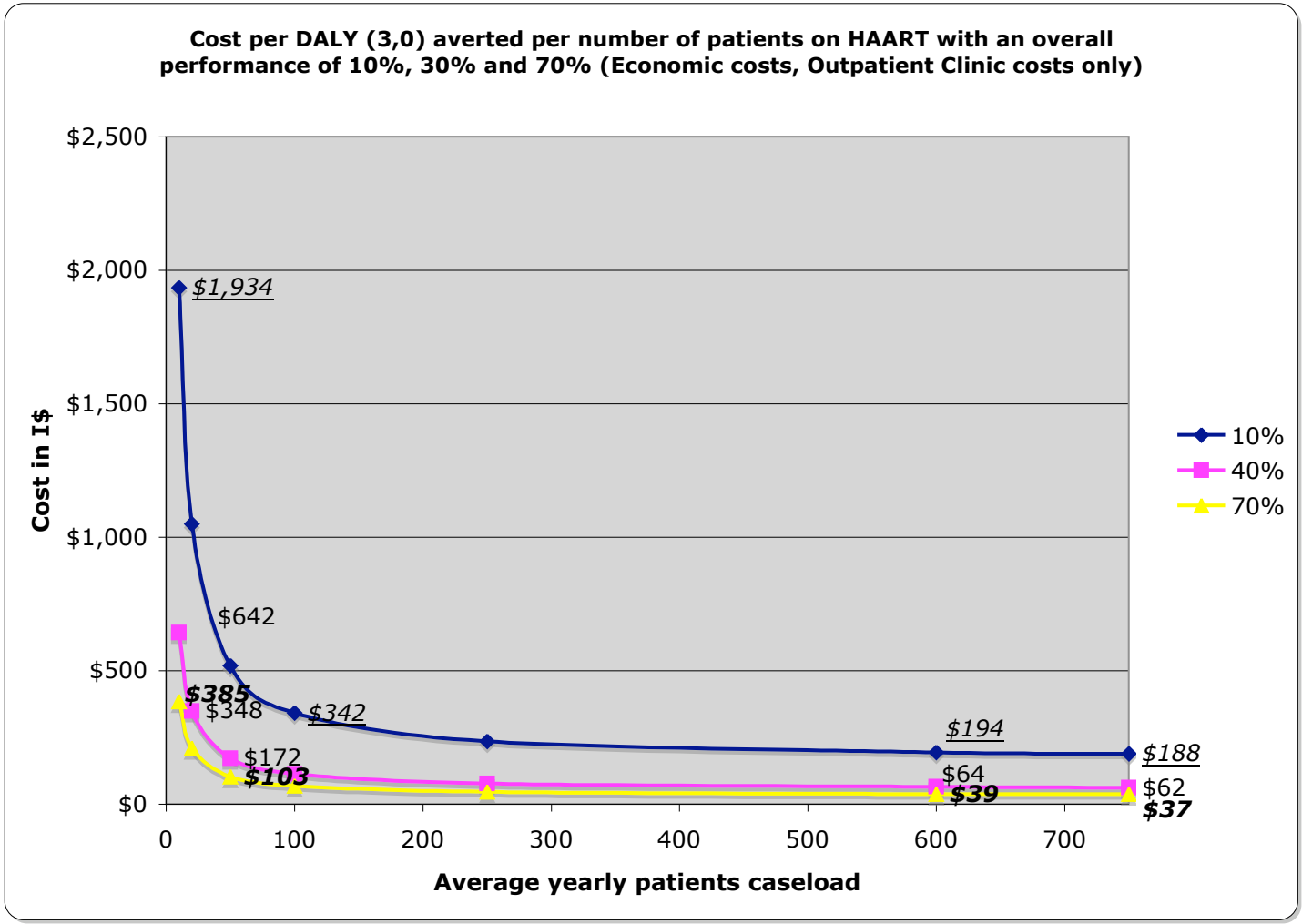
The cost per DALY averted is quite high, and more so when calculating NGO costs (**which are significantly higher when using economic costs.**, Calculating real financial costs would cut down costs to US$190 per DALY averted).

This result has to be compared to the international literature. However, for reasons previously discussed, little has been published on the matter. A paper from A. Renaud et al (2009), which offers a cost-effectiveness analysis of an OPC in Burundi, gives a result of US$**258** (calculated at 2007 exchange rates), which is equivalent to **215** I$ per DALY (3,0) averted. The World Health Organisation-CHOICE gives an indication of 542 I$ in the SEAR-D region for HAART programmes. Yet this result was published in 2000 at a time when medicines were about four times in their price in 2008. Another paper from Shunsuke Ono et al (2006) proposes a value of US$610 per DALY in Thailand. So, based on limited comparisons the intervention could be considered cost-effective..

More helpful is the calculation of the potential cost-effectiveness of the programme according to two key factors: its average caseload, and its general performance.

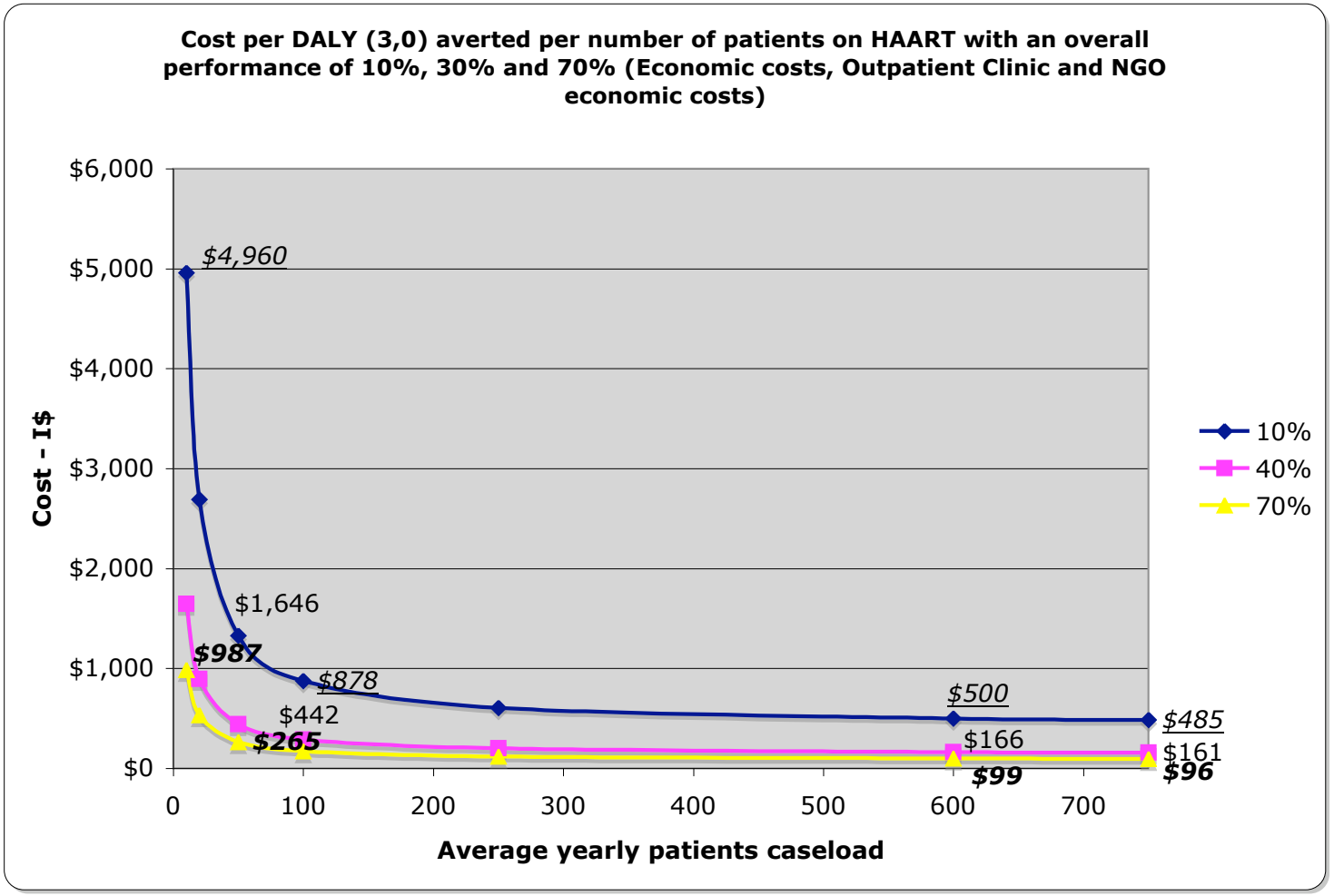
Results thereof are summarised in Figure 49 and 50.

Figure 49 Simulation of the cost per DALY averted: *simulation of the economic cost in I$ per DALY(3,0) averted based on the average medical performance in the programme and its general caseload, with solely programme's costs, and not NGO's*



Source: PhD - VG

Figure 50 Simulation of the cost per DALY averted with NGO costs: *simulation of the economic cost in I$ per DALY(3,0) averted based on the average medical performance in the programme and its general caseload, with NGO's and programme's costs*



Source: PhD – VG

The maximum capacity of the OPC is pegged at 750 HAART patients. The average caseload (80% occupation) is 600 HAART patients, resulting in an ICER of 99 I$, 166 I$ and 500 I$ from 70% to 10 % of performance. To ensure cost effectiveness the site must be accessed by a minimum of 250 HAART patients. Authorities should be encouraged to favour integrated models such as the OPC at Tay Ho in efforts to save capital costs and promote effective management.

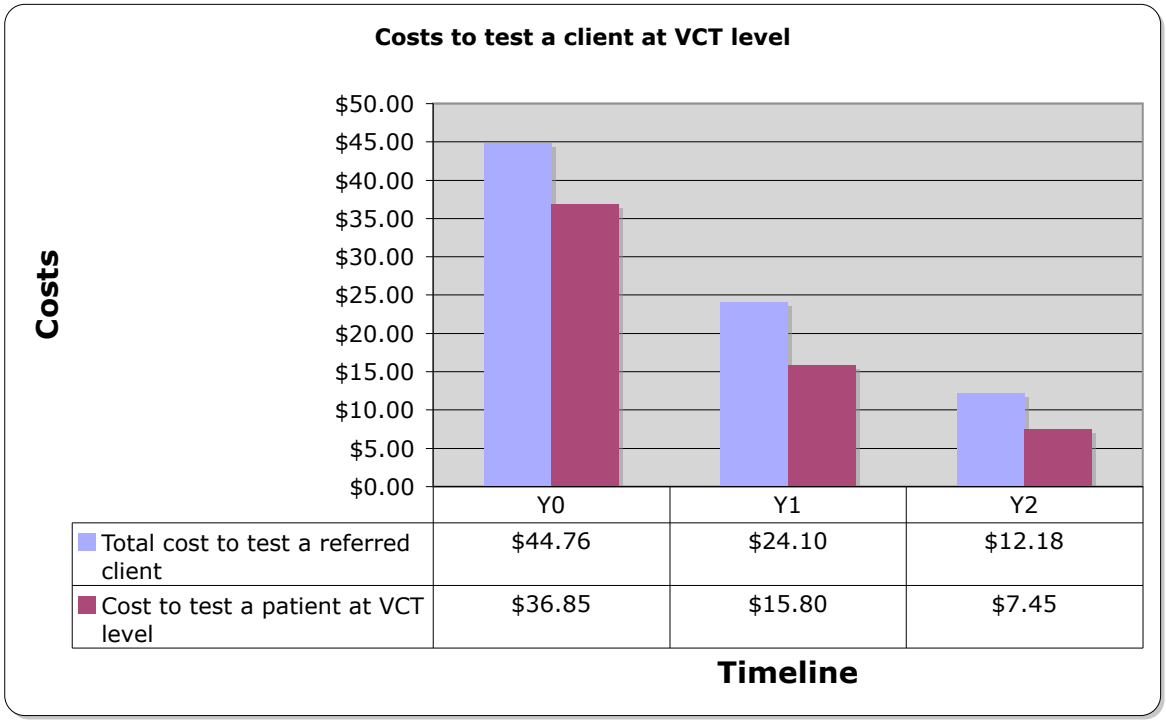
Performance is also crucial. From 10% to 70%, ICER are divided by 5. It is nonetheless a confirmation of the past analysis using financial costs. Clinical care quality is at stake, and ongoing training and medical supervision is necessary to improve the quality of diagnosis and treatment, yet as early access to the programme might be the most critical factor to consider.

Synergies within the prevention component

It is clear that the mobile outreach team has been at the forefront of attracting clients to the outpatient clinic. Important however is to analyse the possibility that the mobile team's operation could decrease the unit cost in such a context.

If we compare the cost to test any client, (referred or not, tested positive or negative) to the complete cost to test and refer a client, (negative and positive included), the added cost for each referred client is not extravagant (see Figure 51).

Figure 51 Cost for a referred client: *financial cost in current US$ to proceed VCT on a referred with its cost of referral, vs. the financial cost in current US$ to simply proceed VCT on any given client over the course of the programme*



Source: PhD - VG

But if we considered the virtual unit costs at the VCT level in the absence of a mobile outreach team, the cost effectiveness of the team approach becomes clearer (see Figure 52 and Figure 53). Over a three-year period, the mobile outreach team has directly generated 66.2% of the VCT unit's traffic and helped improve the use of the capital invested in setting up the VCT site.

As illustrated in Figure 52, the unit cost at VCT level is highly dependant on the inflow of clients because most of the unit's costs are fixed, such as human resources, facility and equipment.

In Figure 53 and Figure 54 we compare the cumulative cost to test a referred client vs. the cost to test a self-referred patient. To calculate these unit costs, fixed costs are averaged

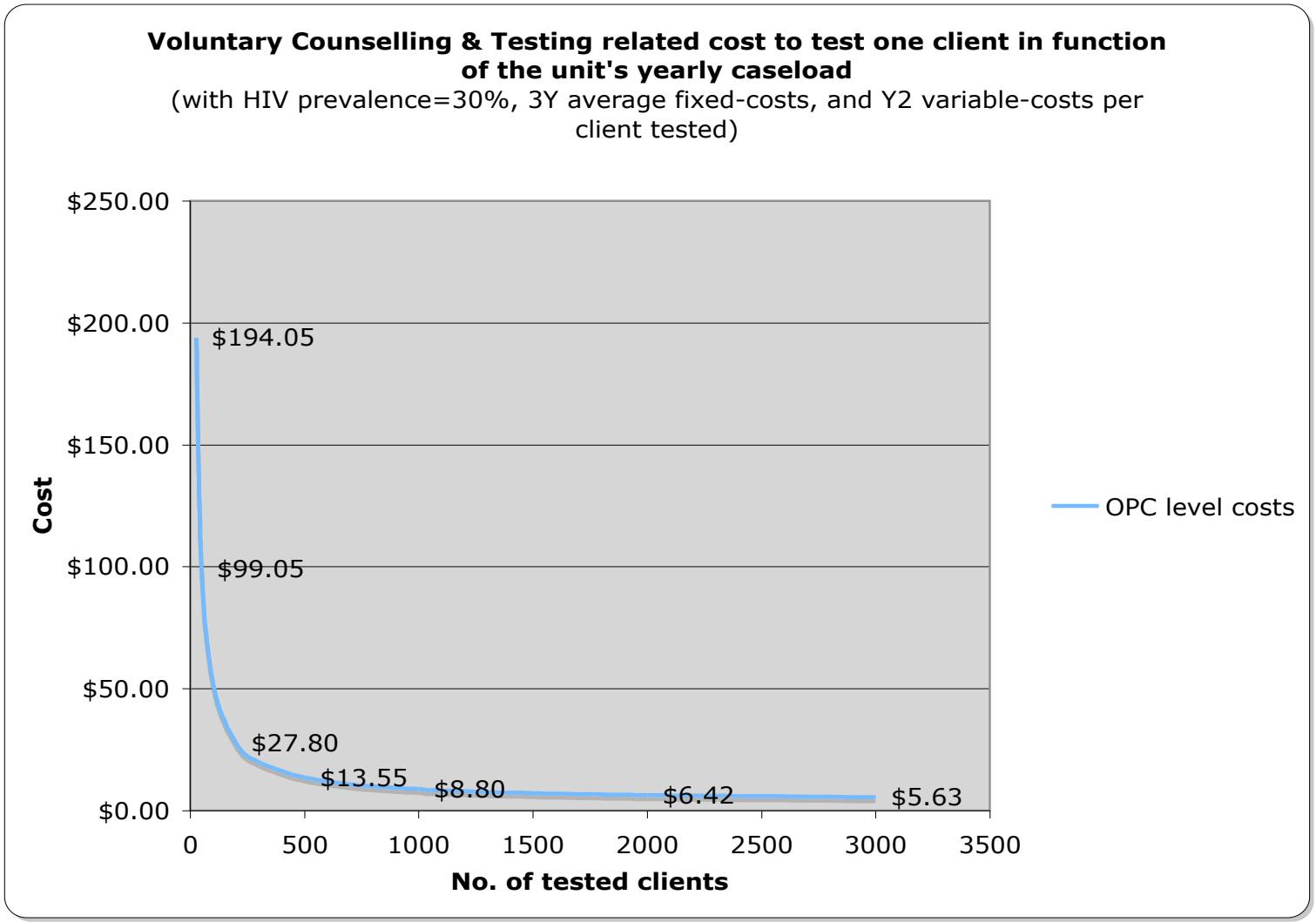
over the three-year period to reflect previous investments. Variable costs are extracted from Y2, after the streamlining exercise at the outpatient clinic.

The data in Figure 53 are calculated based on the cost-per-contact unit cost at the mobile outreach team level to reflect the synergy between its general prevention functions and its referral mandate.

In Figure 54, we compute the unit cost at the mobile outreach team level using its cost-per-referral as a means to reflect the VCT perspective in the case that the mobile outreach team is designed only to identify and refer potential clients.

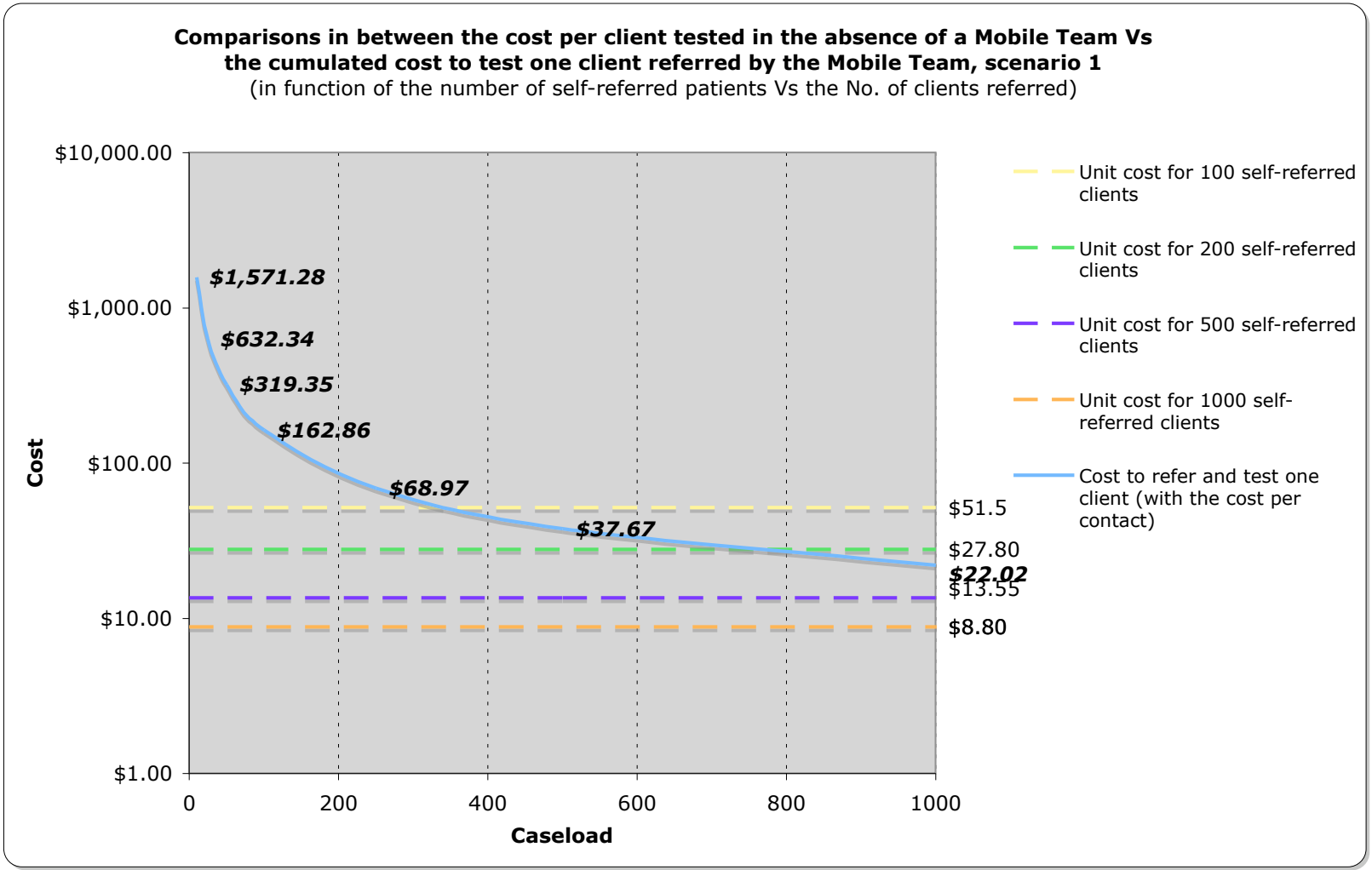
From the data in Figure 53 it is clear that as long as the VCT unit does not receive more than 200 self-referred clients in a year, the added cost of the mobile outreach team diminishes the overall testing costs.

Figure 52 VCT unit cost simulation: *financial cost in current US$ per client tested, programme's costs only*



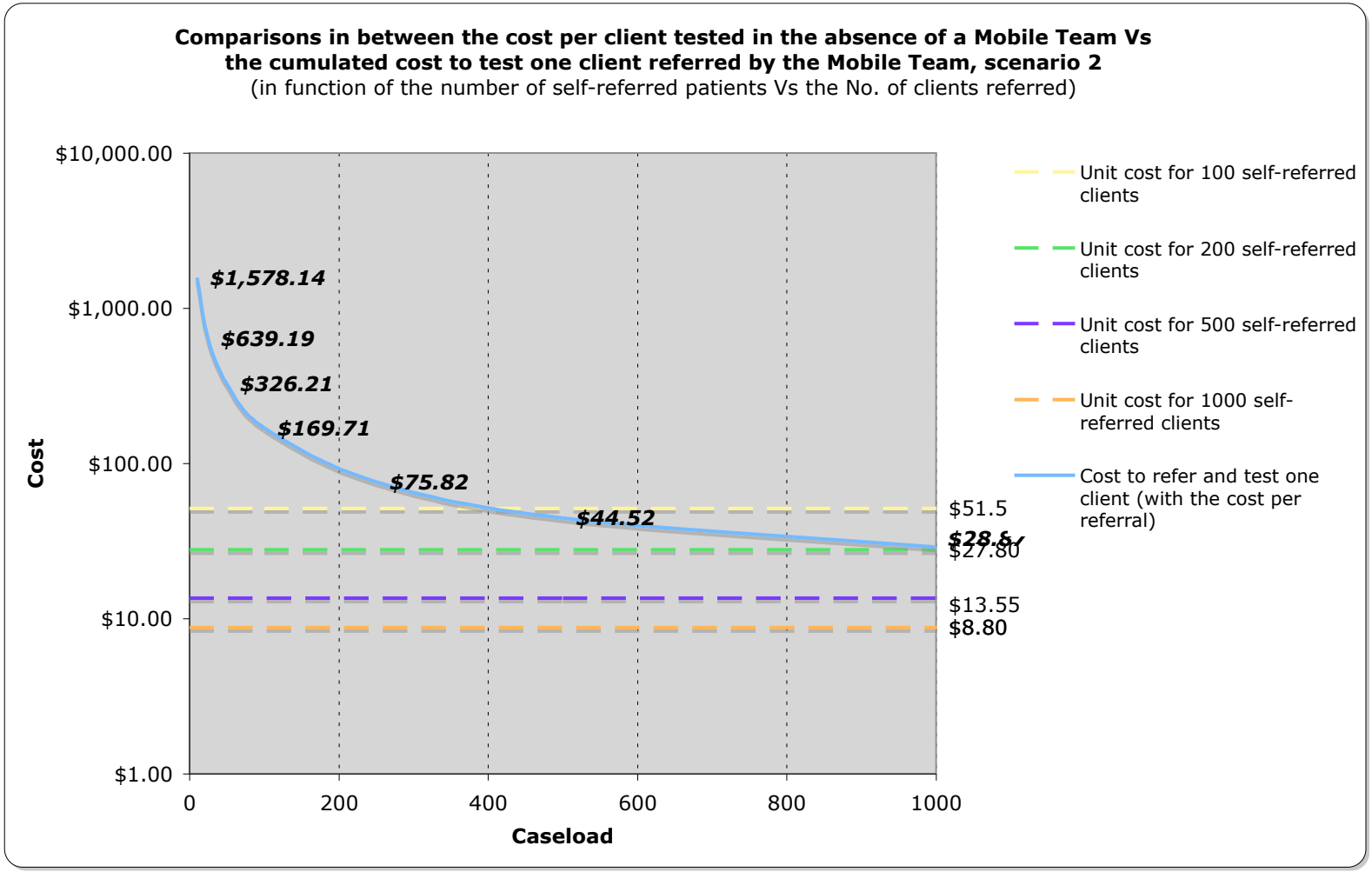
Source: PhD - VG

Figure 53 The impact of the Mobile team in VCT's unit cost: *evolution of the financial cost in current US$ for contacting and testing a client in function of the caseload, and comparison of that financial cost vs. the financial costs in current US$ of various levels of self-referral*



Source: PhD - VG

Figure 54 The impact of the Mobile team on VCT's unit costs: *evolution of the financial cost in current US$ for referring and testing a client in function of the caseload, and comparison of that financial cost vs. the financial costs in current US$ of various levels of self-referral*



Source: PhD - VG

The ceiling is obviously lower in the second than in the first scenario, with a level of 100 self-referred clients per year. But the importance of the mobile outreach team's contribution to keeping start-up units costs low during the first two years of the programme cannot be underestimated.

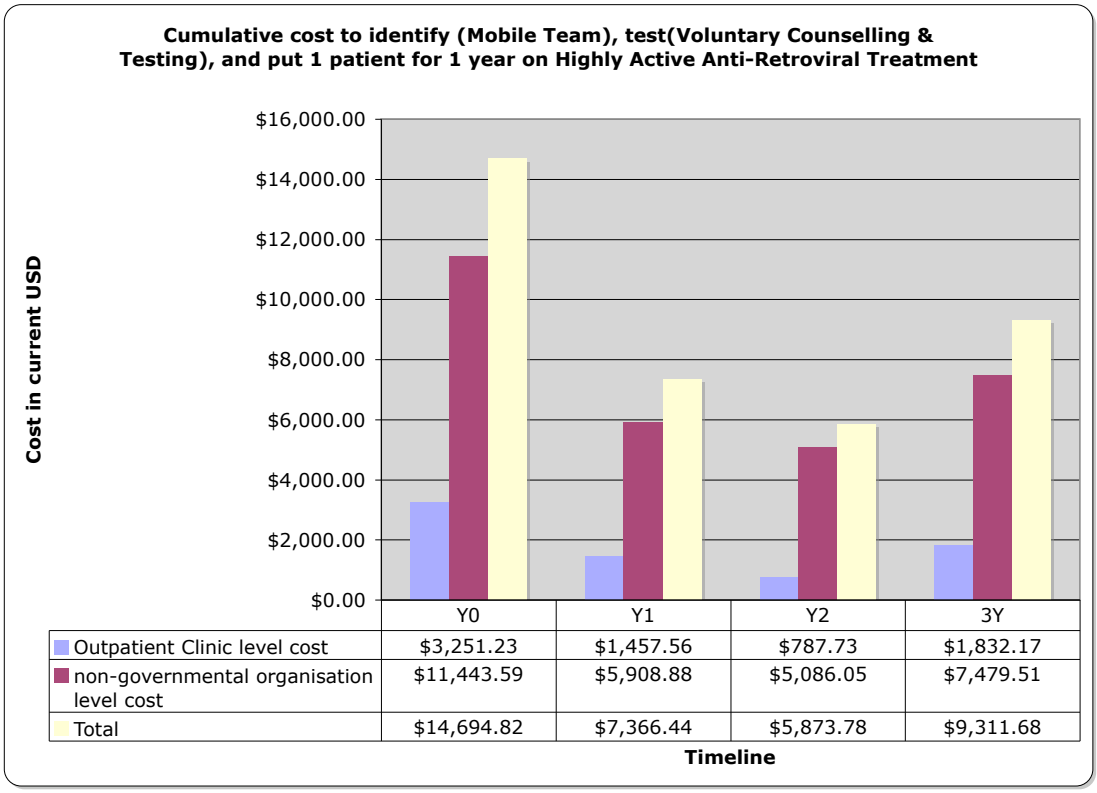
So the addition of the mobile outreach team helped reduce dramatically the unit-cost in the early phase of the programme at VCT level. Moreover, the role of the team in prevention and harm-reduction activities among at-risk groups was an important asset in the model.

Though setting up a mobile team purely to enhance the VCT component could be justified in the early phase of the programme, once the VCT unit was up and running, the role of a mobile team for that specific purpose serves to drive up unit costs and so is questionable. Furthermore, the characteristics of the referred and non-referred clients differ little in terms of at-risk group belonging and HIV prevalence, meaning the qualitative added-value of the mobile outreach team in the long run could be at stake. Working with VCT clients as marketers (see Latkin 2005) of the VCT unit could be a very cheap and efficient strategy in the long-run.

Synergies within the prevention and the Care & Treatment components

Though the mobile outreach team and the VCT team worked with a significant degree of synergy, it appears that the synergy between the various components of the prevention and the care and treatment units of the programme was perhaps even more important in determining its cost-effectiveness, as the data in Figure 55 suggests.

Figure 55 Identifying, testing and treating a PLHA: *evolution over the course of the programme of the cumulative financial cost in current US$ of identifying, testing and treating for 1 year on HAART one patient*



	Y0	Y1	Y2	3Y
Outpatient Clinic level cost	$3,251.23	$1,457.56	$787.73	$1,832.17
non-governmental organisation level cost	$11,443.59	$5,908.88	$5,086.05	$7,479.51
Total	$14,694.82	$7,366.44	$5,873.78	$9,311.68

Source: PhD - VG

The cost to put a patient on HAART for one year decreased dramatically US$**3,251** per year at OPC level (US$11,443 USD at NGO level) in Y0 to US$**787** in Y2 (US$5,086 USD at NGO level). This unit-cost decreased by a factor of four (4) over three years.
This can be explained by the sizeable increase in the total number of clients reached, and tested, the number of patients on treatment, and the strong synergy between the components of the model. Medical costs in the absence of a mobile team would have exploded had the prevention unit been absent from the programme as the patient turnover certainly would have dropped dramatically.

The mobile outreach team referred **70.6%** of the positive clients tested at VCT level. Eighty-nine percent (**89%)** of the registered patients were processed through the VCT service and up to **63%** of the patients on HAART were **contacted** by the mobile outreach team in the first place

The link in between those three elements, Mobile Team, Voluntary Counselling & Testing and Care & Treatment, is organic, and contributed to a decrease in the cost per patient contacted and cared for.

In the first place it is very likely that the existence of the care and treatment site directly contributed to the prevention component. In the case of a positive test, the client could be offered prompt and comprehensive assistance. This arguably was an attractive component of the programme (Maher 2007). Comparisons across sites should be considered to support this hypothesis. Besides cost sharing, especially infrastructure and management between the mobile outreach team, the Voluntary Counselling & Testing unit and the care and treatment unit, contributed to the decrease in unit costs.

Herein, we simulate the average unit cost to follow-up one ARV patient calculated on an average number of active patients to further explore that link.
To do so, we split costs into two categories: fixed-costs and variable costs. Fixed-cost are independent from patient flow. Variable costs are dependent on patient flow.

The fixed-cost categories encompass training, capital, and human resources that, in context, were fixed in size and not modified per patient flow. Variables costs comprised recurrent costs, other than salaries, medical tests, and medicines.

To simulate the unit-cost, we worked from the fixed-costs average over the three years of implementation to reflect heavy capital investment at the end of Y0 and the beginning of Y1. We calculated variable costs for Y2, after the streamlining exercise undertaken at the clinic, to reflect the costs of the optimal organisational scenario. Costs were calculated following the same method as described in the methodology section. Key figures are reflected in Table 20.

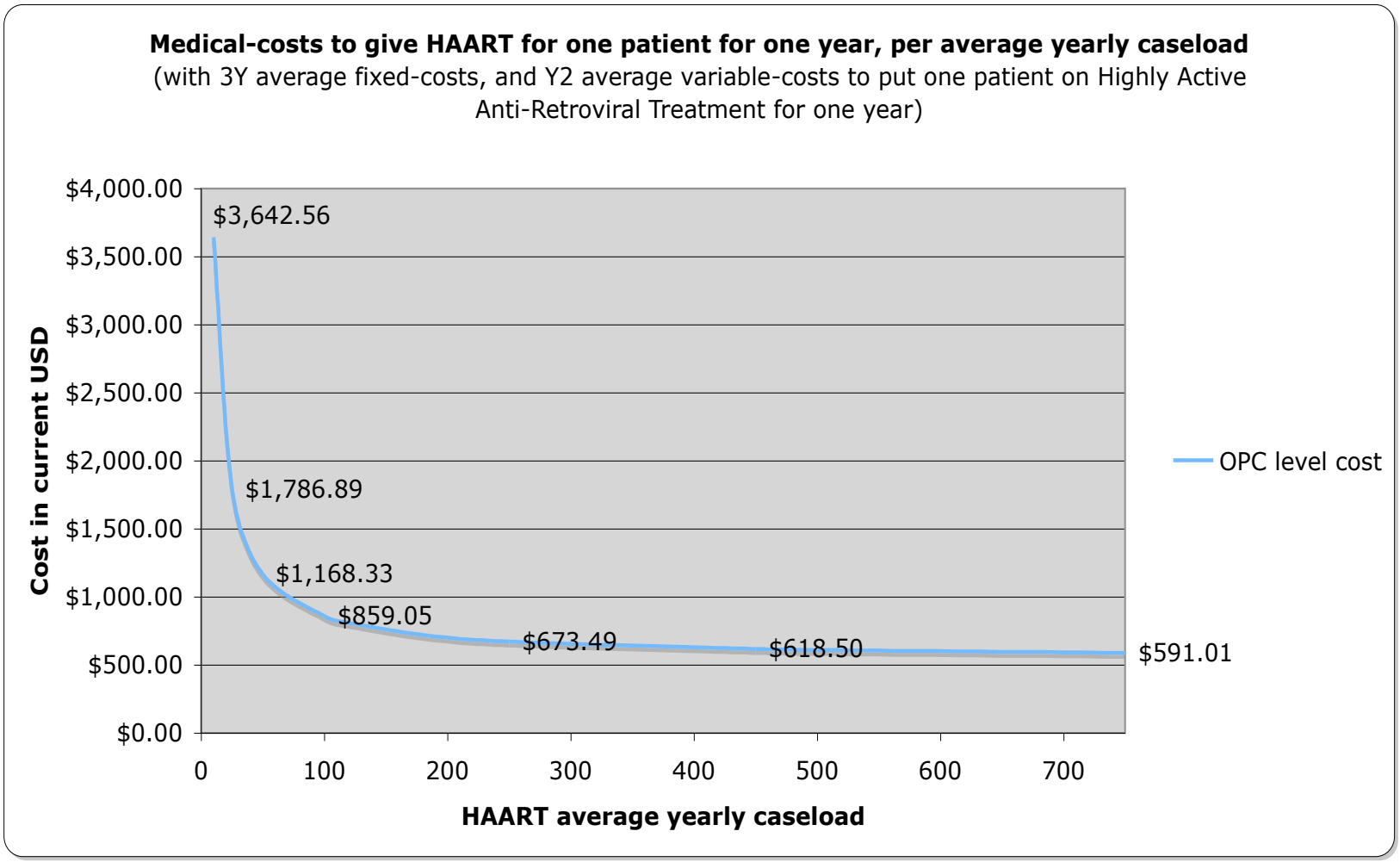
Table 20 Fixed and variable C&T costs

	At pre-Anti-Retroviral level	**At Anti-Retroviral level**
Fixed-cost average	US$1323.50	**US$30,051.15**
Variable costs in year 2, per patient per year	US$62.87	**US$509.78**
Unit-cost: cost per year per Anti-Retroviral patient	Unit-cost = 509.78 + (30,051.15)/ *n* *n= average number of active patients in year 2*	

Source: PhD - VG

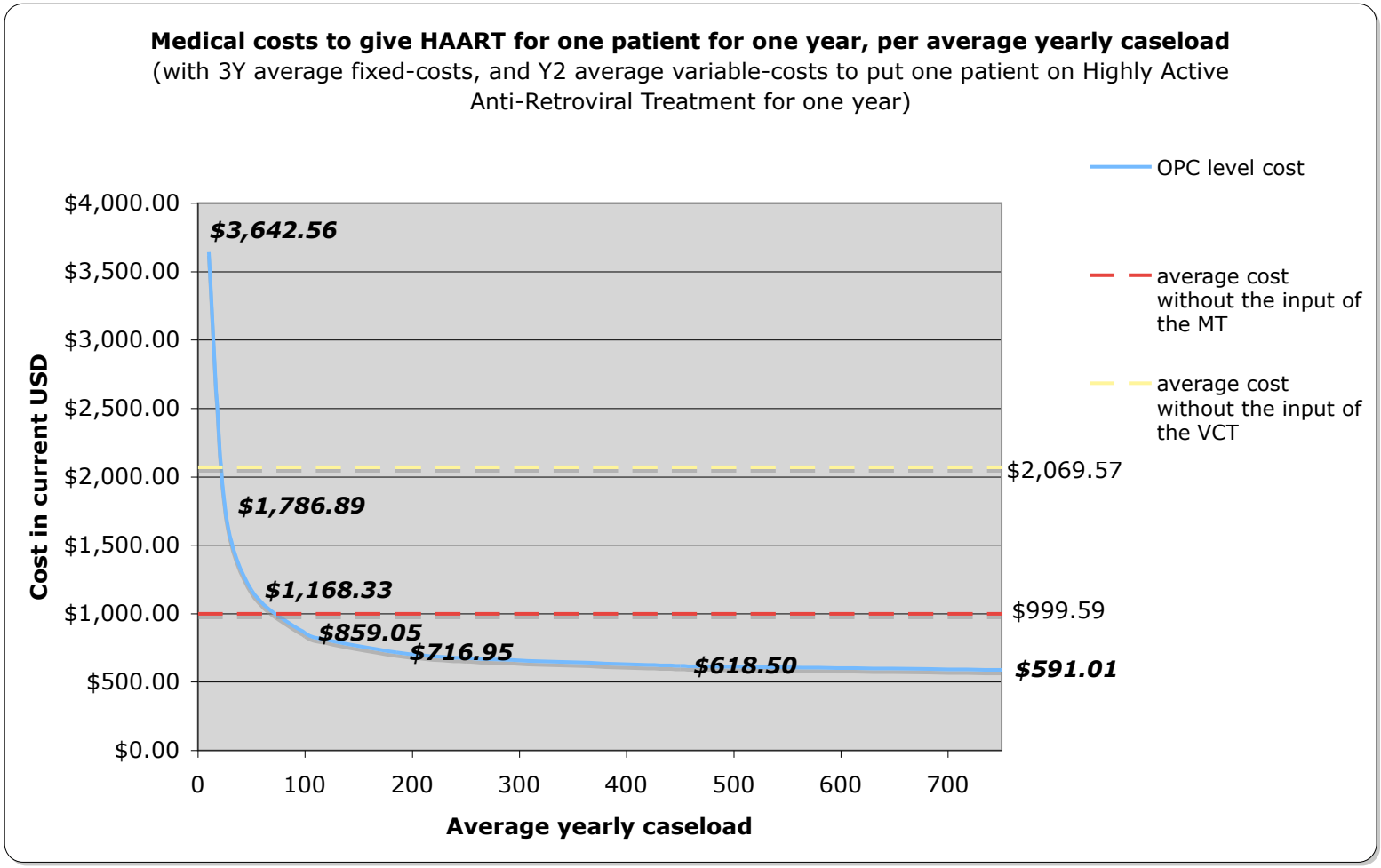
The results are presented in Figure 56

Figure 56 HAART unit costs and caseload: *simulation of the financial cost in current US$ of treating for one year one patient on HAART in function of the caseload, with fixed costs averaged over the 3 years, and variable costs determined from the last year of implementation, programme's costs only.*



source: PhD-VG

Figure 57 Impact of the MT and the VCT on the HAART unit costs: *simulation of the financial cost in current US$ for putting one patient on HAART for one year, compared to that cost in the absence of the flow of patients generated by the Outreach team or the VCT. Programme's costs only.*



Source: PhD - VG

In Y2, the HAART component's average caseload was 182.5 patients. In Y2, the cost to refer and test one positive client was US$**73.18** (using the medical perspective cost calculation). An average of **411** active HAART patients were required to have the fixed-cost per patient match that value assuming no extra capital was incurred to care for those patients.

In Figure 54 we compare the cost to follow-up one patient on HAART for one year per average yearly caseload versus the unit-cost were the patients referrals from the mobile outreach team or the VCT unit discounted.

If the mobile outreach team did not exist, the caseload would have been slashed by up to 63%. If the same were true for the VCT unit, the figure would have been even higher (89%). Differences in unit-costs range from US$250 in the first scenario to US$1,300 second scenario.

In the case of the second scenario (no VCT), there would be a dramatic difference in terms of unit-cost. It could be argued that a strictly medical Outpatient Clinic with agreements with VCT sites could have attracted as many patients. Yet, those VCT centres without obvious links to HAART centres could have recorded much lower turnover. This was in fact the case in many standalone VCT and HAART sites in the country.

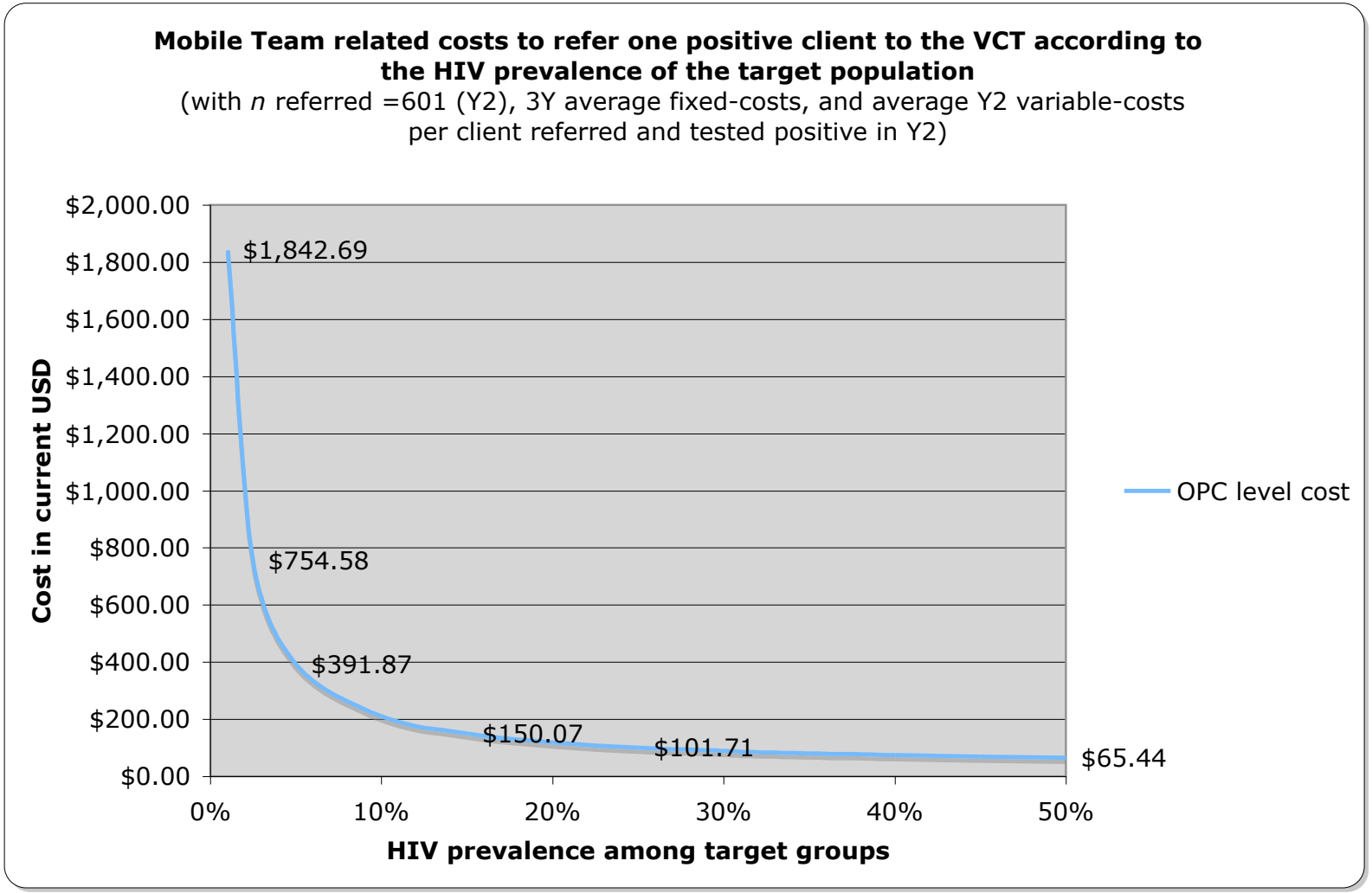
In addition to attracting more patients to VCT, the synergy between the prevention and the medical components of the programme was highly effective in term of cost containment, fixed-costs return and general cost-effectiveness, though the global cost for one year is higher, and the management of such a model could be more complex.

Limits of the synergy

The synergy between the prevention and the medical components is demonstrated in the context of a concentrated epidemic in an urban environment, such as Hanoi.

Were the key patterns of the epidemic and the social context in Vietnam to change, the outcome could be entirely different. For instance, if the HIV prevalence among at-risk groups to decrease notably and the cost per People Living with HIV/AIDS identified would explode under such a model of action (see Figure 58).

Figure 58 MT unit costs and HIV prevalence: *simulation of the financial cost in current US$ to identify one positive case among referred clients in function of the HIV infection rate among at-risk groups of population. Programme's costs only.*



Source: PhD -VG

We calculated the related costs incurred by the mobile outreach team to refer PLHA to VCT per the prevalence in the target at-risk groups.

In Y2, the Mobile Team contacted 2376 at-risk persons, of which 601 went to the clinic for a test. One hundred and eighty-nine (189 or 31.4%)) of these tested positive. As mentioned in the upper sections, in Y2, using a medical perspective (identifying People Living with HIV/AIDS to put them on treatment), the average mobile outreach team related cost to identify one People Living with HIV/AIDS was US$59.65 using Y2 fixed-costs (excluding testing costs) or US$87.07 using the three- year fixed-costs average (excluding testing costs).

Yet, as clear from the data in Figure 58, the costs to identify PLHA for treatment would rises significantly from the from the point at which prevalence falls below 10%. With a prevalence of 10% among any group of population, the cost per identification rises to US$ 210.95, US$392.91 at 5%, and a staggering US$1846.79 at 1%.

Considering previous calculations based on the cost per patient per one year of HAART, were the prevalence within target groups to fall below 25% the HAART unit cost begin to rise. So the identification of potential patients in fact is at the expense of global cost-effectiveness, a limit to that integrated model.

Sensitivity analysis: costs scenarios according to key factors

Programme-dependent factors in the prevention component

Mobile and outreach team

Prevention unit-costs are mostly determined by the ability of the mobile outreach team to convince at-risk persons to come to the centre to be tested. This ability varied greatly over the three years of implementation of the programme, from 9.2% of the contact in Y0, 34.8% in Y1, and 25.3% in Y2, (137, 507 and 601 persons referred respectively). The possibility in this context to boost further referral figures, let alone the general legal framework regarding those specific target groups, is considered unlikely. External factors are most likely to drive the cost-effectiveness of that model as designed.

Voluntary Counselling and Testing (VCT) unit

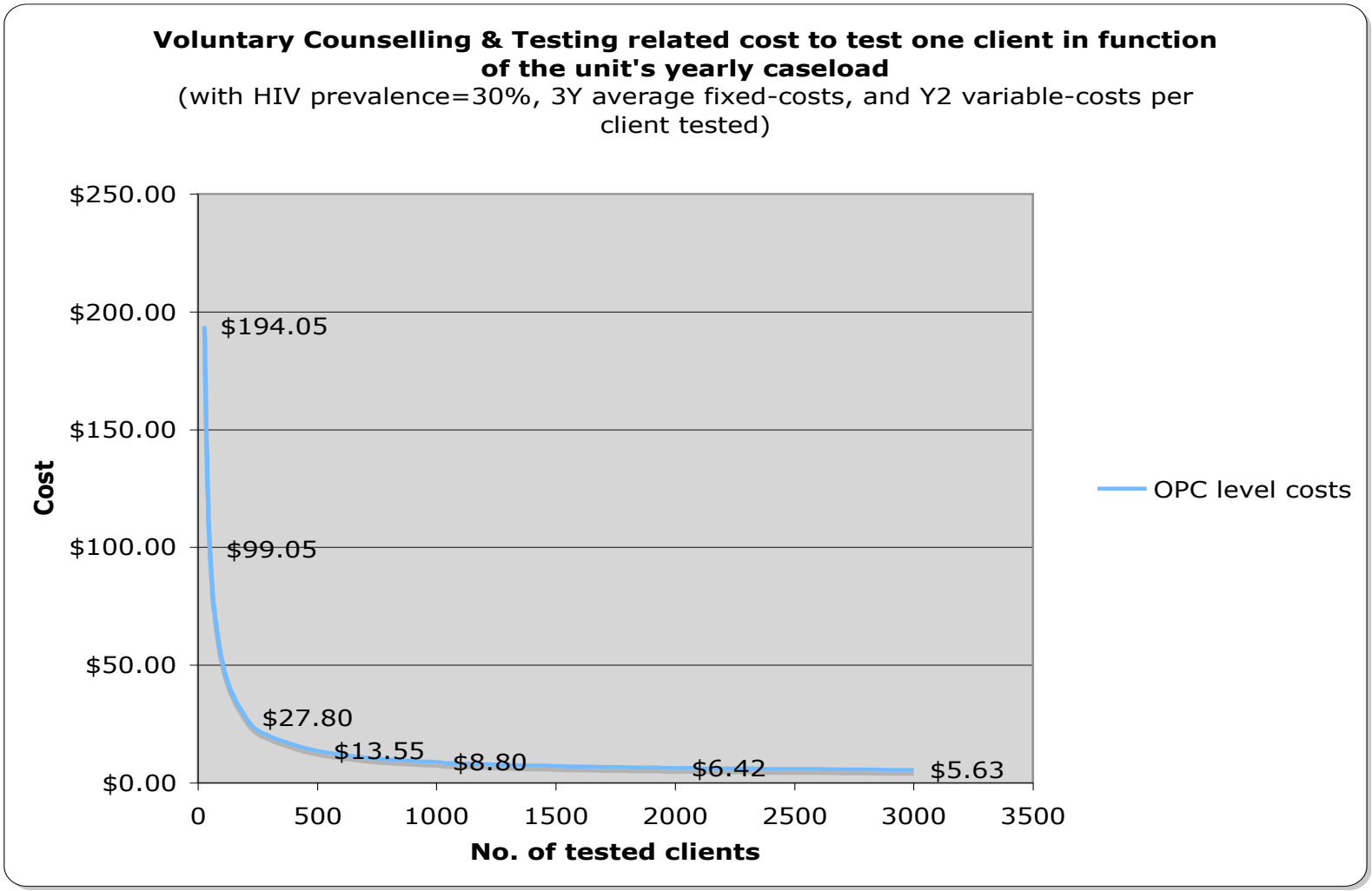
Unit-cost variations for this component of the programme would mostly rely on the average component caseload. With 1058 clients tested in Y2, the busiest of the three, the VCT counsellor had to deal with 2096 consultations a year, (175 consultations per month on average, or about 8 per day). We estimate that the capacity of the VCT unit as designed (one counsellor, one part-time lab nurse, low salaries) could handle 20 consultations a day (20 minutes per consultation, equivalent to 6.5 hours of consultation a day for a 8-hour workday), which translates to 2,787 clients a year (or 40% of capacity).

The VCT unit costs depend largely on the use of fixed capital (see Figure 59).

In Y2, (1056 clients), the cost per client tested reached US$13.56, with an average HIV prevalence of 30% among tested clients. At 80% of its capacity, (2230 clients per year), the cost would bottom out at US$8.30. This result would support the concentration of VCT centres in a given area. Because of stigma and discrimination, however, testing should be offered to clients at sites away from their immediate places of residence.

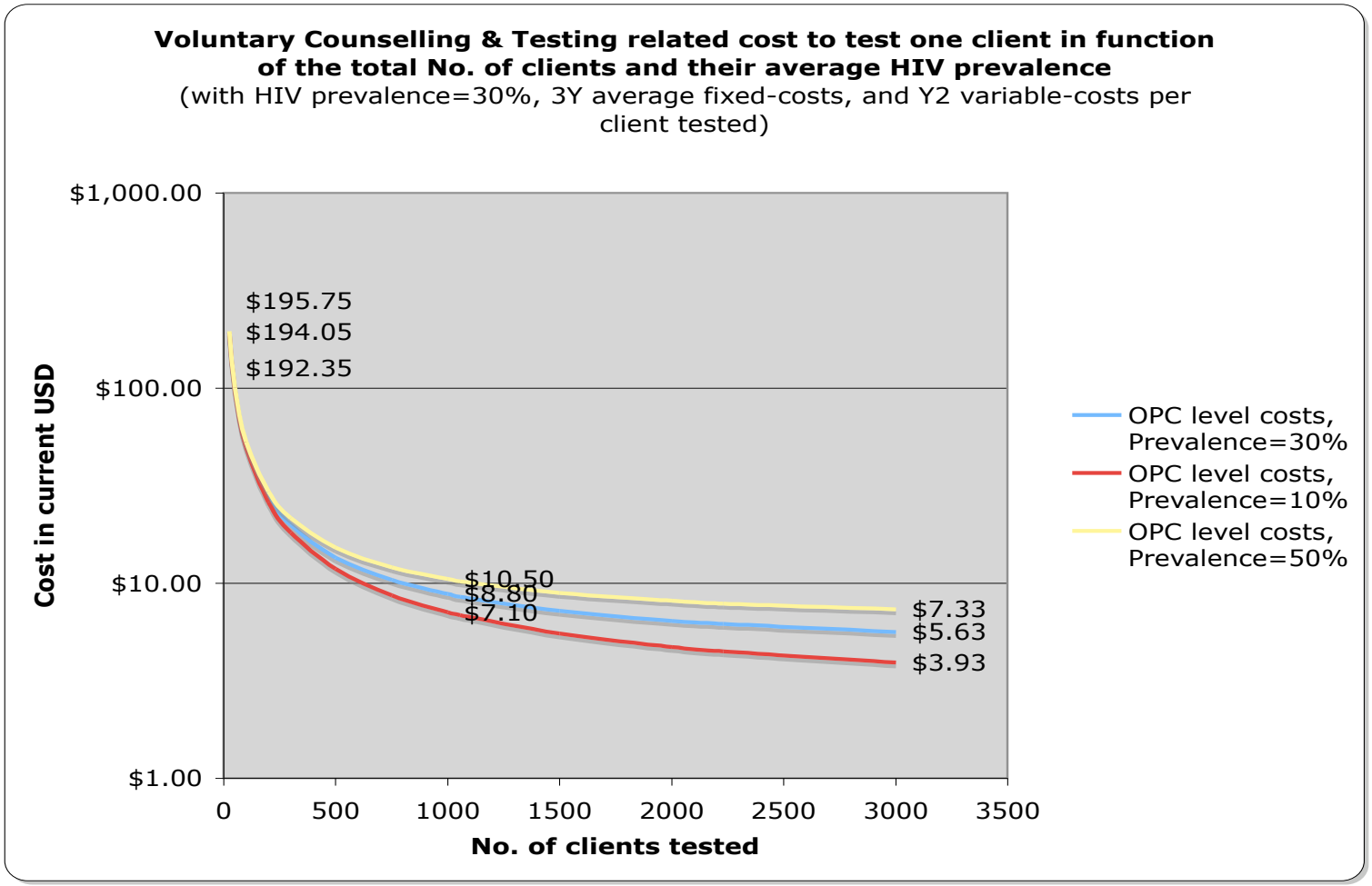
Another variable that determines the cost per client tested is the prevalence among tested clients. It is common practice under Vietnamese law to confirm a first positive quick-test by an ELISA test. Whereas the cost to diagnose a negative case (in terms of test cost) is about US$1.50, a positive test adds US$9.5 in laboratory costs.

Figure 59 VCT unit cost and yearly caseload: *financial cost in current US$ to test one client in function of the caseload, in a context of a 30% HIV infection rate among clients, average fixed-costs of the 3 first years, and variable costs of Y2. Programme's costs only.*



Source: PhD -VG

Figure 60 VCT unit costs, yearly caseload and prevalence: *financial cost in current US$ to test one client in function of the caseload, in a context of a 10, 30% or 50% HIV infection rate among clients, average fixed-costs of the 3 first years, and variable costs of Y2. Programme's costs only*



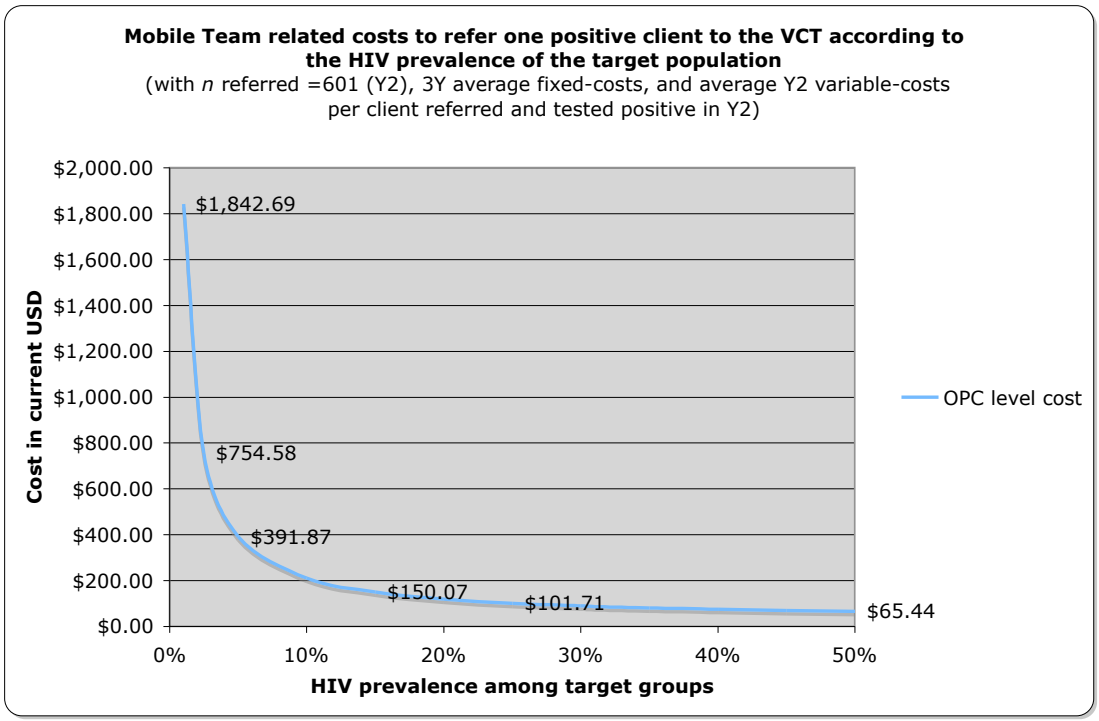
Source: PhD - VG

The regulatory environment results in the cost per client tested being highly subject to the HIV prevalence of the population tested. Let's assume that Vietnam managed to test 200,000 at-risk persons in one year (about its estimated drug-user population). With an average prevalence of 30%, test costs alone would run to US$870,000. In the case that the double quick-test method was used, the cost would decrease significantly to US$390,000 (about US$3 for a combined double quick-test to diagnose a positive case).

External factors

As discussed previously, external factors impacting the cost-effectiveness of the programme are mostly the average prevalence among target groups, and above all the legal framework implemented in Vietnam targeting those groups.

Figure 61 MT unit costs and HIV prevalence: *simulation of the financial cost in current US$ to identify one positive case among referred clients in function of the HIV infection rate among at-risk groups of population. Programme's costs only.*



Source: PhD - VG

From a medical perspective, the necessity of a mobile outreach team to identify PLHA decreases with HIV prevalence.

From a harm-reduction and testing perspective, were legislation to change, accompanied by the implementation of a widespread harm-reduction strategy, the HIV prevalence would plummet in at-risk groups, rendering the mobile outreach team obsolete.

Concurrently, and this is good news for the country, a Methadone Maintenance Therapy pilot programme has been ongoing since June 2007 in two cities: Haiphong and HCMC. The programme's reach is still limited (with fewer than 1,000 persons enrolled), but it could be a way to effectively combat the epidemic among the IDU sub-group, stabilise IDU's living with HIV/AIDS and enrolled in the HAART programme, decrease the use of injected heroin, and thus prevent new infections.

Programme-dependant factors in the medical component

It appears the model fell short of its objective to retain patients before they were enrolled in the HAART programme, with a loss - temporary or permanent - of about 27.5% in the pre-Anti-Retroviral sub-component. This group was of real concern because these were patients likely to return later the centre exhibiting symptoms of severe immune depression, and so impeding the efficacy of Highly Active Anti-Retroviral Treatment.

The HAART sub-component suffered as well from those defections and late arrival in term of disease development at the clinic as described later.

The Home-Based Care component did not prove particularly effective in changing the general outcome of the medical component, and added an extra US$**73.8** per patient per year to the cost of follow-up in the HAART component. Patients interviewed for this study reported positively on their visits with HBC workers. Such visits brought them comfort, and helped ease feelings of isolation. Yet it couldn't address serious social cases, for instance when patients were abandoned or rejected by their families. Nor did it seem to boost adherence to treatment, or to the general protocol of the clinic. Related indicators had not changed seven (7) months after the HBC component was launched. The team was staffed by dedicated peer-educators who received extensive training and supervision, but they were not experienced in either social work or as professional para-medicals. Arguably, the model required them to carry out too many different tasks to be efficient. In the absence of relevant comparisons, however, it is impossible to comprehensively determine the efficacy or relevance of the HBC team.

External factors

Two key elements, in addition to the social accessibility of the programme discussed below, were critical in determining the global cost-effectiveness of the programme.
The first was tuberculosis. The national TB programme is separate from the HIV programme in Vietnam, and there is limited integration of the two. Yet, TB was the leading associated factor in the deaths of HAART patients. More than 30 percent (34.8%) of the HAART patients had a history of TB, and 81.4% of those who died, did so from complications arising from TB. It would appear obvious then that integrating TB and HIV activities would be critical to improving cost-effectiveness.

In Vietnam, TB-related mortality in HIV patients is influenced by early and effective diagnosis. Were TB properly diagnosed and treated, the mortality rate would decrease dramatically. In Y2, TB was directly responsible for 60% of the deaths of patients in the HAART programme. In the absence of TB, that figure would fall dramatically to 5.44%.

Medicines cost was also critical. Though the cost of ARVs decreased sharply during the three-year period under review, it remained a significant cost to the programme (weighted as much as 48.73% of the total cost to follow-up one patient on HAART for one (1) year.

A central issue: the cost of social barriers/stigma

According to our understanding of the situation, the stigma and social barriers that inhibit access to harm-reduction activities for at-risk persons and to care and treatment services for PLHA had a huge impact on the cost of the model, and generally on the cost of the combating HIV in Vietnam. Such barriers also inhibit the better use of resources, particularly in outreach and HAART treatment work.

At prevention and case-detection level

Drug-use and sex-work in Vietnam are common, but dangerously stigmatized. Drug-users, and commercial sex-workers alike are under the constant threat of being detained and forcibly removed to long-term rehabilitation centres. As a result, they are difficult to reach and complex to identify. This further impedes successful prevention and harm-reduction work.

In Y2 it cost US$4.74 to contact one at-risk person, US$18.76 to refer one at-risk person for VCT, and US$59.65 to identify a PLHA. The addition of NGO-related costs boosted the unit costs of these respective activities to US$43.56, US54.93 and US$174.66. These were significant increases resulting, on the whole, from challenges in conducting outreach activities. However, the severe regulatory environment and the social stigma associated with IDUs and CSWs contributed to these inflated costs. Were the approach (both regulatory and social) to IDUs shifted from forced to voluntary rehabilitation, harm-reduction activities could be widely mainstreamed, decreasing rates of HIV prevalence among at-risk groups, as has been proven in Western countries and Thailand.

The negative social barriers resulted, in Y2, in an additional cost of US$37.6 per PLHA registered in the programme (with the assumption that 63% of them were primarily identified by the mobile team), and US$110 for NGO-related costs, costs that should be offset by a change in the legal framework implemented in the country.

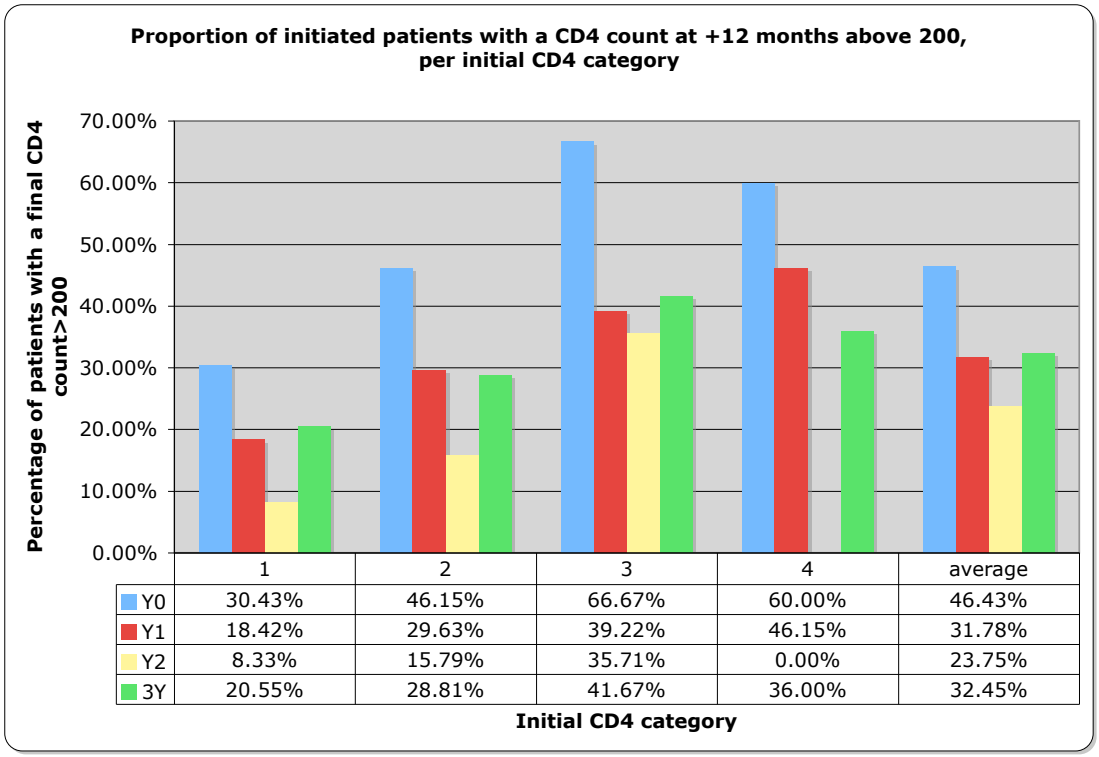
The estimated HIV prevalence in Vietnam's general population is 0.45%, and this translates to about 360,000 People Living with HIV/AIDS out of 80,000,000 Vietnamese citizens. About 60% of these are IDUs according to researches. The cost of detecting HIV in IDUs incurs an addition US$15,004,000, excluding overall management-related costs.

At medical level

As is clear from the previous discussions, stigma and discrimination can be insurmountable obstacles to early access to services. More than half (52%) of patients who registered for HAART had a CD4 count below 200/mm3, and 26% recorded counts below 50. Delays in seeking comprehensive HAART had a catastrophic impact on the future of these patients. The average rate of mortality (at 6 months into

treatment) for patients with CD4 counts initially under 50 (Level 1) was 28.7%. Among patients with CD4 counts between 50 and 100 the rate was 15.7% and among those with CD4 counts above 200 the mortality rate was nil (0%).

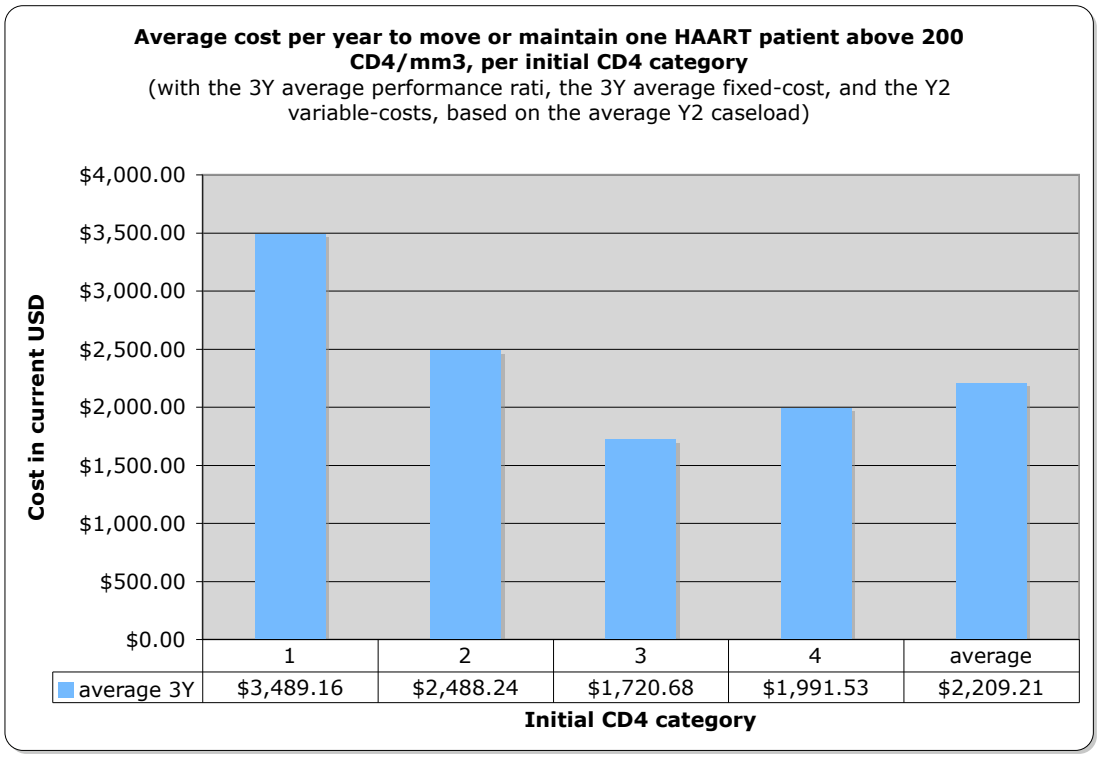
Figure 62 going above 200 CD4/mm3: *evolution of the proportion of HAART patients with a CD4 count after 12 months of treatment above 200 cells per mm3 per initial CD4 count category over the course of the programme, with 4 categories of CD4 count: [0;50], [51;100], [101;200], [>200], and CD4 count expressed in number of cells per mm3*



	1	2	3	4	average
Y0	30.43%	46.15%	66.67%	60.00%	46.43%
Y1	18.42%	29.63%	39.22%	46.15%	31.78%
Y2	8.33%	15.79%	35.71%	0.00%	23.75%
3Y	20.55%	28.81%	41.67%	36.00%	32.45%

Source:PhD -VG

Figure 63 the cost of the 200 CD4 line: *one-year financial cost in current US$ to move or maintain a HAART patient's CD4 count above 200 cells per mm3 after 12 months of treatment, with 4 categories of CD4 count: category 1 = [0;50], category 2 = [51;100], category 3 =[101;200], category 4 = [>200], with CD4 count expressed in number of cells per mm3*



Source: PhD - VG

As clear from the data in Figure 62 and Figure 63, the cost to restore a reasonable CD4 count (above 200/mm3) after one year of HAART varied greatly depending on the initial CD4 count the patient recorded on registering for the programme. After one year on HAART, barely 8% of the patients with Level 1 CD4 counts showed signs of anything but severe immune-depression.

In our simulation, cost per patient was calculated on the ratio of "successful" patients for each category to the average follow-up cost for patients according to their initial CD4 count. The unit-cost for Level 1 patients was nine (9) times higher than for Level 4 patients, meaning nine times more resources were required for the programme to successfully treat and shift one patient from Level 1 status to a less compromised state of immune deficiency, than it was to do the same for a patient who began treatment at Level 4 status.

Again social barriers and stigma contributed enormously to the lack of early access to treatment and thus impeded effective HAART.

PART C Conclusion

Discussion on the research's hypothesises

The underlying hypothesises supporting the implementation of that model of intervention combining prevention and care & treatment components proved true. The model promoted strong synergies, supporting the principle of integrated delivery of outreach, detection and care and treatment services.
The model seems well suited to the local context in terms of efficacy. The integration of outreach, VCT and Highly Active Anti-Retroviral Treatment contributed to the increase in numbers of patients attending at the OPC level. Critical harm reduction activities could be carried out directly in the city's hotspots as we know from other studies they are efficient (Des Jarlais 2007), while at the same time the mobile outreach team was identifying PLHA in need of a treatment. The concentration of these two functions within one team was certainly helpful. It reduced the cost per client referred for VCT, and helped to raise awareness of existing medical services offered by the OPC targeting directly the most at-risk populations.

The integration saved costs, especially in the first years of the programme by boosting the demand for the clinic's services. The VCT unit could rely on the presence of the care and treatment unit in the OPC to build the trust of clients and to offer HAART onsite, a rare service in Vietnam. The OPC also represented an important investment in terms of capital immobilisation, training, supervision, and networking. It would have made no sense to leave the space empty and the teams idle.

Actually, the model worked as a system with positive feedback loops preventing new infections and actively treating identified People Living with HIV/AIDS through levelling off social barriers. Social stigma and barriers to access in Vietnam remain major obstacles to the generalisation of HIV/AIDS prevention and treatment operations in the context of a concentrated epidemic (Johnston 2006, Go 2006, Hammet 2007, Maher 2007, Nguyen 2008, Thanh 2009). Though further research is needed to support this conclusion, it is clear that the absence of strong and integrated service delivery would have had negative cost implications for the model. This system worked not only from outreach to treatment, but certainly as well from treatment to outreach by increasing VCT attraction, at-risk persons being aware of the presence of immediately free medical services within the same structure.

A model in which outreach and detection services were not integrated with care and treatment service would have increased unit costs (by a factor of four (4)), resulting in the medical component running costs per DALY averted far below international standards. The same would have been the case had the VCT unit not been integrated with the mobile outreach service, at least in the first two (2) years of the programme's operation. Integrating the mobile outreach team with the services offered by the VCT unit, cut costs to the latter by a factor of three (3).

When the synergies emerging from the design of the programme are considered, the VCT service could be viewed as cost-effective against international standards. Using the approach developed by Sweat et al. (Sweat 2000), the average ICR of the VCT unit vs. the null set scenario was 12 I$/DALY(3,0) averted, well below World Health Organisation-CHOICE SEAR indicator of 40 I$. Yet, this figure is deemed at odd because no specific work on the matter has been conducted in the past in Vietnam, nor in Asia for that matter, to ascertain this estimate of 12 infections avoided for

every 100 negative tests. Nonetheless, noted previously, the VCT unit benefited from the flow of clients provided by the mobile outreach service. Most of the costs incurred by the VCT unit were fixed and there is no doubt that the figure of 12I$/DALY(3,0) averted was arrived at as a result of the co-operation between the two prevention units. Of course, in the absence of the social barriers to access, this ICR would certainly be lower. Lower barriers imply higher caseloads and lower unit costs for this cost centre.

Table 21 VCT DALY benchmarks

Benchmarks – economic cost per DALY averted using mean infections avoided rate estimation from Sweat & al				
Tay Ho's VCT department	**12 I$**		5.16 to 27.36 I$ in Kenya 6.58 to 45.03$ in Tanzania	Sweat & al 2000
			4.72 to 8.72$ in Tanzania	Thielman 2006
			40 I$ in the South-East Asia region	Hogan 2005 – World Health Organisation-CHOICE

Source:PhD – VG

Clearly the care and treatment unit could be considered cost-effective as well, thanks mainly to the integration of prevention services with the medical outpatient clinic. With an ICER vs. the null set scenario of 252 I$/DALY(3,0) using the real capacity utilisation, and 166 I$/DALY(3,0) averted with an 80% simulated capacity utilisation, the programme was well in line with international standards (see Table 22).

Table 22 C&T ICER benchmarks

Benchmarks – economic cost per DALY averted			
Tay Ho's care and treatment department	**252 I$ with a real capacity utilisation** **166 I$ at 80% of utilisation**	215 I$ in Burundi	Renaud & al 2009
		610 I$ in Thailand	Shunsuke Ono et Al 2006
		542 I$ in the SEAR	World Health Organisation-CHOICE 2000

Source:PhD - VG

Yet, the global cost-effectiveness of the component was hampered by a low adherence to treatment protocols (a critical factor, see Oette 2006 and Ballif 2007,) and high rate of LTF as observed in other contexts (Mugusi 2009, Rougemont 2009, Tessema 2010, Hill 2010) , the delayed in identifying patients for testing and treatment, which impacts negatively on the overall medical performance of the programme (Braitstein 2006, Johansson 2010), and possibly conservative guidelines used in Vietnam re Highly Active Anti-Retroviral Treatment eligibility criteria when earlier treatment upstart is more and more suggested (Bartlett 2009, Munderi 2010). Nevertheless, as demonstrated in the sensitivity analysis, in the initial stage of the programme, the caseload was a more critical variable with regard to calculating the unit costs of the care and treatment cost centre, at least in the initial implementation phase of the programme.
The performance of the medical programme remains the key variable. And it appears that to increase the performance levels from 40% to 70% would require dramatic changes in the environment in which the programme takes place: patients would need to be identified earlier, with better access to TB diagnosis and treatment – a critical aspect in the Vietnamese environment (Tran 2007, Goldfeld 2007), and access to Methadone Maintenance Therapy.
Because two-thirds of the patients registered for HAART had a history of drug-use, and 50% of them were diagnosed with an initial CD4 count below 100 mm3, there was little to expect in term of their progress within the programme because the pathogenic system created by a severe legal framework (resulting in a low social accessibility to the programme), and limited access to addiction treatment, had not been addressed in the first place.

Limits of the model

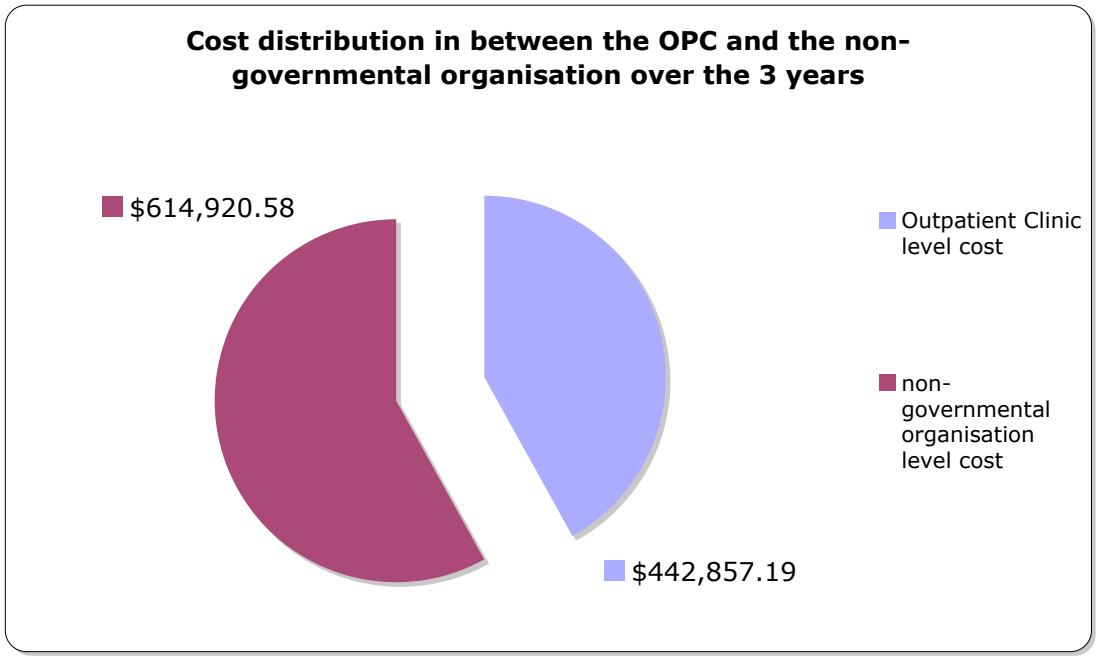
As discussed in the sensitivity analysis, the synergy depends on the context in which the programme operates. Were the prevalence in the target population to decrease below 15%, the synergy between the mobile outreach team and the VCT unit would begin to disappear. Moreover, were VCT services to be mainstreamed in Vietnamese society, the extra-cost incurred by the work of the mobile outreach team would hinder this synergy.

Besides, because of contextual limitations the model showed only an average cost-effectiveness by international standards, especially within its medical component. The model was unable to retain pre-ARV patients in sufficient numbers, or to convince them to abide by the OPC protocols in the absence of critical complementary services, such as Methadone Maintenance Therapy, and/or early access to ART. The introduction of a Methadone Maintenance Therapy in an environment in which about 60% of PLHA are opiate-users would change dramatically the outcome of HAART, not to mention reducing HIV transmission.

Yet, the main limiting issue of this model might be the intense technical support it needed to be implemented and supervised.
Indeed, the presence of an external NGO, such as MDM, though necessary in the international co-operation scheme, added critical costs to that programme that, in the case of increased service delivery, have been diluted. Notwithstanding, the cost of essential medicines was, by far and away the greatest fixed cost incurred by NGO activity in this model.

Over three years, the share of NGO expenses was considerable, amounting to 58.1% of the total (see Figure 64).

Figure 64 The financial weight of the NGO: *the financial value of the action of Médecins du Monde over the 3 years of the programme*



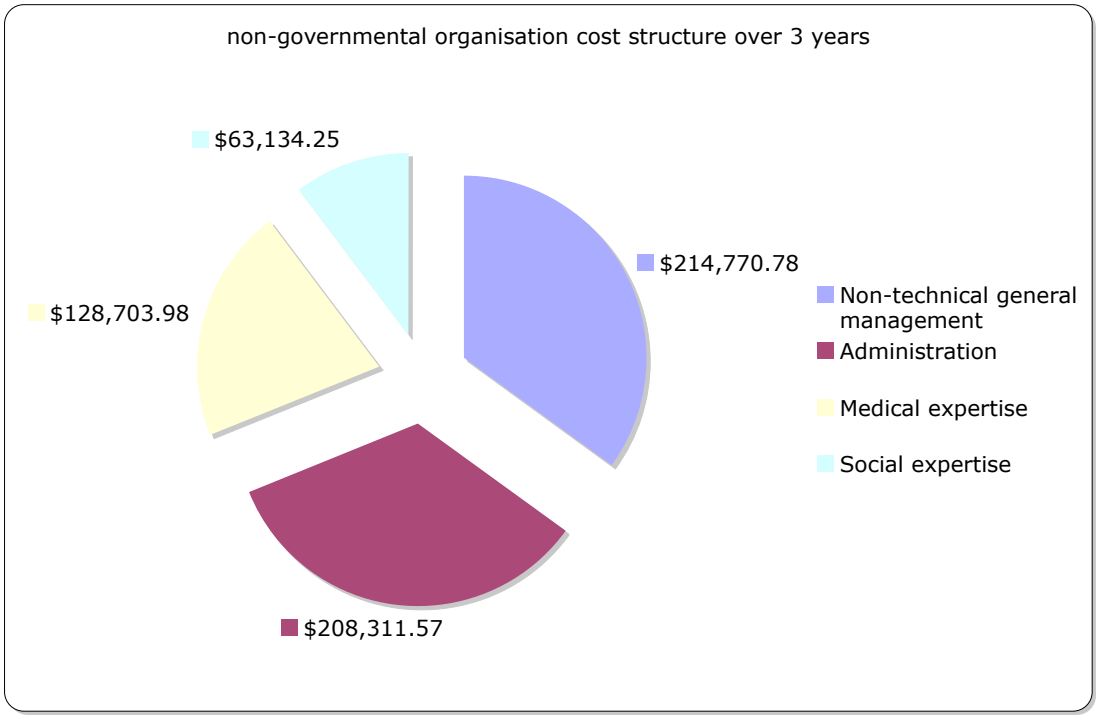
Source: PhD - VG

The cost share to MDM was tremendous and reflected the complexity of setting up the programme in the Vietnamese environment. Particular cost considerations included:

- channelling international funding;
- financial control;
- reporting to the fund source on both financial and performance aspects;
- overall technical supervision of the model; and
- local and international partners relationship, of which some critical such as the medicines management system set up in Vietnam by SCMS-MSH.

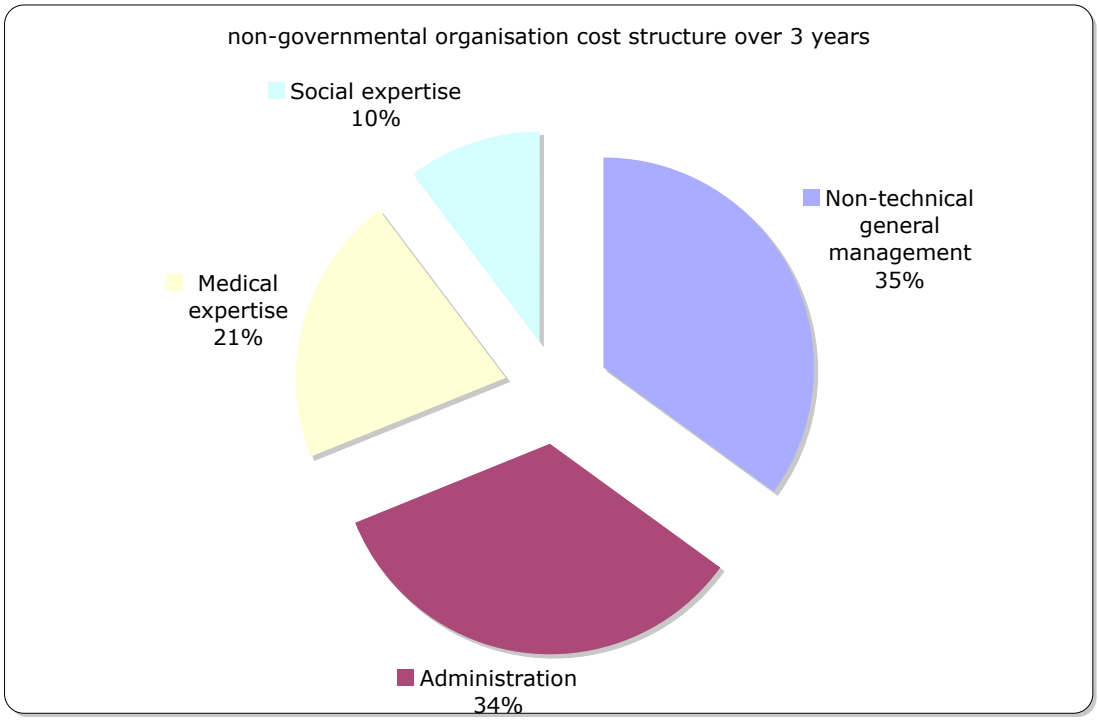
General non-technical management and administration were the greatest costs incurred by MDM , as is clear from the data in Figure 65 and Figure 66.

Figure 65 NGO costs breakdown: *distribution of Médecins du Monde's financial costs in current US$ per key categories: social technical expertise, medical technical expertise, administration and general management*



Source: PhD -VG

Figure 66 NGO costs distribution: *share of each Médecins du Monde's financial categories in percentage of the total, per key categories: social technical expertise, medical technical expertise, administration and general management*



Source: PhD -VG

General co-ordination and administration functions accounted for as much as 69% of the total expenses incurred by MDM, reflecting the constraints around operating an international co-operation system within a local context.

Costs also rose because the general co-operation system in Vietnam creates significant market distortions as a result of skilled labour being flooding niche job markets. All the MDM staff had to be fluent in written and spoken English, and also be computer literate. They had to be familiar with western management mechanisms, and have a specific skilled linked to their job description. On the technical side, MDM, along with other NGOs in the country, was constantly looking for local experts in the medical and the social domain, such as a medical doctor with a degree in public health and a strong command of HIV projects.

As a consequence, combined unit cost and a NGO costs raised total costs significantly as shown in Table 23.

Table 23 The NGO's share in key programme's unit costs

Unit-cost designation	**Outpatient Clinic unit-cost**	**Additional non-governmental organisation level unit-cost**	**Total**
Reaching an at-risk person by the mobile team	$4.74	$9.15	$13.89
Testing a Voluntary Counselling & Testing client	$7.47	$9.16	$16.63
Following-up for one year a pre-Anti-Retroviral patient	$45.94	$55.40	$101.34
Following-up for one year an Anti-Retroviral patient	$665.95	$822.26	$1,488.21
Increasing by 100 points after one year of Highly Active Anti-Retroviral Treatment an Anti-Retroviral patient	$1,841.16	$2,273.30	$4,114.46

Source:PhD - VG

It is likely that the international system in place inflated costs at the NGO level by creating not only job-market distortions, but also several time-consuming tasks, such as reports, proposal writing, seeking fund prolongation agreements, and juggling different accounting and report norms. The life cycle of an NGO is complex and resource-consuming because of the very nature of the system in which it operates. Programme management comes often second only to donor-related communication.

It is not possible at this stage to thoroughly evaluate the impact on costs and performance of a different cooperation system, for instance one involving a direct

transfer of the funds to public authorities without the mediation on a NGO. It opens the field for additional research to assess different co-operation mechanisms and their impact on the quality and costs of programmes.

As such, the question remains on how transfer both financial and technical burden to local authorities in a context of limited resources.
The Vietnamese government spends US$1,100,000,000 on health care according to official figures from the National Office of Statistic, representing an expense per citizen of US$13.75, including general administrative costs.
The sole medicine cost if the current number of PLHA (240,000) in Vietnam were to have access to first-line HAART rises to a minimum US$24,000,000 per year (or 3% of the total health budget), excluding medicines and management costs. Apply the model's average cost to follow-up a patient for one year of HAART, including medical management and biological follow-up in an optimal situation (average caseload of 750 patients), and that cost would exceed US$200,000,000 a year, (or almost 20% of the annual health budget). This excludes integrating general supervision and management costs, which, depending on the efficiency of the system put in place by the Vietnamese authorities, could add an extra 30% to the total.

Conclusion

It seems that in the long term, the matter of the context and capital intensity are central.

Though cost-effective when compared to international standards, and well adapted to the current constraints of the Vietnamese environment, the Tay Ho OPC approach is only a short-term solution until prevention and detection activities are mainstreamed and social obstacles lifted off. It could well be the best model to address HIV/AIDS in the Vietnamese context, or in any other places where concentrated epidemics are evident, yet at the expense of considerable technical assistance and associated costs resulting from the complexity of the management of such models of intervention.

The situation of Vietnam, or similar countries, combining a lack of technical and financial resources and social obstacles to accessing at-risk populations poses the problem of long term sustainability of such actions. The coverage of prevention and treatment activities in Vietnam is still limited, and the scaling up of such an integrated model of intervention appears to be necessary to break the cycle of the epidemic. Nevertheless, the necessary resources to operate such integrated models of action when scaled up across a country would result in a probably unaffordable programme when compared to the more modest cost of lifting social barriers to care for at-risk and marginalized populations which will ease access to detection and harm-reduction activities, an hypothesis paving the way to further research on cost offsets and better ICR resulting from more accessible interventions, hence documenting the real cost of stigma and discrimination.

Finally, the public health community should investigate further the cost of technical assistance of those integrated models of intervention based on the context of intervention, and should analyse the issue of technical management transfer and maintenance costs. This is a critical matter. Effective solutions exist and can be designed. Yet the issue of the capital intensity of such approaches, in the form of

technical skills and human resources appears to be a critical sustainability factor in settings where access to high quality human resource is scarce, notably at the public administration level when NGOs are competing to access and hire the most qualified persons, in a context of short funding cycles usually ranging from three to five years. Commodities such as medicines and laboratory tests saw their prices declining over the last 10 years. On the long run, the in-depth study of the cost-effectiveness of technical assistance itself should be at the core of future research programmes to now starting to document and review best practices to inform donors and implementers.

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Annexes

The Tay Ho Outpatient Clinic's components description

The prevention component

The prevention component consists of two main elements: the mobile outreach team and the VCT unit. They work in parallel to reach a common goal: to reduce HIV transmission in at-risk populations in Hanoi. The prevention component includes harm-reduction and behaviour change communication activities, voluntary testing, spreading general information about the epidemic and referring PLHIV to the care and treatment unit.

The general population of the city is not a primary target of the programme, though services are open to anyone.

The mobile outreach team

- **Staff**: the mobile outreach team is staffed mainly by peer-educators. Of a total of six team members, four are male IDUs and one is a female CSW. The sixth member is a male doctor-assistant.
- **Status**: each staff member is salaried (paid by the clinic)
- **Tasks**: the team undertakes the following tasks:
    - **contact** at-risk persons in the so-called hotspots of the city;
    - **inform** at-risk persons about the HIV epidemic;
    - engage in **behaviour-change communication** with the target population;
    - **deliver prevention and harm-reduction material**: free condoms and syringes, prevention leaflets; and
    - **refer** at-risk persons to the Tay Ho Outpatient Clinic for a free VCT
- **Hours:** the mobile outreach team operates six evenings a week, from 7pm to 11pm. The team's primary mode of transport is the motorbike.
- **Role of MDM:** The role of MDM in respect of the mobile outreach team is to:
    - organise communication training;
    - support the team in its hotspot-mapping process;
    - support the team in its monitoring and evaluation (M&E) efforts;
    - support the outpatient clinic's management in supervising and evaluating the performance of the team; and
    - help coordinate the team with other groups in the city, and within the clinic.

The technical office at MDM level in charge of this component is the social project officer, or SPO.

The Voluntary Counselling and Testing (VCT) unit

- **Staff**: the VCT department is staffed by one retired female doctor-assistant performing the task of VCT counsellor. The department receives the support of the laboratory. A nurse, partly dedicated to the VCT department, and partly to the care and treatment unit, is in charge of the testing phase. She draws blood samples, operates the first quick-test, and refers the sample if necessary to a certified laboratory in the city. A laboratory-technician was employed for 20 months of the programme to support the nurse. This position was closed

during a streamlining process.

- **Status**: both the VCT counsellor and laboratory nurse operate full-time and are salaried by the programme.
- **Tasks**: the VCT counsellor is in charge of the pre- and post-test counselling session. The VCT in the outpatient clinic is anonymous (clients are registered under a code), and free of charge. The pre-test and the test are done during the same session, and the post-test session takes place seven (7) days thereafter, on receipt of the confirmation test from the laboratory. Clients with negative results on the first quick-tests do not receive their results on the same day of the quick-test, because the aim is to treat all clients equally. The official protocol in Vietnam requires an ELISA confirmation test for any positive quick-test. Double quick-tests protocols are not permitted.
- **Hours**: the VCT department operates Monday-Friday, 8.30am - 12.30pm, and 2pm - 5pm
- **Role of MDM**: the department is under the supervision of the MDM's medical team. Its tasks include:
    - co-ordinating external training sessions;
    - on-the-job training;
    - monitoring and evaluation support; and
    - supporting the clinic's management in co-ordinating the work of the department with that of the mobile outreach team and the care and treatment unit, as well as ensuring quality control at the laboratory level.

The care and treatment department

The outpatient clinic offers a comprehensive service to registered patients, from adherence training and support to home-based care and HAART. All services are provided free of charge, including routine biological and morphological tests (ultrasound, X-Ray, scanner). Hospitalisations for severe opportunistic infections are generally not covered by the programme, unless exceptional cases arise.

The medical unit

The medical unit is in charge of the medical follow-up of the patients, from initial clinical and biological staging to HAART.

- **Staff**: in the early stages of the programme the unit was staffed by one full-time nurse and one part-time medical doctor. As the number of patients increased, another medical doctor was hired on a part-time basis.
- **Status**: the nurse is employed full time by the programme. The full-time doctor is deployed from the public service and receives an allowance from the programme, and the part-time doctor is recently retired and receives a salary from the programme
- **Tasks**: The team is in charge of the staging of the patients and their medical follow-up, both biological and clinical. Routine check-ups are programmed per the Vietnamese national guidelines for care and treatment: pre-ARV patients are examined every six (6) months, with a CD4 count, patients on HAART are examined every month and their CD4 counts are tested every six (6) months. Any patient developing opportunistic infections is welcome to come to the clinic to receive a free examination and free treatment. Patients on HAART are seen at the clinic on average three (3) times a week during the

first month of treatment. Patients are closely monitored and the ARV selection committee, consisting of the two clinic doctors, the director of the clinic and members of the adherence team, review each case and decide when patients should begin HAART.

- **Hours**: the team is on duty during office hours, Monday-Friday. They are also accessible to patients by phone in case of an emergency occurring after close of business
- **Role of MDM** includes:
  - training design and implementation;
  - referral network building;
  - quality of care assessment;
  - on-the-job training;
  - M&E support;
  - supporting clinic management in co-ordinating the work of the medical unit with the other care and treatment units: and
  - connecting the centre with other centres in the city.

The technical office at MDM level in charge of this component is the Medical Project Officer (MPO), including the medical co-ordinator.

The nutrition unit

The nutrition unit existed only temporarily for 20 months in the first phase of the programme. It was terminated because the service (nutrition support to patients, and nutrition training) was not popular among patients, and quite costly. Nutrition training has been absorbed by the adherence team, as a part of the pre-ARV training curriculum.

- **Staff**: in the early stages of the programme, the unit was staffed with one full-time nutritionist, supported during the cooking sessions by the clinic's receptionist.
- **Status**: The nutritionist was a salaried employee.
- **Tasks**: The nutrition team was in charge of training patients about nutrition and HIV, including basic general nutrition training, ARVs and food, and how to adapt diet to cope with AIDS symptoms. The team provided cooking courses to patients and their care-givers and was responsible for the preparation of daily meals for the weakest and poorest patients registered in the programme. Ironically it was the latter service that proved unpopular with patients, despite the fact that many of them were obviously undernourished.
- **Hours**: the nutrition team was on duty during office hours, Monday-Friday.
- **Role of MDM included**:
  - training design and implementation; and
  - referral network building; M&E support.

The tasks were carried out by the medical team's assistant.

The adherence unit

The adherence unit is a critical component in an environment in which 60% of the patients are active IDUs.

- **Staff**: in the early stages of the programme, the unit was staffed by two part-time medical doctors. Two years (24 months) after the clinic's streamlining exercise was implemented the two MDs were replaced by a new team

consisting of a retired doctor-assistant, a peer-educator who was on ARVs, and a former member of the HBC team.

- **Status**: The two medical doctors were deployed staff and received a stipend from the programme. After streamlining, the replacement team is working full-time for the programme, and members receive salaries accordingly.
- **Tasks**: The adherence unit team has two essential tasks:
  - **pre-ARV adherence training**: this consists of a formal training course of six (6) sessions: three (3) in-group with a care giver, and three (3) individual. The objectives of the course are to prepare future ARV patients for the possible repercussions of treatment, including side-effects, the risk of resistance, adherence to treatment, and nutrition guidelines. The training takes place over three (3) weeks, with two (2) meetings a week. Patients with CD4 counts below 50 do not have to follow the course and qualify for the so-called "fast track" ARV procedure, which is given seven (7) days after the CD4 count test is released. After patients finish the training, their cases are reviewed by the ARV selection committee for final validation.
  - **Anti-Retroviral patients follow-up**: the team receives requests from the medical unit to follow up patients suspected of poor adherence. Members of the team undertake to reinforce adherence messages. Patients considered at high risk of low adherence to treatment are followed-up on a regular basis by the adherence team, in conjunction with the HBC team.
- **Hours**: the adherence team is on duty during office hours, Monday-Friday.
- **Role of the MDM** includes:
  - training design and implementation;
  - referral network building; and
  - M&E support.

The technical office at MDM level in charge of this component is the MPO, including the medical co-ordinator.

The home-based care (HBC) team

The home-based care team was created eight (8) months into the programme as a way to reinforce patient support and follow-up and to prolong care at home.

- **Staff**: All peer-educators are recruited from the clinics patients' pool. The HBC team averages six (6) members, of whom 5 are peer-educators, initially mostly former IDUs. For management reasons (including problems of HBC peer-educators using and dealing drugs onsite) the home-based care peer-educators were replaced by non-IDU patients of the clinic.
- **Status**: The five (5) peer-educators are employed full-time by the programme and receive salaries. The doctor-assistant is deployed from the public sector, works part time and receives an allowance.
- **Tasks**: The team is in charge of the home follow-up of HAART patients, and particularly patients with severe medical conditions. The team's tasks range from basic psychological support, social status evaluation, to adherence follow-up and basic medical check-ups
- **Hours**: the HBC team in on duty office hours, Monday-Friday, in the field at patients' homes
- **Role of MDM** includes:
  - training design and implementation;

- on-the-job training;
- supporting the clinic management to co-ordinate the work of the HBC team with the rest of the care and treatment programme; and
- M&E support.

The technical office at MDM level in charge of this component is the medical coordinator, including the MPO.

The pharmacy

The pharmacy is an essential part of the care and treatment unit because it dispenses all medicines, and undertakes the general logistics of the department. The pharmacy is located in the clinic and is required to handle essential medicines dispensing duties. Medicines are ordered from an international NGO consortium, Medicine Science for Health - Supply Chain Management System (MSH-SCMS), which operates in Vietnam under the auspices of PEPFAR. The MSH-SCMS is also in charge of certifying the unit in terms of drug dispensation, storage, and inventory.

- **Staff**: initially the pharmacy was staffed by one part time pharmacist assistant. Later a pharmacist was hired to support the assistant.
- **Status**: both the pharmacist and the pharmacist-assistant are deployed from the public sector and receive an allowance.
- **Tasks**: The pharmacy team is in charge of dispensing medicines to patients - primarily ARVs and drugs to treat opportunistic infections, controlling the medicines stock, and passing purchase orders regarding small medical consumables used by the care and treatment unit.
- **Hours**: the pharmacy team is on duty during office hours, Monday-Friday.
- **Role of MDM** includes:
  - training design and implementation;
  - on-the-job training;
  - supporting the unit in terms of quality control (mostly drug dispensation, and storage);
  - supporting the clinic's management in co-ordinating the work of the unit with that of the care and treatment component of the programme;
  - M&E support; and
  - Cross-checking inventory with the reported number of patients receiving medicines.

The technical office at MDM level in charge of this component is the medical co-ordinator, including the MPO.

The laboratory

The laboratory is a minor unit in charge of performing the VCT quick-tests, collecting blood samples for patients and occasionally administering vaccines. Apart from the HIV quick-tests, no real lab work occurs. All blood samples are sent to off-site referral laboratories.

- **Staff**: One laboratory nurse, and one laboratory technician were employed in the initial stages of the programme. The latter position was closed 20 months into the programme, following a streamlining exercise. The laboratory nurse works for both the care and treatment unit and the VCT unit.
- **Status**: The laboratory technician was deployed from the public sector and received an allowance. The laboratory-nurse is fully employed by the programme and receives a salary.
- **Tasks**: The laboratory is solely in charge of drawing blood specimens, which

are later referred to a certified laboratory, specifically for CD4 count testing. No advanced test needing laboratory techniques such as microscopy are undertaken onsite. Blood is drawn at the clinic for the comfort of the patients.

- **Hours**: the laboratory operates office hours, Monday-Friday
- **Role of MDM includes**:
    - training design and implementation;
    - on-the-job training;
    - supporting the unit in term of quality control (mostly blood-sample storage);
    - supporting the outpatient clinic's management to co-ordinate the work of the unit with that of the care and treatment component of the programme; and
    - M&E support.

The technical office at MDM level in charge of this component is the medical co-ordinator, including the MPO

Financial costs of the principal cost centres at Outpatient Clinic level

			Y0	Y1	Y2	Total
Mobile team	Programme's costs	Direct	$8,901.15	$6,026.69	$8,430.02	$23,357.86
		Indirect	$2,843.07	$6,038.47	$2,806.37	$11,687.91
		Sub-total	***$11,744.22***	***$12,065.17***	***$11,236.39***	***$35,045.77***
	NGO's costs	Direct cost	$7,505.22	$7,981.64	$9,860.35	$25,347.21
		Indirect cost	$24,255.15	$11,194.28	$11,352.87	$46,802.30
		Sub-total	***$31,760.37***	***$19,175.92***	***$21,213.22***	***$72,149.51***
	TOTAL		**$43,504.58**	**$31,241.09**	**$32,449.61**	**$107,195.28**

			Y0	Y1	Y2	Total
Voluntary Counselling & Testing and laboratory related costs	Programme's costs	Direct	$5,319.80	$6,391.60	$6,484.42	$18,195.81
		Indirect	$1,461.32	$3,706.52	$1,394.47	$6,562.31
		Sub-total	***$6,781.12***	***$10,098.11***	***$7,878.89***	***$24,758.12***
	NGO's costs	Direct cost	$2,538.85	$2,882.08	$3,115.12	$8,536.05
		Indirect cost	$12,165.22	$6,921.65	$5,888.04	$24,974.91
		Sub-total	***$14,704.07***	***$9,803.73***	***$9,003.15***	***$33,510.96***
	TOTAL		**$21,485.19**	**$19,901.84**	**$16,882.05**	**$58,269.08**

			Y0	Y1	Y2	Total
Care & treatment	Programme's costs	Direct	$53,106.55	$98,491.23	$124,967.23	$276,565.02
		Indirect	$9,887.42	$26,926.20	$15,491.75	$52,305.37
		Sub-total	***$62,993.97***	***$125,417.44***	***$140,458.98***	***$328,870.39***
	NGO's costs	Direct cost	$18,845.29	$45,715.03	$55,607.61	$120,167.93
		Indirect cost	$87,405.16	$98,126.37	$106,093.73	$291,625.26
		Sub-total	***$106,250.45***	***$143,841.40***	***$161,701.35***	***$411,793.19***
	TOTAL		**$169,244.42**	**$269,258.84**	**$302,160.33**	**$740,663.58**

			Y0	Y1	Y2	Total
Social activities	Programme's costs	Direct	$16,047.09	$14,941.04	$16,558.51	$47,546.64
		Indirect	$1,708.07	$3,522.26	$2,009.02	$7,239.35
		Sub-total	***$17,755.16***	***$18,463.29***	***$18,567.53***	***$54,785.99***
	NGO's costs	Direct cost	$8,800.57	$12,984.46	$16,002.01	$37,787.03
		Indirect cost	$23,767.98	$17,590.20	$18,321.71	$59,679.88
		Sub-total	***$32,568.55***	***$30,574.66***	***$34,323.71***	***$97,466.92***
	TOTAL		**$50,323.70**	**$49,037.95**	**$52,891.25**	**$152,252.91**

Grand total for 3 years : 1,058,380 2008-USD

Financial costs of the cost centres' sub centres at OPC level

			Y0	Y1	Y2	Total
Home-Based Care	Programme's costs	Direct	$2,140.98	$5,234.58	$9,469.82	$16,845.38
		Indirect	$2,356.58	$8,896.60	$4,033.77	$15,286.96
		Sub-total	***$4,497.56***	***$14,131.18***	***$13,503.59***	***$32,132.34***
	NGO's costs	Direct cost	$899.74	$4,633.24	$5,318.04	$10,851.02
		Indirect cost	$4,525.96	$10,574.62	$10,094.21	$25,194.80
		Sub-total	***$5,425.70***	***$15,207.87***	***$15,412.25***	***$36,045.82***
	TOTAL		**$9,923.27**	**$29,339.04**	**$28,915.84**	**$68,178.15**

			Y0	Y1	Y2	Total
Laboratory	Programme's costs	Direct	$5,172.37	$14,628.21	$22,089.97	$41,890.55
		Indirect	$1,842.88	$4,946.10	$1,965.93	$8,754.91
		Sub-total	***$7,015.25***	***$19,574.31***	***$24,055.90***	***$50,645.46***
	NGO's costs	Direct cost	$2,784.12	$6,829.03	$9,558.84	$19,171.99
		Indirect cost	$13,556.57	$14,869.80	$18,183.88	$46,610.24
		Sub-total	***$16,340.68***	***$21,698.83***	***$27,742.72***	***$65,782.23***
	TOTAL		**$23,355.93**	**$41,273.14**	**$51,798.62**	**$116,427.69**

			Y0	Y1	Y2	Total
Pharmacy	Programme's costs	Direct	$32,850.64	$65,479.30	$75,472.26	$173,802.20
		Indirect	$1,424.76	$4,031.56	$4,366.36	$9,822.68
		Sub-total	***$34,275.40***	***$69,510.86***	***$79,838.62***	***$183,624.88***
	NGO's costs	Direct cost	$6,985.75	$26,801.17	$31,532.35	$65,319.26
		Indirect cost	$31,741.02	$56,006.33	$60,441.93	$148,189.28
		Sub-total	***$38,726.77***	***$82,807.50***	***$91,974.28***	***$213,508.54***
	TOTAL		**$73,002.17**	**$152,318.36**	**$171,812.90**	**$397,133.42**

			Y0	Y1	Y2	Total
Adherence	Programme's costs	Direct	$883.53	$1,975.50	$2,622.78	$5,481.81
		Indirect	$854.19	$2,276.77	$1,467.68	$4,598.64
		Sub-total	***$1,737.72***	***$4,252.27***	***$4,090.46***	***$10,080.45***
	NGO's costs	Direct cost	$789.31	$1,150.19	$1,613.47	$3,552.96
		Indirect cost	$3,801.75	$2,883.77	$3,066.93	$9,752.45
		Sub-total	***$4,591.06***	***$4,033.96***	***$4,680.40***	***$13,305.41***
	TOTAL		**$6,328.78**	**$8,286.23**	**$8,770.86**	**$23,385.86**

			Y0	Y1	Y2	Total
Nutrition	Programme's costs	Direct	$2,410.09	$4,699.51	$343.07	$7,452.67
		Indirect	$872.48	$1,244.22	$16.00	$2,132.70

		Sub-total	***$3,282.57***	***$5,943.74***	***$359.07***	***$9,585.37***
	NGO's costs	Direct cost	$652.19	$1,910.47	$144.57	$2,707.23
		Indirect cost	$3,964.06	$4,422.23	$282.00	$8,668.29
		Sub-total	***$4,616.25***	***$6,332.70***	***$426.57***	***$11,375.52***
	TOTAL		**$7,898.82**	**$12,276.44**	**$785.64**	**$20,960.89**
			Y0	**Y1**	**Y2**	**Total**
Medical team	Programme's costs	Direct	$11,023.68	$10,332.39	$19,465.66	$40,821.73
		Indirect	$3,031.95	$6,923.25	$4,045.82	$14,001.02
		Sub-total	***$14,055.63***	***$17,255.64***	***$23,511.48***	***$54,822.75***
	NGO's costs	Direct cost	$7,454.17	$6,060.29	$9,380.16	$22,894.61
		Indirect cost	$33,548.97	$13,125.35	$17,674.82	$64,349.13
		Sub-total	***$41,003.14***	***$19,185.63***	***$27,054.98***	***$87,243.75***
	TOTAL		**$55,058.77**	**$36,441.27**	**$50,566.46**	**$142,066.50**

Financial costs of the cost centres at non-governmental organisation level

		Y0	Y1	Y2	Total
Indirect costs	General coordination	$79,884	$61,517	$73,369	$214,771
	Administration	$67,710	$72,315	$68,287	$208,312
Direct costs	Medical coordination	$21,384	$48,597	$58,723	$128,704
	Social coordination	$16,306	$20,966	$25,862	$63,134
Total		**$185,283**	**$203,396**	**$226,241**	**$614,921**

Economic costs at Outpatient Clinic level

		Economic costs, fixed and variable, with a Y2 level of activity		
		Outpatient Clinic level cost	**non-governmental organisation level cost**	**Total**
MT	direct cost	$22,417.32	$14,429.91	**$36,847.24**
	indirect cost	$1,210.92	$22,808.05	**$24,018.96**
	total	**$23,628.24**	**$37,237.96**	**$60,866.20**
VCT	direct cost	$4,230.83	$2,560.12	**$6,790.94**
	indirect cost	$228.54	$4,206.74	**$4,435.27**
	total	**$4,459.36**	**$6,766.85**	**$11,226.22**
MED	direct cost	$28,132.50	$17,023.27	**$45,155.77**
	indirect cost	$1,519.63	$27,972.32	**$29,491.95**
	total	**$29,652.13**	**$44,995.59**	**$74,647.72**
LAB	direct cost	$20,532.03	$12,424.15	**$32,956.18**
	indirect cost	$1,109.08	$20,415.13	**$21,524.20**
	total	**$21,641.11**	**$32,839.28**	**$54,480.38**
PHA	direct cost	$64,240.17	$38,872.41	**$103,112.59**
	indirect cost	$3,470.06	$63,874.41	**$67,344.47**
	total	**$67,710.23**	**$102,746.82**	**$170,457.05**
HBC	direct cost	$20,029.71	$12,120.19	**$32,149.91**
	indirect cost	$1,081.94	$19,915.67	**$20,997.62**
	total	**$21,111.66**	**$32,035.86**	**$53,147.52**
NUT	direct cost	$1,659.92	$1,004.44	**$2,664.36**
	indirect cost	$89.66	$1,650.47	**$1,740.14**
	total	**$1,749.59**	**$2,654.91**	**$4,404.49**
ADH	direct cost	$5,877.27	$3,556.40	**$9,433.66**
	indirect cost	$317.47	$5,843.80	**$6,161.27**
	total	**$6,194.74**	**$9,400.20**	**$15,594.94**
IGA	direct cost	$2,498.00	$1,607.95	**$4,105.95**
	indirect cost	$134.93	$2,541.54	**$2,676.47**
	total	**$2,632.93**	**$4,149.49**	**$6,782.42**
Social sup+OVC	direct cost	$2,604.09	$1,676.24	**$4,280.32**
	indirect cost	$140.66	$2,649.47	**$2,790.14**
	total	**$2,744.75**	**$4,325.71**	**$7,070.46**
Club	direct cost	$5,278.95	$3,398.03	**$8,676.98**
	indirect cost	$285.15	$5,370.96	**$5,656.11**
	total	**$5,564.10**	**$8,768.99**	**$14,333.09**

		Fixed economic costs		
		Outpatient Clinic level cost	**non-governmental organisation level cost**	**Total**
MT	direct cost	$18,579.46	$13,323.95	**$31,903.42**
	indirect cost	$2,060.85	$20,354.61	**$22,415.46**
	total	**$20,640.32**	**$33,678.56**	**$54,318.88**
VCT	direct cost	$3,902.11	$2,491.75	**$6,393.86**
	indirect cost	$432.83	$4,091.20	**$4,524.02**
	total	**$4,334.94**	**$6,582.94**	**$10,917.88**
MED	direct cost	$20,382.74	$13,015.68	**$33,398.42**
	indirect cost	$2,260.88	$21,370.43	**$23,631.30**
	total	**$22,643.61**	**$34,386.11**	**$57,029.72**
LAB	direct cost	$3,773.22	$2,409.44	**$6,182.66**
	indirect cost	$418.53	$3,956.06	**$4,374.59**
	total	**$4,191.75**	**$6,365.50**	**$10,557.24**
PHA	direct cost	$3,359.15	$2,145.03	**$5,504.18**
	indirect cost	$372.60	$3,521.92	**$3,894.52**
	total	**$3,731.75**	**$5,666.95**	**$9,398.70**
HBC	direct cost	$16,249.25	$10,376.18	**$26,625.43**
	indirect cost	$1,802.38	$17,036.64	**$18,839.03**
	total	**$18,051.63**	**$27,412.82**	**$45,464.46**
NUT	direct cost	$1,526.08	$974.50	**$2,500.58**
	indirect cost	$169.27	$1,600.03	**$1,769.30**
	total	**$1,695.35**	**$2,574.53**	**$4,269.88**
ADH	direct cost	$5,225.14	$3,336.59	**$8,561.73**
	indirect cost	$579.58	$5,478.34	**$6,057.92**
	total	**$5,804.72**	**$8,814.93**	**$14,619.65**
IGA	direct cost	$2,498.00	$1,791.40	**$4,289.40**
	indirect cost	$277.08	$2,736.67	**$3,013.75**
	total	**$2,775.08**	**$4,528.07**	**$7,303.15**
Social sup+OVC	direct cost	$406.26	$291.34	**$697.60**
	indirect cost	$45.06	$445.07	**$490.14**
	total	**$451.32**	**$736.41**	**$1,187.73**
Club	direct cost	$5,278.95	$3,785.71	**$9,064.66**
	indirect cost	$585.55	$5,783.32	**$6,368.86**
	total	**$5,864.49**	**$9,569.02**	**$15,433.52**

		Marginal economic costs per extra unit of activity for each sub-cost centre		
		Outpatient Clinic level cost	**non-governmental organisation level cost**	**Total**
MT	direct cost	\$1.62	\$0.51	**\$2.13**
	indirect cost	\$0.01	\$1.28	**\$1.29**
	total	**\$1.63**	**\$1.80**	**\$3.42**
VCT	direct cost	\$0.31	\$0.18	**\$0.49**
	indirect cost	\$0.00	\$0.30	**\$0.30**
	total	**\$0.31**	**\$0.48**	**\$0.79**
MED	direct cost	\$41.89	\$24.50	**\$66.39**
	indirect cost	\$0.25	\$39.94	**\$40.20**
	total	**\$42.14**	**\$64.45**	**\$106.59**
LAB	direct cost	\$13.48	\$7.89	**\$21.37**
	indirect cost	\$0.08	\$12.86	**\$12.94**
	total	**\$13.56**	**\$20.74**	**\$34.31**
PHA	direct cost	\$329.09	\$192.50	**\$521.58**
	indirect cost	\$1.99	\$313.78	**\$315.77**
	total	**\$331.08**	**\$506.28**	**\$837.36**
HBC	direct cost	\$20.43	\$11.95	**\$32.39**
	indirect cost	\$0.12	\$19.48	**\$19.61**
	total	**\$20.56**	**\$31.44**	**\$52.00**
NUT	direct cost	\$0.72	\$0.42	**\$1.15**
	indirect cost	\$0.00	\$0.69	**\$0.69**
	total	**\$0.73**	**\$1.11**	**\$1.84**
ADH	direct cost	\$3.52	\$2.06	**\$5.59**
	indirect cost	\$0.02	\$3.36	**\$3.38**
	total	**\$3.55**	**\$5.42**	**\$8.97**

Cost of the most important medicines used in the programme

Item designation	Cost per unit			
	International price in 2008 USD	CIF price in 2008 USD	CIF+storage and transport in 2008 USD	CIF price in 2000 USD
Cotrimoxazole 800/160mg	$0.01	$0.013	$0.014	$0.011
Cotrimoxazole 400/80mg	$0.01	$0.013	$0.014	$0.011
Cotrimoxazole Siro 40/200mg	$1.00	$1.119	$1.169	$0.913
Dapsol 100mg	$0.01	$0.010	$0.011	$0.008
Clindamycin 150mg	$0.06	$0.069	$0.072	$0.057
Azithromycine 250mg	$0.19	$0.210	$0.219	$0.171
Azithromycine bột 200mg	$0.19	$0.210	$0.219	$0.171
Metronidazole 250mg (klion)	$0.14	$0.157	$0.164	$0.128
Ciprofloxacine 500mg	$0.04	$0.045	$0.047	$0.037
Cephalexin 500mg	$0.08	$0.094	$0.098	$0.077
Amoxycilin 500mg	$0.07	$0.075	$0.079	$0.062
Cefuroxime acetyl 250mg	$0.45	$0.503	$0.525	$0.410
Doxycyclin 100mg	$0.01	$0.012	$0.013	$0.010
Ceftriaxone IV 250mg	$4.30	$4.811	$5.026	$3.927
Benzathine PenicillineIM 1.2 MUI	$0.42	$0.475	$0.497	$0.388
Fluconazole 150mg	$0.59	$0.661	$0.690	$0.539
Itrazonazole 100mg	$0.71	$0.799	$0.835	$0.652
Miconazole gel	$0.73	$0.817	$0.854	$0.667
Clotrimazole 100mg	$0.14	$0.157	$0.164	$0.128
Diflucan 200mg	$0.39	$0.440	$0.460	$0.359
Clotrimazole	$0.14	$0.157	$0.164	$0.128
Acyclovir 200mg	$0.05	$0.057	$0.059	$0.046
Mebendazole 100mg	$0.03	$0.038	$0.040	$0.031
Albedazole 200mg	$1.36	$1.523	$1.591	$1.243
Loperamid 2mg	$0.01	$0.009	$0.009	$0.007
Cimetidine 300mg	$0.03	$0.031	$0.033	$0.026
Simethicone 80mg	$0.04	$0.044	$0.046	$0.036
Loperamid 2mg	$0.01	$0.009	$0.009	$0.007
Metaclopramide 10mg	$0.10	$0.112	$0.117	$0.091
Acetaminophen 500mg	$0.00	$0.004	$0.005	$0.004
Acetaminophen/Codein 500mg/30mg	$0.05	$0.051	$0.054	$0.042
Acetaminophen 120mg/5ml	$1.31	$1.468	$1.534	$1.199
Acetaminophen 160mg/5ml	$0.97	$1.084	$1.132	$0.885
Ibuprofen 200mg	$0.01	$0.008	$0.008	$0.007
Ibuprofen siro 100mg/5ml	$0.78	$0.874	$0.913	$0.713
Prednisolone 5mg	$0.00	$0.004	$0.005	$0.004
Aspirin 500mg PH8	$0.01	$0.010	$0.010	$0.008
Tylenol	$1.12	$1.257	$1.313	$1.026
Promethazine 15mg	$0.01	$0.008	$0.008	$0.007
Promethazine siro 0,1%	$0.20	$0.220	$0.230	$0.180
Multivitamin	$0.00	$0.004	$0.004	$0.003
Multivitamin siro	$0.88	$0.986	$1.030	$0.805
Vitamin 3B	$0.01	$0.013	$0.014	$0.011

Vitamine C 500mg	$0.04	$0.044	$0.046	$0.036
Fe-Folic	$0.03	$0.038	$0.039	$0.031
Oxomemazine + Guaifenesin	$0.51	$0.574	$0.599	$0.468
Acetylcystein 100mg	$0.05	$0.053	$0.056	$0.044
d4T/3TC/NVP	$0.14	$0.155	$0.162	$0.127
ZDV/3TC/NVP	$0.33	$0.368	$0.384	$0.300
d4T 30mg	$0.03	$0.032	$0.034	$0.026
d4T 40mg	$0.07	$0.080	$0.084	$0.065
ZDV 300mg	$0.09	$0.099	$0.103	$0.080
ZD4/3TC 300/150mg	$0.19	$0.216	$0.225	$0.176
3TC 150mg	$0.05	$0.057	$0.059	$0.046
NVP 200mg	$0.06	$0.067	$0.070	$0.054
EFV 600mg	$0.40	$0.450	$0.470	$0.367
DDI 200mg	$0.12	$0.137	$0.143	$0.112
DDI 100mg	$0.14	$0.152	$0.159	$0.124
DDI 25mg	$0.12	$0.137	$0.143	$0.112
ABC 300mg	$0.47	$0.529	$0.553	$0.432
NFV 250mg	$0.64	$0.717	$0.749	$0.585
TDF 300mg	$0.48	$0.535	$0.559	$0.437
LPV/r	$0.48	$0.537	$0.561	$0.438

Resume

Experience

General Director and Founder of Urban Care Ltd., Hanoi, Vietnam, April 2010 – Present

Lead Consultant for AMI in Thailand: program performance, sustainability, ownership and cost analysis, November - December 2010

General evaluation of Aide Medicale Internationale's program in the Tak Province in the Karen refugees camps of Mae La, Nupoh and Umpiem, primary health care and general prevention services. 80,000 refugees covered by the program

Lead Consultant on cost and cost-effectiveness analysis for FHI Vietnam, Hanoi, Vietnam, October 2010 - March 2011

Costs, unit-costs and cost-effectiveness analysis of FHI Vietnam's HIV intervention portfolio in Vietnam covering outreach, counseling and testing, care & treatment, and community-based intervention. 25 sites and 70 program components

Rapporteur for Family Health International Headquarters - Hanoi - August 2010

Rapporteur for their internal world SPME - Strategic Information meeting.

Country Medical Coordinator, Médecins du Monde France, Hanoi, Vietnam - Jan 2008 – Nov 2009

Medical guidance at country level of the HIV program, M&E tools development & supervision, IEC & BCC materials development, donor technical relation, budget building and follow-up. 2000 People Living with HIV/AIDS registered, in 2 cities and 3 sites.

Medical Coordinator, Médecins du Monde France, Hanoi, Vietnam - Jan 2007- Dec 2008

Close technical management of the Tay Ho Outpatient Clinic: VCT, HBC, HAART and human resources, IEC & BCC materials development, OVC network development, and M&E systems implementation and supervision. 600 People Living with HIV/AIDS registered.

Medical referent, Médecins du Monde France, Rabat, Morocco, Aug – Oct 2006

Building and technical supervision of a PHC centre for illegal sub-saharian migrants in transition in Rabat: general medicine, reproductive health, TB and HIV. Target population of 5,000

General Practitioner – Family Doctor, France, 2004 -2006

Resident, Pediatric service of the university hospital of Yaoundé, Cameroon, March - Sept 2003

Paediatric clinical care (malnutrition, lung-infections, malaria, HIV and TB). Research on the social, geographic and economic accessibility of the service.

Tutor/teacher in biostatistics of pre-graduate medical students, Bordeaux, France, Access Ltd - 1995 – 1998

Education

Ph.D in Epidemiology, Swiss Tropical and Public Health Institute, Basel, Switzerland - Oct 2007- Nov 2010

On the cost-effectiveness evaluation of the prevention and care & treatment HIV site of Tay Ho, Hanoi. Unit-costs, financial and economic analysis, DALY analysis, and affordability of the program. Under the direction of Pr M. Tanner.

Medical Doctor degree, Bordeaux II Medical School, Bordeaux, France - 2004

Thesis: Modeling the accessibility of the Yaounde's university hospital pediatric service

Master of Science in International Health, Bordeaux II medical school and Troped network, France and Europe - 2002-2004

(advanced modules at the Swiss Tropical Institute, the Heidelberg Institute of Tropical Medicine, and the London School of Tropical Hygiene)

Degree in Tropical Medicine and Hygiene, Bordeaux II medical school, Bordeaux, France 2002