Direct Costs of Medical Care for HIV-Infected Children Before and During HAART in Abidjan, Côte d'Ivoire, 2000–2002

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Abstract

The objectives of this study were to obtain an estimation of the cost of care for HIV-infected children in Africa. In Abidjan, Côte d'Ivoire, with the Drug Access Initiative, HIV-infected children obtain antiretroviral (ARV) drugs free of charge. Since October 2000, HIV-infected children have been monitored in an observational cohort in Abidjan. Criteria for eligibility for Highly Active Antiretroviral Treatments (HAART) are to be HIV-symptomatic or have a CD4 percentage below 15%. From the time they became eligible for HAART until they started the treatment we analysed all health events occurring in HIV-infected children and all costs related to medical care. We compared these to events and expenses occurring from the time they started HAART until September 2002. All direct medical costs were taken into account (outpatient visits, day hospital, hospitalizations, drug expenses, laboratory tests, X-rays, travel costs) for each child and for the two time periods.

Fifty four HIV-infected children, eligible for treatment, were monitored before and during HAART prescription. Follow-up periods before and during HAART were respectively 310 and 638 children/months. In Abidjan, mean costs for care management per year for a symptomatic HIV-infected child were €666.13 without HAART, and €3,037.81 with HAART for the same child. Morbidity decreased two to three-fold with this treatment. Antiretroviral

drugs and biological tests represented respectively 84% and 8% of the costs during HAART. This represents 3 to 4 times the minimum salary in Côte d'Ivoire and there is no realistic possibility of covering these care costs without the support of the government and the international community.

Résumé

Les objectifs de cette étude étaient d'obtenir une estimation du coût de la prise en charge médicale des enfants infectés par le VIH en Afrique. À Abidjan, dans le cadre de l'initiative d'accès aux médicaments antirétroviraux (ARV), l'État prend totalement en charge le coût de ces médicaments pour les enfants. Depuis octobre 2000, des enfants infectés par le VIH sont suivis dans une cohorte observationnelle à Abidjan. Les enfants éligibles pour ces traitements sont cliniquement symptomatiques ou ont un pourcentage de CD_4 inférieur à 15%.

Depuis le moment de leur éligibilité jusqu'au début du traitement, nous avons observé et analysé les évènements morbides et les coûts de traitement. Ces dépenses ont été comparées à celles survenues chez les mêmes enfants du début de leur traitement par ARV jusqu'en septembre 2002. Tous les coûts médicaux directs ont été pris en compte (consultations, hospitalisations, médicaments, examens de laboratoire, transport) pour chaque enfant et pour les deux périodes.

Cinquante-quatre enfants infectés ont été suivis avant traitement, puis sous traitement. Le suivi a été de 310 et 638 enfants/mois avant et pendant les ARV. À Abidjan, le coût moyen annuel de la prise en charge médicale d'un enfant infecté par le VIH symptomatique, sans ARV est de 666.13 € et, pour le même enfant de 3037,81 € avec les ARV. La morbidité est diminuée d'un facteur de 2 à 3 sous ARV. Les ARV et les tests de laboratoire représentent respectivement 84% et 8% des dépenses sous ARV. Ils représentent trois à quatre fois le salaire minimum en Côte d'Ivoire. Une approche réaliste du problème du coût des soins médicaux ne peut se faire sans un soutien financier effectif des états et de la communauté internationale.

Introduction

AIDS epidemic in Côte d'Ivoire in children

At the end of 2002, UNAIDS estimated the total number of persons living with HIV/AIDS (PLWA) at 42 million, with 3.2 million children worldwide.

The AIDS epidemic started early in Côte d'Ivoire the first case of AIDS being identified in 1985. Côte d'Ivoire is the most HIV-infected country in West Africa with 9.7% of 15-49 year-olds being HIV-infected. In this country, around 690,000 adults and 80,000 children under 15 are HIV-infected [1], the vast majority remaining undiagnosed or, if diagnosed, without any access to HAART.

Access to antiretroviral therapies

In Côte d'Ivoire, less than 5,000 HIV-infected patients, adults and children currently have access to HAART. Even if estimations are difficult to make, we can consider that less than 10% of HIV-infected adults know they are infected. Among children, the proportion is probably even lower. It is not usual to test children for HIV, especially those over 4 or 5 years old. Generally, health workers consider that HIV-infected children do not survive beyond five, thus they rarely think about testing older children. However, as the epidemic has existed for more than fifteen years, particularly among adults of reproductive age, there are many children 5 years old or more who are infected and live in the community. In the different centers where health professionals and Non Governmental Organizations (NGOs) care for HIV-infected children in Abidjan, it can be estimated that not more than one thousand HIV-infected children receive care, and there are probably only another thousand throughout the country receiving care.

The mortality of HIV-infected children living in Africa is very high, in the absence of antiretroviral treatment and cotrimoxazole prophylaxis: prospective studies of HIV-infected infants report over 50% mortality before the age of 15 months [2-4]. Available data for children over 5 years old is scarce and mostly from hospital-based or cross sectional studies [5, 6].

Several studies in Europe and the United States have however demonstrated the efficacy of antiretroviral treatments, and shown that they substantially reduce child mortality [7-10]. Despite studies describing the feasibility and efficacy of antiretroviral multitherapy in adults [11], including Africa [12-14], there are still very few data available on Highly Active Antiretroviral Treatments (HAART) in children in Africa [15]. There are also very few data on costs of paediatric HIV infection in Africa [16], and no study of this kind has included the costs of HAART.

In Côte d'Ivoire, the UNAIDS/Ministry of Health Drug Access Initiative, with the support of the International Therapeutic Solidarity Fund (ITSF), provides free access to antiretroviral therapies for HIV-infected children, after registration and confirmation of eligibility in the only accredited Paediatric Department (Centre Hospitalier de Yopougon, Abidjan) in Côte d'Ivoire. In fact there are less than 300 HIV-infected children on HAART, mainly in this paediatric department of Yopougon and a private health structure, the CIRBA, although a small number of HIV-infected children receive HAART in other accredited departments for HIV care. Although HAART treatment is subsidized and free of charge for families of HIV-infected children, there are several other limits to accessing these treatments. First, as mentioned above, many families do not know that the children they look after are HIV-infected. Second, even when they know the children are HIV-infected because their parents are ill or deceased, the extended family is not always well-informed about the health structures which can care for these children. Finally, as in adults [17], it is not only the costs of the drugs that families have to consider in getting access to HIV treatment for these children. In addition, there are travel costs, consultations, hospitalisations and biological tests (although biological follow-up of HAART is free of charge in the DAI). Other drugs, for bacterial infections, tuberculosis and opportunistic infections can be very expensive too, especially when symptoms are chronic, and often have poor results.

As part of a research project in Abidjan, we have been able to offer HAART to a group of children in an observational cohort, with all other medical costs covered by the program. HAART was offered in accordance with recent recommendations for antiretroviral treatment in Africa [18].

It is very important to estimate the cost of care for HIV-infected children in Africa, especially when we can expect an improvement in the health of these children with HAART, in order to clarify its impact on direct medical costs: to what extent will extra costs due to the price of HAART combinations be offset by savings in other direct costs of care, especially those for clinical episodes of opportunistic infections and other HIV-related morbidity?

In Abidjan, Côte d'Ivoire, among the 2 to 15-year-old HIV-infected children recruited and monitored in our cohort, some clearly needed initiation of antiretroviral therapies. Through the Drug Access Initiative, these medically eligible children could obtain antiretroviral drugs free of charge from the Ministry of Health. However, between 1998 and the end of 2001, there were often long

delays in obtaining HAART, and children sometimes spent months waiting for treatment, with an associated decline in their immune system.

Our objective was to estimate, in the short- and mid-term, the direct cost of all medical care of HIV-infected children who needed antiretroviral therapies, before and after initiation of this treatment. Even though our program is only a pilot, mainly funded by research organizations and the government, the collection of such information is important for future public health policy regarding the care of HIV-infected children and for raising funds for their care management.

I
METHODS

All the children are monitored in a dedicated Abidjan health center through standardized procedures. After inclusion in the cohort, once families have given their consent, there are quarterly routine visits, and a day-clinic is open all week for sick children. When necessary, children are seen for any intercurrent disease free of charge. Paediatricians have developed a clinical form to record any pathological event occurring during the follow-up of these children.

Criteria for children's eligibility for HAART are the following: to be HIV-symptomatic (CDC stages B or C) or to present a CD4 percentage below 15%. Under 25% of CD4 lymphocytes, all children were systematically put on daily cotrimoxazole prophylaxis.

For this study we selected all the children in our cohort who satisfied these eligibility criteria for HAART at some point during follow-up and who had experienced a delay of more than ten days. Children in the cohort who did not fulfil the eligibility criteria for HAART during follow-up, those who were already HAART-treated at inclusion and those who had access to HAART less than ten days after reaching the eligibility criteria were not included in the present analysis.

The choice of this sub-sample allowed us to analyze all health events and related medical costs that occurred during the period in which eligible children were waiting for access to HAART, and to compare them to those occurring after HAART initiation up to September 2002.

For each child, the length of follow-up time without HAART was calculated in months and we summed all follow-up periods in months. We followed

the same procedure for the time on HAART. In this way, we obtained a common unit of person/follow-up time in months. In this article we have chosen a child/year of follow-up as the common unit of calculation in order to calculate the mean direct costs of medical care per year per child and to compare periods with and without HAART.

We systematically and retrospectively reviewed the medical records of the children from inclusion to mid-September 2002, compiling drug prescriptions, clinical and biological investigations, specialized medical consultations, hospitalizations. All costs were expressed in Euro (€1 = US$1). All direct costs (outpatient visits, hospitalization in day-care units, hospitalizations in paediatric departments, drug expenditures, laboratory tests, other investigations) were taken into account for each child and for the two time periods. We compared these costs by type of expenses and also in total, including the cost of antiretroviral drugs.

For follow-up visits, we took the cost of a paediatric outpatient consultation in the public hospital (€3.05). The routine biological tests were a CD4 lymphocyte count (€11.89) and viral load (€102.06) at onset and then every six months. The costs of these biological tests remained unchanged between 2000 and 2002. For a day clinic stay, the cost of a one-day stay was estimated at €7.62. Lastly, the cost of biological screening (urea, creatinine, SGOT, SGPT, alkaline phosphatase, amylase, glycemia) for patients included in the Initiative was estimated at €15 [14]. In our case, we took into account two such screenings for each child starting HAART, one just before and one every six months. For travel costs, we estimated an average cost of €1.52 for each contact with our care network. For drug costs (other than HAART), we used our actual costs: drugs were bought through the Public Pharmacy or drug wholesalers. We only took the private pharmacy price for drugs which were not available through these systems. We used the 2002 prices in our calculations, as we were not able to obtain the original prices for 2000 and 2001 for each child. Comparison of drug prices for each year showed a price rise of less than 2% in frequently used drugs. We therefore used only 2002 prices, in order to simplify calculations.

As this program involves several partners, expenses are currently covered as follows: the Ivorian Government, with the help of International Therapeutic Solidarity Fund (ITSF) up to the end of 2002, pays for antiretroviral drugs; all biological follow-up necessary for antiretroviral prescription and monitoring is paid by the Projet Retro-CI (a research program of Centers for Disease Control in Côte d'Ivoire); all other medical care expenses are covered by the research program which is funded by the French National Agency for AIDS Research (ANRS). Families generally pay travel expenses.

We did not include costs of the psychological follow-up (visits, group meetings) and community care (food and school support), choosing to focus on medical care. Psychological visits are routine for all children in our research program. But this type of consultation is rather unusual in Abidjan and cannot be considered as included in the "standard of care", although it should be. However, compared to medical expenditures, the community care costs remain quite small with no difference before and after treatment, as they correspond to the economic situation of the family and not to the health status of the child.

Antiretroviral drugs were obtained through the Public Health Pharmacy, the only official route available for their acquisition in Côte d'Ivoire since 1998 [19]. The drugs available were trademark drugs. Multitherapy consisted of two nucleoside analogues and either a protease inhibitor (Nelfinavir) or a non-nucleoside reverse transcriptase inhibitor (Efavirenz). Drug doses were calculated according to child weight as recommended by each manufacturer. Costs were calculated from the purchase price paid by the Public Health Pharmacy. These prices are fixed yearly following tenders to the MOH, and are applied from 1st June every year. Costs were therefore calculated in relation to the year of treatment. For each child, we calculated the time period (in days) he or she received HAART, and applied 2000 prices for the period up to 31st May 2001, 2001 prices for the period up to 31st May 2002, and 2002 prices for the period from 1st June 2002 to 15th September 2002.

Epi-Info 6.04 cfr (CDC, Atlanta, USA and WHO, Geneva, Switzerland) was used for comparison of incidence densities of medical events.

II
RESULTS

From October 2000 to mid-September 2002, 161 HIV-infected children were recruited in our cohort. Altogether, 81 children received antiretroviral therapies at some point during follow-up: 22 were already HAART-treated before inclusion in the cohort and 59 were not on antiretroviral treatment at inclusion. Most of

these 59 children (n = 54) had had a follow-up period in the cohort during which they were already medically eligible for HAART but had not yet had the opportunity to start this treatment. Altogether, these "delays" in accessing HAART amounted to a total of 310 child. month (mean 5.5 months). For these same 54 children, the total length of follow-up after HAART initiation was 638 child/month (mean 11.4 months). General characteristics of these 54 children at recruitment are described in Table 1.

Table 1:
Characteristics at baseline of HIV-infected children (N=54) before HAART treatment,
Programme Enfant Yopougon, Abidjan, 2000-2002

Characteristics	N=54
Age, median years (range)	6.6 (1.5 – 13.4 YEARS)
Number of males (%)	33 (61)
Route of HIV-transmission	
Mother to Child	54 (100)
Both parents living	30 (55%)
Only one parent living	20 (37%)
Orphan	4 (7%)
Clinical stage	
N	1 (2)
A	13 (24)
B	33 (61)
C	7 (13)
Median plasma HIV-RNA viral load in Log/ml (range)	5.28 (3.31 – 6.99)
CD4 lymphocyte % (median)	
< 2 years old (n=4)	9.6%
2 – 5 years old (n=19)	8.8%
> 5 years old (n=31)	4.2%
CD4 lymphocyte count (median)	
< 2 years old (n=4)	704
2 – 5 years old (n=19)	229
> 5 years old (n=31)	108

Medical events, care and costs before HAART

Before HAART, there were 328 recorded medical events for these 54 children (Table 2). The five most frequent diagnoses were: skin complaints, upper respiratory tract infections, bronchitis, diarrhoea and fever of unidentified origin.

These medical events involved 327 general outpatient consultations, 9 specialized consultations, 16 day-clinic hospitalisations and 4 hospitalisations in the paediatric department, corresponding to a total period of 15 days. There were 125 routine follow-up visits for the research program, of which 68 involved drug prescription.

The costs are listed in Table 3. For one HIV-infected child, routine follow-up visits for research amounted to €14.77 per year, and HIV immunological and virological screening came to €348.78, mostly in relation to viral load (89.6% of the cost). Medical visits, hospitalizations and diagnostic tests were estimated at a mean cost of €98.2, travel costs at €27.44, and total care at €191.7 per year of follow-up per child. Thus the global cost including follow-up expenditures was €680.90 per year. The specific follow-up for research represented only 2.2% of the total costs and, excluding these costs, care per year per HIV-infected child at a symptomatic stage came to a total of €666.13.

Table 2:
Medical events among HIV-infected children (N=54), before and during HAART treatment, Programme Enfant Yopougon, Abidjan, 2000-2002

	Before HAART		*During HAART*			
	N	Incidence per 100 months-child	N	Incidence per 100 months-child	Relative risk	p value
Length of follow-up (in months)	310		637			
Skin disorders	61	19.68	65	10.20	1.93 (1.36-2.73)	<0.0002
Upper respiratory tract infections	55	17.74	67	10.52	1.69 (1.18-4.35)	<0.003
Bronchitis	53	17.1	38	5.96	2.87 (1.89-4.35)	<0.0001
Diarrhoea	45	14.52	31	4.87	2.98 (1.89-4.71)	< 0.0001
Fever of unidentified origin	23	7.42	28	4.4	1.69 (0.97-2.93)	0.06
Pneumonia	20	6.45	15	2.35	2.74 (1.4-5.35)	0.0025
Oral candidiasis	16	5.16	5	0.78	6.58 (2.41-17.95)	<0.0001
Other infections	16	5.16	16	2.51	1.82 (1.18-2.85)	0.005
Conjunctivitis	10	3.23	16	2.51	1.28 (0.58-2.83)	0.33
Biological disorders	8	2.58	6	0.94	2.74 (0.95-7.90)	0.052
Mycobacteria	6	1.93	1	0.16	12.33 (1.48-102.4)	0.006
Malaria	1	0.32	15	2.35	0.14 (0.01-1.04)	0.015
Other	14	4.52	10	1.6	2.88 (1.28-6.48)	0.0087
Total	328	105.8	313	49.14	2.15 (1.84-2.51)	<0.0001

Table 3: Cost of medical care for HIV-infected children, before and during HAART treatment, Programme Enfant Yopougon, Abidjan, 2000-2002

	Before HAART			*During HAART*		
	N	Total cost (range)	Cost for a year of follow-up	N	Total cost (range)	Cost for a year of follow-up
Length of follow-up in months (years)	310 (25.81)			638 (53.21)		
Routine visits	125	381.25 (3.05-15.25)	14.77	214	652.7 (0-21.35)	12.27
HIV immunological and virological tests	79	9002.05 (113.9-341.8)	348.78	103	11736.85 (0-341.85)	220.58
HAART biological screening				135	2025.00 (15-60)	38.06
General consultations	327	997.01 (0-97.6)		348	1061.04 (0-76.25)	
Specialized consultations	9	59.45 (0-15.2)		15	109.76 (0-22.9)	
Day clinic	16	121.96 (0-30.5)		23	175.32 (0-38.1)	
Hospitalizations	4	243.92 (0-106.7)		8	1875.11 (0-899.4)	
Other biological tests		736.33 (0-101.4)			717.57 (0-78.6)	
Other tests		375.78 (0-53.4)			573.21 (0-183)	
a Sub total visits, tests and hospitalizations@		11536.5	446.98		18273.86	343.43
b *Travel Costs**	466	708.32 (4.6-59.3)	27.44	552	839.04 (3.0-54.7)	15.77
Antibiotics		1325.31 (0-176.3)			1399.83 (0-225.0)	
Cotrimoxazole prophylaxis**		1299.89 (0-121.6)			2770.68 (0-137.24)	
Other drugs		2172.50 (0-130.6)			2508.21 (0-130.5)	
Other care £		150.16 (0-64)			89.94 (0-45.7)	
c Sub total care without HAART		4947.86	191.70		6768.66	127.21
Sub Total without HAART		17573.93	680.90		26534.26	498.67
d *HAART*		NA			135760.65 (20.4-6225.4)	2551.41
Total		17573.93	680.90		162294.91	3050.08

@ Excluding routine visits; £ including immunizations, transfusions, anti-tuberculous treatments, and physiotherapy; * travel costs were paid by the program for routine visits, and by families for medical events; ** in children, more than 70% of cotrimoxazole prophylaxis is taken in syrup form, which is more expensive than pills.

Medical events, care and costs during HAART

Among the same 54 children during HAART, there were 313 recorded medical events (Table 2). The five most frequent diagnoses were also skin disorders, upper respiratory tract infections, bronchitis, diarrhea and fever of unidentified origin, but with a much lower incidence, characterized by a two – to three – fold decrease with HAART (Table 2).

These events involved 348 general outpatient consultations, 15 specialized consultations, 23 day clinic hospitalizations and 8 hospitalizations in the paediatric department, amounting to a total of 120 days. There were 214 routine follow-up visits for the research program, of which 94 included drug prescription.

The costs are listed in Table 3. One year of follow-up of one treated HIV-infected child in the cohort cost €12.27, with €220.58 for HIV immunological and virological screening, essentially for viral load (89.6% of these costs). Biochemical screening cost €38.06. Medical visits, hospitalisations and diagnostic tests were estimated at a mean cost of €84.79, travel costs at €15.77, and drugs and care without HAART at €127.21. Thus care management per year per HIV-infected child at a symptomatic stage, excluding the cost of HAART, cost €498.67, *i.e.* €486.4 excluding costs of routine visits (73% of costs before HAART).

The price of antiretroviral drugs decreased dramatically during these years (Table 4). However, it represented an expense of €2,551.41 per child per year, the cost of nelfinavir accounting for 72.5% of this expenditure. The global cost, including HAART and follow-up, was therefore €3,050.08 per year. The cost of HAART represented 83.6% of the total.

If we compare the proportion of each type of cost before and during treatment, excluding HAART, we can see that the proportion of each type of expense is fairly similar: biological tests represent 51% and 52% of expenses before and after treatment respectively, medical visits and hospitalizations 14.4% and 17%, drugs 28% and 25.5%.

Table 4:
Evolution of antiretroviral drugs prices used in children in Abidjan 2000-2002 (in F CFA and Euros)

	2000		2001		2002	
	F CFA	€	F CFA	€	F CFA	€
EPIVIR ™ 150 mg, 60 tabs	48180	73.45	14160	21.59	13500	20.58
EPIVIR ™ syrup	14000	21.34	8100	12.35	7705	11.75
RETROVIR ™ 100 mg, 100 tabs	27800	42.38	19600	29.88	18701	28.51
RETROVIR ™ syrup	16200	24.7	13200	20.12	12601	19.21
STOCRIN ™ 200 mg, 90 tabs	132750	202.38	29340	44.73	31590	48.16
VIDEX ™ 150 mg 60 tabs	NA		14200	21.65	14200	21.65
VIDEX ™ 100 mg 60 tabs	33840	51.59	9420	14.36	9420	14.36
VIDEX ™ 50 mg 60 tabs	17940	27.35	7020	10.70	7020	10.70
VIRACEPT ™ 250 mg, 270 tabs	213840	326	213840	326	190350	290.19
VIRACEPT ™ syrup	NA		22684	34.58	21873	33.35
ZERIT ™ 20 mg 56 tabs	NA		3864	5.89	3864	5.89
ZERIT ™ syrup	18700	28.51	7002	10.67	7025	10.71

Discussion

Medical care costs for HIV-infected children are not well-documented in Africa. In this study, mean costs for care management of a symptomatic HIV infected child without HAART per year are €666.13 and €3,037.81 for the same child with HAART. The incidence of disease events decreases two – o three – fold with such treatment. Even when we compare these incidence before and after initiation of treatment using a statistical test for matched pairs which is possible with this group of children, these differences remain. Ou study does not indicate the impact of HAART on mortality, as these childre

survived long enough to be on HAART, but we know the positive impact on mortality from other studies [9, 12]. The main expense with HAART is, of course, the treatment itself which is very expensive, representing around 84% of the global cost. Biological screening is also a major expense, representing 8.5% of the cost. More interestingly, the only protease inhibitor used with children in Abidjan is nelfinavir, which represents 72.5% of the expenses for HAART, and is produced by the firm Roche TM which refused to participate in price negotiations on HAART for developing countries until very recently.

We have no way at the moment of estimating the representativeness of this cohort of HIV-infected children among the same population in Abidjan, as it is a specifically-recruited observational cohort. Moreover, only short and mid-term calculations were possible in our study, as the cohort was only set up two years ago. However, the care received by children in this cohort represents the standard of care HIV-infected children should receive in Côte d'Ivoire, as we only used drugs and technical means available in Côte d'Ivoire. Therefore, the costs we calculated for HIV infection with HAART are probably close to the mean cost of such a disease. But for HIV infection without treatment they are undoubtedly an underestimate as we selected only children who survived long enough to obtain antiretroviral drugs. If we had taken into account children in the final stage of the disease, the costs would probably have been higher.

It is also probable that we underestimated costs such as drugs (other than HAART) because of possible (and usually frequent) self-prescription of drugs for example, or visits to traditional healers, which are not reported in our system and could be significant, especially among untreated and symptomatic HIV-infected children. Moreover, as we took the prices we paid through the national Public Pharmacy and wholesalers, the expenses for drugs were lower than if families had had to pay for all drugs through private pharmacies.

The costs of care for a symptomatic HIV-infected child with HAART are 4.5 times higher than without HAART, and are well beyond the means of the families who take care of such sick children. Moreover, these treatments continue for many years, as HIV is a chronic infection without cure. But we need to emphasize that without such treatment, HIV-infected children die, often after a long and painful illness which usually mobilizes a large part of the family's resources. In any event, even the care of HIV-infected children without HAART is beyond the means of families, as it represents more than the minimum salary in Abidjan.

In addition to the cost of antiretroviral therapies which have decreased in the last few years and continue to decrease, other costs could also be reduced. For immunological monitoring, there are alternative methods which have been validated and could be 4 to 5 times less expensive [20]. Viral load measurement is not always necessary and could be omitted for most children. If absolutely necessary, viral load measures could be replaced by much cheaper methods, such as Taqman technology, in the near future [21].

In 1997, the cost of care of HIV-infected children in Abidjan in the first year of life was estimated at €255, excluding HAART which was not available at that time [16]. That cost was an average of all asymptomatic and symptomatic children under one year of age taken together. In this study, costs are higher, but for much older children and all HIV-symptomatic. The cost for asymptomatic children is probably considerably lower.

The cost of care for symptomatic HIV-infected children represents about 3 or 4 times the minimum salary in Côte d'Ivoire. It should include HAART, in developing as well as rich countries, as it gives the same dramatic decrease in morbidity and mortality. These figures give the real size of the problem. The Ministry of Health in Côte d'Ivoire, supported for a time by the International Therapeutic Solidarity Fund, provided one of the keys to caring for these children by subsidizing antiretroviral therapies for children. From our point of view as an external funding agency involved in research, other sources of funding are possible, such as private foundations, NGOs, companies, private donors, etc. In countries such as Côte d'Ivoire there are also public and private health insurance policies which cover part of the health expenditures of some people (*e.g.* workers and office staff in large companies) and could be involved in funding such treatment, as some firms already do [22]. In any event, even if we can obtain a dramatic reduction in the costs of drugs and biological screening, if international organisations and countries really wish HIV-infected children to be treated, the only way is to give families extensive support.

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