

Treatment for HIV/AIDS in Brazil: strengths, challenges, and opportunities for operations research

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Abstract

Brazil is the only middle-income country to provide free, universal access to antiretroviral (ARV) therapy for the treatment of HIV/AIDS. Currently, the Brazilian National STD/AIDS Program provides ARV therapy to over 95,000 people living with HIV/AIDS (PLWHA). But a successful HIV/AIDS treatment program must provide more than drugs. It must offer a comprehensive set of services along the continuum of care and support, including promoting early entrance into care, facilitating adherence to ARV therapy especially among vulnerable populations, integrating psychosocial support services into care, ensuring that access to ARV therapy does not lead to unintended behaviors, and providing ongoing training to medical personnel and psychosocial support staff. Additionally, the ARV therapy and related support services must be affordable. Brazil has been engaged in a permanent effort to foster national production of ARV and to negotiate substantial discounts with international drug companies. This paper outlines Brazil's significant achievements in creating and sustaining access to ARVs and other anti-AIDS drugs as well as developing innovative care and support services with which to respond to the multifaceted needs of PLWHA in Brazil. The paper also reviews the improvements in AIDS-related mortality and morbidity and subsequent cost savings attributed to the provision of universal access to ARV therapy in Brazil.

Introduction

Increasing the availability of antiretroviral (ARV) therapy for the treatment of HIV/AIDS is urgently needed to achieve significant reductions in HIV/AIDS-related morbidity and mortality globally. Brazil is currently the only middle or low-income country to provide free, universal access to ARV therapy for the treatment of HIV/AIDS. Universal access to ARV therapy was established by Brazilian Federal Law No. 9.313 on 13 November 1996. This law states: "HIV-infected people and/or people living with AIDS are entitled to receive, at no cost, all medicines necessary for their treatment, from the National Health System" (1). At present, more than 95,000 persons receive ARV therapy in Brazil. There are an estimated 622,973 people living with HIV/AIDS (PLWHA) currently in Brazil (2). This proportion of approximately 15% of PLWHA under ARV treatment corresponds to the number of persons who have been identified as needing such treatment by the Brazilian National Health System. The Brazilian criteria for free ARV, which is currently under revision, covers any HIV-positive person who is clinically ill or who has less than 500 CD4+ cells/mm³ and a viral load greater than 30,000 copies. The full criteria and guidelines are available on the Internet (3).

A successful HIV/AIDS treatment program must provide more than access to ARV and other HIV-related drugs. It must offer a comprehensive set of services along the continuum of care and support, including the promotion of early entrance into care; facilitating adherence to ARV therapy especially among vulnerable populations; integrating psychosocial support services into care; ensuring that access to ARV therapy does not lead to unintended behaviors; and the provision of on-going training to medical personnel and psychosocial support staff. Additionally,

the effort to provide ARV and related support services must also be affordable. In this sense, Brazil has been engaged in a permanent effort to foster national production of ARV and to negotiate substantial discounts with international drug companies. The following paper outlines the significant achievements that have been made in Brazil creating and sustaining access to ARV and other anti-AIDS drugs as well as developing innovative care and support services to respond to the multifaceted needs of PLWHA in Brazil. The paper also reviews the improvements in AIDS-related mortality and morbidity and subsequent cost savings attributed to the provision of universal access to ARV in Brazil.

Brazil cannot be considered a typical developing country, as a middle-income nation with a per capita gross domestic product of US\$ 3230.00 (4). The very existence of a universal health system providing medical care at no cost (including ARVs) and many successful public health initiatives (5) make Brazil a country with much better health standards than most other developing countries. However, Brazil is also a country with deep socioeconomic inequalities and large disparities in the standards of care of the National Health System (6), both of which have had unfavorable impacts upon a variety of critical health indicators such as the country's infant mortality rate (5). Although it is recognized that important socioeconomic and political distinctions exist across middle and lower income countries, it is hoped that the Brazilian experience building and sustaining a comprehensive HIV/AIDS treatment program including ARV therapy is one that can potentially help inform and pave the way for such countries as they begin to offer these lifesaving medications to PLWHA.

Overview of the HIV/AIDS epidemic in Brazil

The current population of Brazil is estimated at 170 million inhabitants (4). Forecasts released in 1992 estimated that 1.2 million adults would be living with HIV/AIDS by the year 2000 (2). However, according to a recent report issued by the Brazilian Ministry of Health (BMH), the official estimated number of adults living with HIV/AIDS in 2000 actually corresponds to half of what was predicted (2). From their analyses, Brazilian and international experts are unanimous in concluding that the substantial difference between actual and estimated numbers of PLWHA in Brazil is attributable in large part to a comprehensive set of prevention and care initiatives implemented by the Brazilian National STD/AIDS Program, state and municipal health secretariats, and nongovernmental organizations (NGOs) (2, 7).

In the early 1980s, the HIV epidemic in Brazil was largely restricted to people living in major urban centers, men who have sex with men (MSM), and people who received blood transfusions (8, 9). In the mid-1980s, the epidemic began to spread to midsize cities and markedly increased among vulnerable groups, such as injection drug users (IDUs). In a third and ongoing phase, HIV has been spreading toward smaller municipalities and among heterosexuals (8, 9). Fortunately, scenarios that forecast a massive epidemic among heterosexuals throughout Brazil have not materialized to date (2). The Joint United Nations Programme on HIV/AIDS (UNAIDS) estimates the current overall HIV prevalence in Brazil as 0.57% (10). However, HIV prevalence rates among specific subgroups such as female sex workers and IDUs, for example, are considerably higher. A 1998 study conducted among female sex workers in São Paulo, for example, documented 18% HIV prevalence rates (10). The overall prevalence of HIV has been declining in recent years throughout the country; however, prevalence continues to rise among specific segments of the population, such as poor women and IDUs and their sexual partners in specific geographic areas such as the south of Brazil (8-12). Maps describing such trends are available online for Brazil (8) and Rio de Janeiro (12).

The impact of access to ARV therapy on HIV/AIDS in Brazil

AIDS-related mortality began to decline slightly in Brazil in 1995, before the advent of universal access to ARV therapy (9). However, these small declines were only observed in the two main

metropolitan areas and epicenters of the HIV epidemic in Brazil, São Paulo and Rio de Janeiro. Additionally, these initial declines were found among men only (9). More substantial overall declines in AIDS-related mortality occurred in the major urban areas and among both men and women only after 1996 (2).

The decline in AIDS-related mortality observed after the introduction of universal access to ARV therapy has been quite dramatic. For example, between 1995 and 2000, AIDS-related mortality declined 73% in Rio de Janeiro and 54% in São Paulo (2). Other substantial declines have also been observed in HIV-associated morbidity due to the combined effects of access to ARV and prophylaxis for opportunistic infections. For instance, a 76% decline in the incidence of tuberculosis among HIV-infected individuals was observed in São Paulo during the period 1996 to 2000 (2, 13).

The road to access to ARV therapy

After more than 2 decades of dictatorship in Brazil, the 1980s was a period of profound political change. Civil society, minority movements, and NGOs were substantially strengthened during this time. Public health, in general, benefited from the combined effects of political reform and social advocacy. For example, in 1989, a new constitution was passed, restoring basic civil rights and guaranteeing all Brazilians the right to treatment in public health facilities or in private facilities paid through third-party reimbursement, irrespective of their medical condition.

Similarly, with regard to HIV/AIDS, the 1980s and early 1990s in Brazil was a period of both major confrontations and collaborative agreements between governmental institutions, researchers, NGOs, and activists. Unlike other countries, where AIDS activism challenged the inertia and conservatism of elected governments, AIDS activism in Brazil was born in a climate of broad-based social movements and political reform including claims for amnesty, a new constitution and democratic elections, and the return of many influential expatriated leaders (14).

These confrontations and collaborations had a positive impact on the availability of treatment for HIV/AIDS in Brazil. In 1988, BMH started distributing prophylactic and therapeutic medicines for the treatment of HIV-related opportunistic diseases, initially through the reference centers belonging to the National Health System. In 1991, the first ARV therapy was made available to a significant number of PLWHA, beginning with AZT (zidovudine). Although statistics on the exact extent of coverage during this initial phase of distribution are not available, anecdotal evidence describes far from comprehensive coverage during this period. Between 1991 and 1996, many individuals, supported by human rights and health-related NGOs, sued the Brazilian government in order to procure access to ARV therapy (1). As a result of such activism, Federal Law No. 9.313, which established universal access to ARV therapy for PLWHA, was adopted by the Brazilian legislature in 1996. This groundbreaking legislation was the product of almost 2 decades of advocacy and negotiation among governmental and nongovernmental institutions and a variety of social activists in Brazil (14).

The implementation of the law of universal access for ARV was almost immediate in well-structured municipal health systems such as that of São Paulo. However, considerably more resources, time, and effort have been and are required in order to fully adopt and implement universal coverage throughout all areas of Brazil. In the same way that inequalities have been documented regarding the Brazilian National Health System overall, limitations also exist with regard to the program of universal access to ARV. In a country such as Brazil with major social inequalities (5, 15, 16), the idea of universal health coverage (for any disease or condition) is far from being fully implemented (6). Many limitations still exist, such as shortages in supplies, lack of adequate training and infrastructure, and substandard managerial practices and methods, due in large part to fluctuations and scarcity of funds (6). In the case of

HIV/AIDS, instability in the flow of medicines and some delays in the introduction of new drugs/combined regimens of drugs have been documented in certain facilities and/or municipalities, especially those located in remote regions of the country (17).

Despite its imperfections, the Brazilian program of universal access to ARV therapy has been referred to as a "model" for many developing countries (7, 10). Indeed, the Brazilian model offers important lessons to such countries, including the process and significance of a specialized HIV/AIDS treatment center accreditation program, the establishment of national networks for the implementation and monitoring of clinical and laboratory procedures, the development of local expertise in the production of high-quality generic drugs, and a comprehensive system of ongoing training for a large and diverse pool of medical professionals located across great geographic distances. Such lessons learned, as well as the challenges and potential improvements needed in the Brazilian model for the treatment of PLWHA, are described in detail below.

Infrastructure and coordination needed to provide universal access to ARV

Given the size and diversity of Brazil and the large number of PLWHA receiving ARV therapy, it became clear early on that an integrated network would be needed to implement, coordinate, and monitor the procurement and distribution of ARV medications. The network, called the AIDS Medicines Logistics Network, is chaired by the coordinator of the National STD/AIDS Program and comprised of other members of BMH, with substantial input from several other expert panels, committees, and community representatives.

The national coordinating body of the network is also informed by the local secretariats of health and their respective consulting bodies regarding the number of patients being treated and receiving different therapeutic regimens. This information is entered into a national database, called the SICLOM, which insures that ARV prescriptions are not duplicated and that ARV combinations known to potentially cause serious side effects, major harm, or even death are not prescribed.

The SICLOM is integrated with a second computerized database, Laboratorial Procedures Information and Surveillance System (SISCEL), which guarantees that the appropriate ARV medications are being prescribed given the clinical and laboratory results for each patient. [Details about the SICLOM and related systems are available at the BMH site (18).]

Many challenges still need to be faced in order to achieve national implementation of these systems, given the large number of laboratories performing exams, geographic distance, and telecommunication problems. Major reference centers profit from radio-linked or fiber-optic networks, but communications in Brazil using telephone lines is still difficult, especially in remote regions. Units still waiting to be included in the computerized system continue to work using manual spreadsheets, faxes, and postal mail to gather and share information.

When these systems become fully implemented, every participating patient will have a magnetic identification card that the attending physician can read by computer. Using the card, a physician can automatically retrieve the patient's current clinical status and HIV/AIDS management plan. Currently, 424 network facilities have been accredited by the Brazilian Ministry of Health to deliver ARV therapy to PLWHA; 111 of these facilities (representing 65% of all patients receiving ARVs) have online capabilities linking them with the SICLOM and SISCEL systems (2, 18). Public outpatient services, clinics, and hospitals (but not individual doctor's offices or private facilities) can apply for and be accredited by the local health secretariats to deliver ARV. Minimum requirements to be included as an accredited delivery unit include previous experience with HIV/AIDS patients, trained staff, and basic pharmacy and laboratory infrastructure (2).

In addition to the AIDS Medicines Logistics Network, BMH has established a network for laboratories involved in monitoring the clinical course of HIV infection. While BMH continues to

work to upgrade existing facilities, all laboratories in the network have the ability to conduct basic procedures, such as CD4 and CD8 lymphocyte counts (19), and most of them can perform viral load testing. New lab-related networks have also been proposed and are being fully implemented in certain parts of the country in specialized topical areas such as the isolation and characterization of HIV (20) and the assessment of resistant strains of HIV. The cost of these more sophisticated laboratories (e.g., monitoring of HIV resistance using genotyping techniques) is a significant barrier to expanding access to such resources throughout the country, and they currently function as reference units, funded by specific research grants.

Ensuring early access to care

Despite substantial improvements in access to voluntary counseling and testing (VCT) in Brazil, many persons are still not being diagnosed until the late stages of HIV infection. Late diagnoses make the clinical care of HIV/AIDS more complicated and costly. To address this issue, BMH has intensified the development of a comprehensive network of free and anonymous VCT units throughout the country. Currently, there are more than 140 HIV testing units across Brazil, scattered all over the country, with the highest concentrations in the southeast and southern regions (2).

International studies have documented that vulnerable populations, such as poor women and IDUs, have lower rates of early diagnosis and hence of initial and continued access to ARV therapy (21, 22). This is one area where specialized research and programs are needed. In Brazil, special outreach teams have been developed to meet the needs of specific populations such as pregnant women, MSM, and IDUs in order to increase access to VCT. Additionally, VCT centers have become gathering places for larger scale community development or human rights initiatives that have evolved out of community outreach activities and have included partnerships between community members and leaders, VCT center staff, and university researchers (2). Formalized evaluations of the impact of these innovative VCT, community outreach, and development initiatives on HIV-related outcomes are needed in order to inform future policy and program planning.

Of great concern in Brazil is the number of HIV-infected women who have never been tested for HIV and are unaware or unsure of their HIV status (23, 24). Prenatal care has often been seen as a setting in which many women could be offered VCT. However, many women in Brazil, especially poorer women, have never received prenatal care or do so only late in their pregnancy (23, 24). An ongoing project involving the University of California, Los Angeles, and several Brazilian institutions has been addressing such difficulties, offering rapid HIV testing and prompt intervention to women in late stages of pregnancy. The project has already enrolled over 4000 women from Rio de Janeiro, Porto Alegre (southern border), and Belo Horizonte (southeast) (23). In the major hospitals of the southeast and south, state and municipal health secretariats have trained staff in the management of HIV-infected women and babies, introduced rapid tests, and encouraged the prescription of AZT or nevirapine when appropriate and the replacement of breast feeding with formula or milk from a network of milk banks (24, 25). Much more has to be done to improve standards of care in smaller units and in poorer or remote regions. Additionally, research and intervention are needed to understand and address barriers to early access to prenatal care and VCT among poor women in Brazil.

Adherence to ARV regimes

Adherence to ARV regimens is of great importance for individual patients and for public health in general. For a PLWHA, lack of adherence to an ARV therapeutic regimen may lead to therapeutic failure, deterioration of immune system functioning, and/or the emergence of resistant HIV strains (26). Lack of adherence to ARV therapies may also lead to increased rates of infectivity and potentially increased rates of the transmission of resistant HIV strains (27).

Therapeutic failures imply unnecessary suffering and increased morbidity and mortality. Additionally, lack of adherence will lead to escalating costs of care, including the possible use of complex salvage therapies, intensive and sophisticated diagnostic procedures, and increased frequency of hospitalizations (28). The issue of increased costs is particularly important in developing countries, where resources are limited and the health care systems are already overburdened.

International and Brazilian studies show that adherence to an ARV regime depends on a complex array of factors, ranging from the structure of services (29, 30), the technical expertise and attitudes of medical personnel (29-33), social and psychological support (29, 30, 34), and the sociodemographic characteristics and behaviors of the clientele (29, 31, 34, 36). Conflicting findings regarding levels of adherence to ARV therapy have been documented in three different studies carried out in São Paulo. In two of them, patients from two different outpatient clinics were found to have relatively low levels (<50%) of adherence to ARV regimes (37, 38); in the third, a study of 27 outpatient clinics and 1141 patients in São Paulo, overall adherence (~70%) (29) was found to be comparable to the best international treatment centers (39-41). Such differences are possibly due in part to differences in sampling strategies and study designs, the heterogeneous nature of the different participating clinical facilities and their clientele, and the varying definitions of "adherence" itself that were used in these studies. Overall levels of adherence have been significantly higher in the larger, better funded, and better staffed facilities (29, 42). Results from these studies highlight the need to assess not only the characteristics of individual patients but also the characteristics of the clinical facilities to which they have access.

The studies on adherence conducted in São Paulo also offer insight into the challenges faced by patients in trying to adhere to ARV regimens, especially among more vulnerable groups such as IDUs and lower-income women. According to Nemes et al. (29), IDUs were found to have lower rates of adherence to ARV regimens than noninjecting substance users. Lower levels of adherence were found to be particularly common among IDUs who had low levels of social support, unstable lifestyles, and higher frequencies of injection. Findings from studies conducted outside Brazil have found similar conclusions. Additionally, such studies have highlighted additional characteristics of IDUs that frequently compromise their adherence to ARV regimens, such as depression and anxiety, lack of follow-up with clinical care, age and gender, and lack of treatment for drug use. Judgmental and negative attitudes of health personnel and the absence of specialized care for this population have also been found to be critical elements affecting adherence among IDUs (31, 35).

In relation to adherence and women, a cooperative group involving the São Paulo Reference Center and the University of São Paulo has been studying and addressing issues specifically related to women and HIV/AIDS for the last several years. Such research has shown that women experiencing problems with adherence are younger, embarrassed about their sexuality, less informed about HIV/AIDS, and have a poorer relationship with medical personnel (30).

Different initiatives have been developed to try to increase adherence to ARV therapy, including individual counseling, support groups, and educational workshops, several of which have been piloted in Brazil, especially in São Paulo (31, 30). Case management, which offers coordinated care across an array of service types, including care for HIV/AIDS, substance-use management, and specialized mental health services, has been shown to be an important tool for improving the quality of life of PLWHA, especially those from highly vulnerable and disenfranchised groups (43-45). Pilot programs of case-management teams for IDUs, for example, have been implemented in both Rio de Janeiro and São Paulo, drawing upon resources made available from a consortium of agencies, such as research centers, harm-reduction programs, universities, and religious institutions (30, 46). Again, systematic evaluations of this type of innovative programming for IDUs and women are urgently needed to ensure that the special needs of these groups are appropriately and effectively met. The limited

evaluation data available to date are largely restricted to the references centers from São Paulo.

Psychosocial support and protecting the human rights of PLWHA

Nongovernmental organizations have a long-standing and important history in the struggle to prevent HIV and to provide care and support for PLWHA in Brazil (1, 2, 7, 14). The role of these NGOs has become even more critical in this new phase of the HIV/AIDS epidemic, as ARV therapy has become available. Brazilian NGOs have implemented different initiatives to provide psychosocial support for PLWHA, such as spaces and forums devoted to sharing practical experiences and mutual-help groups. These initiatives have strong links with their respective communities (e.g., gay men's initiatives or women's rights initiatives) (14).

Over the years, strong partnerships have been forged between NGOs, community leaders, and governmental agencies in an effort to sustain and expand psychosocial support for PLWHA (7, 14). For instance, psychosocial support projects focusing on MSM carried out by ABIA (a major NGO located in Rio) have now been fostered and adopted by a variety of governmental agencies (47). However, such partnerships and initiatives are scant or even absent in smaller and remote cities, where progressive medical personnel and activists are still facing formidable challenges posed by individuals and institutions harboring prejudices against MSM, people who use drugs, and/or PLWHA in general (1, 2, 7, 14).

In an effort to raise public consciousness concerning the issues faced by PLWHA in Brazil, national annual conferences of PLWHA began in 1991. Since then these conferences have attracted an ever-growing number of PLWHA from all over the country, as well as domestic and international activists (7, 14). A major achievement in the fight against HIV-related stigma and discrimination in Brazil was the formation of the Brazilian Network of Human Rights Advocacy in the Field of HIV/AIDS in 1997. This network, partially supported by federal funds, brings together PLWHA, activists, NGOs, and a variety of public institutions working in the area of HIV/AIDS (2, 7).

Reducing unintended consequences of universal access to ARVs

The advent of highly active antiretroviral therapy (HAART) has greatly decreased HIV-associated morbidity and mortality, but it has also raised new concerns regarding the unintended consequences of these therapies on HIV-related behaviors. There now exists a growing body of evidence in the published literature that "optimistic" beliefs about the effects of ARV therapy for the treatment of HIV/AIDS may lead to increased sexual risk taking. Several studies have been conducted in developed countries that demonstrate this association (48, 49). To our knowledge, no study in the published literature has addressed this question in a developing country and/or among other population groups apart from MSM.

Currently, a study is being conducted in Rio de Janeiro to investigate local beliefs and attitudes regarding ARV therapy for the treatment of HIV/AIDS among heterosexuals and IDUs and the effect of these beliefs on risk behavior. The primary goal of this research is to identify specific strategies for the provision of ARV medications that will ensure that access does not lead to increased risk behavior (50).

Another potential unintended consequence is the possibility of transmission of resistant strains of HIV if PLWHA who begin to feel better due to access to ARV decide to interrupt treatment. Page-Shafer et al. (51) presented preliminary results about the emergence and transmission of such resistant strains in the Santos, São Paulo, area of Brazil. Additional data on this issue are expected in 2002 based on a comprehensive study being conducted by the Brazilian Network for Resistance Assessment (52). These issues highlight the need for formative research to better understand individual and community-level responses to access to ARV and how access

may affect future HIV-related preventive behaviors and treatment decisions.

Training of health care professionals

Recently, the complexity of therapies for the treatment of HIV/AIDS has increased substantially, as have reports of unexpected side effects, particularly after long-term use of ARV medications (53). The training of physicians, nurses, and other health professionals constitutes an ongoing challenge to be addressed by regulatory institutions, professional bodies, NGOs, and research centers and universities. The BMH has made a concerted effort to provide training and educational opportunities since the mid-1980s. Most of these courses have addressed comprehensive HIV/AIDS management and have combined training in clinical care with basic concepts of prevention and epidemiology (2). Although the number of training opportunities in the area of clinical care for HIV/AIDS continues to increase, BMH is unable to meet the needs of many clinicians, especially those located in remote areas of the country. To address some of these needs, BMH has implemented a distance-learning program on a variety of topics such as: basic laboratory techniques for the diagnosis of HIV and for monitoring the course of the virus, biosafety guidelines, and standards of clinical care. The series has received a number of national and international awards for its scientific excellence and audiovisual presentation (54).

The costs and cost-effectiveness of providing ARV therapy

Increasing restrictions on the budget of BMH and the rising costs of recently released ARVs still covered under patent have challenged the Brazilian initiative of maintaining universal access to ARV. In 1996, for example, the year the federal law guaranteeing universal access to ARV therapy was adopted, an across-the-board cut of 10% was imposed on the budget of BMH. Due to a concerted effort and the mobilization of activists, NGOs, and international agencies and networks, the budget for AIDS ARVs was fortunately preserved.

The average per patient costs of treatment and care provided to PLWHA in Brazil were assessed by two studies conducted in Rio de Janeiro and São Paulo in the early and mid-1990s (55, 56). These studies document a substantial decrease in the mean annual per patient cost of providing treatment for HIV/AIDS: from US\$16689 in 1991 to US\$4885 in 1996. The authors highlighted significantly shorter hospital stays, improved clinical management, and fewer opportunistic infections in 1996, as compared to 1991, as the main factors responsible for the observed decrease (55, 56). These studies, however, were conducted before the advent of HAART regimens; since then, no other comparable or comprehensive studies have been performed. The BMH recently announced a request for proposals to conduct an up-to-date study on HIV-related costs and to develop a comprehensive monitoring system for ongoing cost and cost-effectiveness of ARV.

The global public and private costs of providing ARV to PLWHA in Brazil are depicted in [Table 1](#). In 1998, the acquisition of ARV medicines corresponded to 57% of public expenditures on HIV/AIDS. One must also note that in 1998, the World Bank loan of approximately US\$40 million, although an essential part of the national HIV/AIDS budget, was not used to purchase ARV medicines, as stated in the contract between the World Bank and Brazilian government (57).

Table 1. National aggregated expenditures in HIV/AIDS prevention, care and institutional development (in thousand US\$), Brazil, 1998. Source: Adapted from Brazilian Ministry of Health, 2000 (57).

	Public expenditures*					
	BMH**	States	Municipalities	Universities	OPI**	Total
Prevention	41945	1709	2567	659	77	46957
IEC**	14603	92	91	24	24	14834
Blood banks	22867	1283	243	635	53	25081
Condoms	1961	334	2233	--	--	4528
Others	2514	--	--	--	--	2514
Treatment	352281	36143	12933	4887	205	406449
Medical expenses***	19623	853	203	2337	52	23068
Medicines	267571	9159	7343	--	--	284073
VCT**	58383	3531	1399	2550	153	66016
Institutional development	41555	--	--	--	--	41555
TOTAL	435781	37852	15500	5546	282	494961

*It includes 39670 (in thousand US\$) from the World Bank loan

**BMH = Brazilian Ministry of Health; IEC = Information, Education, and Communication; VCT = Voluntary Counseling and Testing

***Direct medical expenses other than medicines and reimbursement of individual physicians and nurses (paid by other sources)

Brazil has adopted several strategies to reduce the costs of ARV medications. These include alternative drug production and procurement strategies such as its now widely recognized program of locally produced generic ARVs, reaching important agreements with international drug companies that have offered BMH substantial pricing discounts on certain ARV medications, and joint ventures between international firms and local producers to produce these drugs (2, 58). As a result of these cost-saving strategies, prices of ARVs have not escalated in recent years, as was originally forecast by estimates based on previous spending, and have actually begun to decrease as seen in [Figure 1](#) and [Figure 2](#) below.

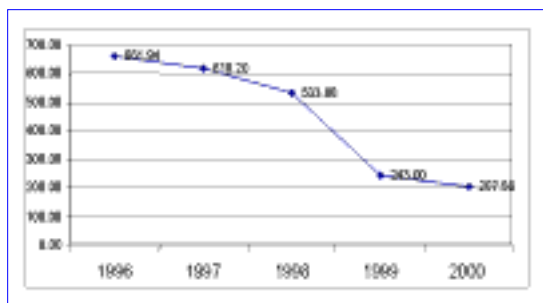


Figure 1. Mean cost of AZT (zidovudine) prophylaxis per pregnant woman (ACTG 076 guidelines), in deflated US\$. Brazil, 1996-2000.

[\[View larger version of this image\]](#)



Figure 2. Estimated mean cost of average ARV therapy per patient, in deflated US\$. Brazil, 1996-2000.

[\[View larger version of this image\]](#)

According to recent unpublished modeling analyses (58), a decrease of 72% in the average individual cost of a hypothetical anti-AIDS therapy using a standard combination of two ARVs was documented between 1997 and 2000 due to the aforementioned cost-saving strategies. Similar calculations were conducted for different combinations of triple ARV therapy, which comprise the majority of treatments being currently provided in Brazil (see Figure 3), where a decrease of 40% to 43% was documented for the same time period.

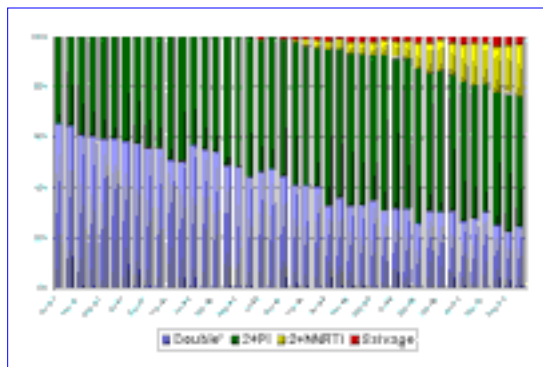


Figure 3. Proportion of HIV/AIDS patients by different therapeutic regimens. Brazil, January 1997 to June 2000.

*Estimates

[\[View larger version of this image\]](#)

The two medicines still protected by patents--nelfinavir and efavirenz--currently represent a major share of the aggregated costs of ARV medications in Brazil, because one or both drugs are included in approximately 40% of all triple therapies. If Brazil was able to locally produce drugs such as nelfinavir and efavirenz as early as 2001, mathematical models forecast that a reduction of 30% in the overall cost of ARV therapy would occur for the period 2001-04 (58). Brazil's ability to produce ARVs locally and hence reduce the cost of universal access is due in large part to great improvements in national capacity in the fields of advanced chemistry and applied pharmacology.

Conclusions

Despite the major challenges that remain, Brazil has demonstrated that universal access to ARV is an achievable goal in a middle- to low-income country context and a basic human right for PLWHA. To date, Brazil remains the only middle to low-income country to offer universal, free access to ARV therapy for the treatment of HIV/AIDS. The Brazilian model offers important

lessons learned to developing countries as access to ARVs becomes more prevalent, and BMH and its governmental and nongovernmental partners continue to develop and improve programs and policies to ensure that in practice, and not just on paper or in law, all PLWHA receive the clinical and psychosocial care and support that they need and deserve.

In spite of this, limitations still exist in the capacity of the Brazilian system to reach, test, counsel, and provide ARVs to every Brazilian who could benefit from these medicines. While a comprehensive medicine logistics system has been implemented, much has to be done to guarantee prompt access and proper monitoring of complex combined regimens of drugs in a country of continental dimension, communication problems, and deep social inequalities.

Operations research, or research that seeks to provide specific "how to" information to fill gaps in programmatic knowledge, is still needed, as are comprehensive and updated studies to estimate costs and cost effectiveness. The types of critical operational issues that need to be addressed are: how to expand and improve VCT to ensure early HIV diagnosis and care; how to facilitate adherence to ARV regimes especially among vulnerable populations (e.g., IDUs, the lower-income population, and/or women serving multiple societal roles such as wives, mothers, and caregivers); how best to provide ongoing clinical training to different types of medical personnel; how to assess the impact of distance learning on standards of clinical care; how best to integrate psychosocial support services for PLWHA into a comprehensive continuum of treatment and care; how to ensure that access to ARV medications does not lead to unintended behavioral outcomes (e.g., increased sexual risk behavior); and how to reduce the cost of ARV therapy and other anti-AIDS medications, ensuring access to as many PLWHA as possible in resource-poor settings where the heaviest burden of disease lies. The answers to these questions will help not only to maintain and improve the treatment of HIV/AIDS in Brazil but also to assist other countries as they begin to develop and maintain their own models of treatment and care for HIV/AIDS.

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