

The social geography of HIV/AIDS among injection drug users in Brazil

Francisco Inácio Bastos*, Maria de Fatima de Pina, Célia L. Szwarcwald

Department de Informação em Saúde, Oswaldo Cruz Foundation, DIS/CICT/FIOCRUZ, AV. Brasil 4365, Biblioteca de Mangueiras #209, 21045 900 Rio de Janeiro, Brazil

Abstract

The paper addresses the socio-geographical spread of HIV/AIDS among injection drug users (IDUs) in Brazil, highlighting patterns and trends of the epidemic in different Brazilian regions. Data relative to the Southeast are reviewed and original analyses for the South are presented. The results indicate that the epidemic is diminishing in the Southeast, after a significant increase in the late 1980s, following major cocaine trafficking routes. On the other hand, the AIDS epidemic is far from leveling off in the South. In this region, IDUs have been pivotal in the dynamics of the epidemics. This explains, at least partially, the recent spread in the South, affecting a large number of women, most of them partners of IDUs, and their offspring, and contributing for a less significant decline of AIDS related deaths, when compared with other Brazilian regions. © 2002 Published by Elsevier Science B.V.

Keywords: IDUs; HIV/AIDS; Epidemic

Introduction

Brazil is a middle-income nation, with a per capita GDP of US\$ 3230.00. Comprising a population of approximately 170 million inhabitants, one of the main characteristics of the country is its huge dimension and deep regional contrasts. Brazil shows intense socio-economic inequalities, which are evident at different geographic levels, from macro-regions within Brazil to municipalities within a state or to neighborhoods within a single city, such as Rio de Janeiro (Szwarcwald, Bastos, Barcellos, Pina & Esteves, 2000a; Szwarcwald, Andrade, & Bastos, 2002).

In view of the aforementioned, one cannot speak of a single Brazilian AIDS epidemic without incurring oversimplification. In the last two decades, Brazil has been affected by different AIDS regional epidemics, each one showing a specific dynamic. Although the sub-epidemics are, to a certain extent, interactive due to movements secondary to internal migration, circular displacement of the working force, and transportation of goods (Barcellos & Bastos, 1996), after two decades of AIDS

in Brazil, the regional specificities are still noticeable and especially relevant among injection drug users (IDUs).

Epidemics among IDUs are the complex result of many interplaying forces, among them the characteristics of individuals and small groups, the 'intermediate level' forces such as the dynamics of local drug scenes, and the macro-level variables such as drug trafficking routes and the cultural habits and economic backgrounds of states and regions (Rhodes, 2002). Since our analysis is based on secondary data, an attempt to address such variables and levels is far beyond the scope of this paper. We restrict ourselves here to describe the main trends of the AIDS epidemic among IDUs in Brazil, highlighting some of the putative correlations of the regional dynamics with the key sociodemographic and cultural elements of the different Brazilian regions.

Our research group has been involved in recent years in many different analyses of the patterns and trends of the Brazilian AIDS epidemic, using a variety of techniques and methods, from descriptive epidemiology to spatial analysis (Szwarcwald et al., 2000b; Barcellos and Bastos, 1996; Lowndes et al., 2000; Bastos, Barcellos, Lowndes & Friedman, 1999; Szwarcwald & Bastos, 1998). The paper reviews the main findings of our research group in the analysis of patterns and trends of Brazilian AIDS epidemic highlighting results found in

* Corresponding author.

E-mail address: bastos@cict.fiocruz.br (F.I. Bastos).

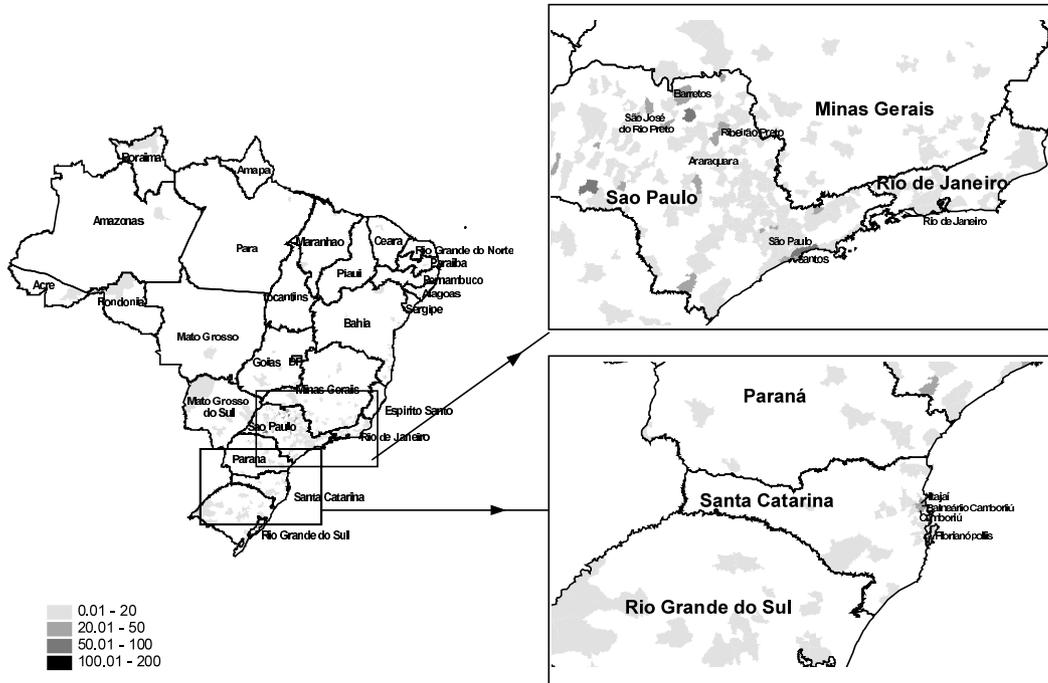


Fig. 1. Accumulated AIDS incidence among IDUs. Brazil, 1988–1990.

the Southeast, the epicenter of the epidemic for two decades, and presents original data for the South, the only Brazilian region where the epidemic continues to show an intensive increase and where efforts to curb the epidemic have been so far failed owing to the continuous spread of HIV among IDUs, their sexual partners and offspring.

Methods

The original analyses for the South uses the National System of AIDS Reported Cases (SINAN-AIDS) and the National Mortality System, and employ descriptive epidemiology and geoprocessing. Data from SINAN-AIDS and/or the National Mortality System are merged

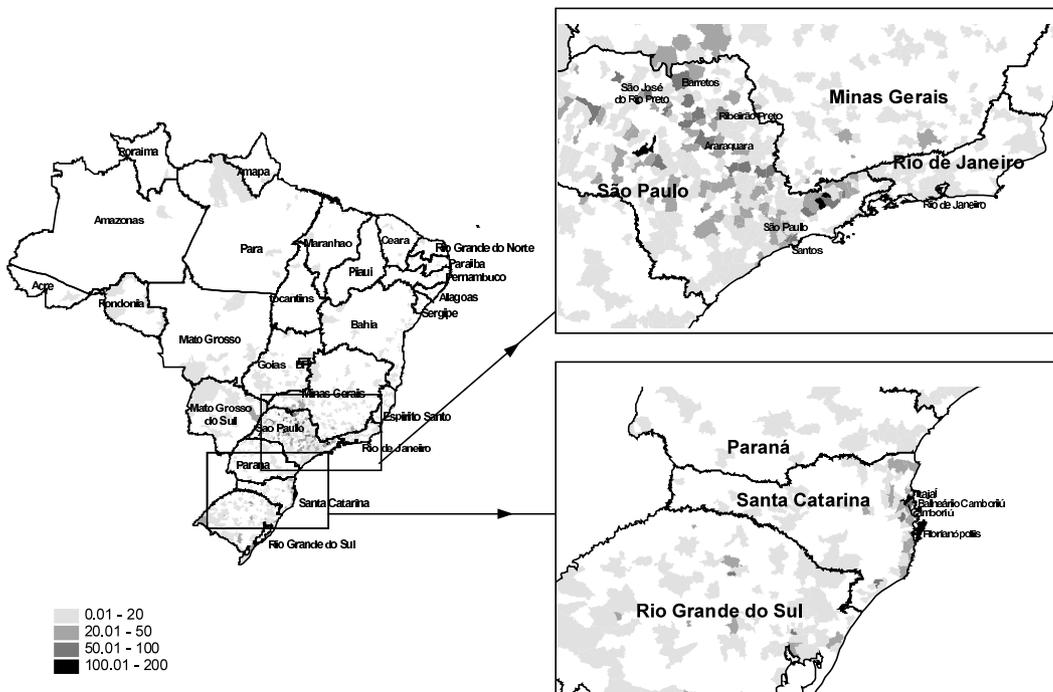


Fig. 2. Accumulated AIDS incidence among IDUs. Brazil, 1995–1997.

with sociodemographic and geographic data provided by the Brazilian National Geographic and Statistics Institute (IBGE), creating an integrated database where AIDS cases are geo-referred to an electronic network of municipalities. Each municipality is represented in the first layer of the electronic maps as a dot, but additional information can be obtained by clicking on each municipality using the tools of Oswaldo Cruz Foundation (FIOCRUZ) Geographic Information System (GIS).

For the city of Rio de Janeiro, located in the Southeast, we profit from various analyses of secondary data and empirical studies in this city and from a comprehensive GIS for Rio de Janeiro metropolitan area. FIOCRUZ GIS has zoom resources, permitting analysis of information from the level of each census tract to the broad level of neighborhoods or major administrative divisions. Personal identification labels are removed as soon as data are entered into the system.

The Brazilian AIDS national epidemic and regional sub-epidemics

In the early 1980s, the AIDS epidemic in Brazil was largely restricted to people living in major urban centers (such as São Paulo and Rio de Janeiro, both located in the Southeast), men who have sex with men (MSM), and people who received blood transfusions (Lowndes et al., 2000; Szwarcwald et al., 2000b). In the mid-1980s, the epidemic spread to mid-size cities and markedly increased among vulnerable groups, such as IDUs. In a third and ongoing phase, HIV has been spread towards smaller municipalities and among heterosexuals (Szwarcwald et al., 2000b).

A number of studies (Barcellos & Bastos, 1996; Szwarcwald et al., 2002b) have shown that Brazil harbors many different HIV sub-epidemics. IDUs have had a negligible role in the AIDS epidemic in the less industrialized areas located in the Northeast and in the North, with the exception of the state of Bahia which borders the Southeast (Andrade, Lurie, Medina, Anderson & Dourado, 2001a; Andrade, Dourado, Farias & Galvão-Castro, 2001b). and some recent AIDS cases among IDUs in the states of Acre and Pará, located in the Amazon tropical forest, and yet to be analyzed in detail. However, IDUs have played a central role in the AIDS sub-epidemic in the industrialized Southeast, especially in the state of São Paulo, and the line along the South coast, from São Paulo towards the South limits of Brazil (Figs. 1 and 2).

The contemporary Brazilian drug scene is in a state of rapid transition, consisting of traditional patterns of drug consumption (e.g. cannabis products), over-the-counter psychopharmacological drugs, inhaled substances (e.g. glue) and illicit drugs prevalent in western countries, such as powder and crack cocaine (Bastos &

Carlini-Cotrim, 1998). Recent findings point to the overlapping of risks posed by the simultaneous use of cocaine by different routes of administration, such as via injection and smoking, as crack cocaine (Bastos et al., 1998), or in the combined use of snorted powder cocaine and smoked crack cocaine (Souza, Diaz, Suttmoller & Bastos, 2002). Another area of concern is the relatively frequent transition of cocaine self-administration routes (Dunn & Laranjeira, 1999; Ferri & Gossop, 1999), for instance, from snorting and smoking cocaine to injection. The AIDS epidemic in Brazil among IDUs is basically fuelled by the injection of cocaine. The role of opiates has thus far been negligible (Bastos & Carlini-Cotrim, 1998; Bastos et al., 2000).

The 'first wave': the Southeast

The IDU-associated AIDS epidemic in Brazil, in its beginning, broadly followed the main cocaine trans-shipment routes, from the western border to the coastal main ports located in the Southeast (Barcellos & Bastos, 1996). The trans-shipment cocaine routes—linking the West and the Southeast of the country—benefit from the best Brazilian highway network and opportunities for 'en route' selling of cocaine and money laundering, since the highway crosses a network of mid-size cities with a strong commercial and financial infrastructure (the so called 'Brazilian California').

Drug scenes in Brazil markedly differ according to the geographic region of the country. For instance, crack cocaine has shown a core role in Salvador, Bahia (Andrade et al., 2001a; Andrade et al., 2001b) or Santos, São Paulo (Szwarcwald et al., 1998), whereas the drug scene in the southern states is basically characterized by cocaine injection (Caiaffa et al., 2002). On the other hand, studies indicate that IDUs are a very mobile population (Frischer, 1998), and act, in this sense, as links between different settings and contexts where distinct drug-using habits and epidemiological patterns prevail. A unique example is the occurrence of two outbreaks of secondary malaria among IDUs in São Paulo State (SP), which has been free of malaria for many decades. The outbreaks were attributed to the migration of IDUs (also co-infected with HIV) from other areas in the country where malaria is endemic, such as the tropical forest in the North and some areas in the Center-West (Bastos et al., 1999).

Cities like Santos, SP (the biggest Brazilian port) experienced a high HIV/AIDS burden in the beginning of the epidemic. However, an impressive decline among new IDU-associated AIDS cases has been observed over the past years (Mesquita et al., 2001), suggesting that Brazil is chronologically experiencing different epidemics. The epidemic in Santos, where HIV prevalence among IDUs formerly 'stabilized' at very high levels, ranging from 50 to 60% (Carvalho et al., 1996), has been

experiencing a significant recent decline, due to various possible factors such as saturation, effects of preventive programs and shifts in the drug scene and injecting habits, with a consistent decrease in injection and needle sharing among IDUs.

Recent ecological studies confirm that the diffusion of HIV among IDUs in the State of São Paulo has followed a localized ('in situ') growth pattern, suggesting that the very rapid diffusion of HIV among IDUs, especially at the end of the 1980s, has been overtaken by a larger spread of heterosexually acquired infections (Szwarcwald & Bastos, 1998).

Rio de Janeiro, the second largest Brazilian city and port, has a lively drug scene where cocaine is typically snorted. Interestingly, its rather small IDU population has not considerably influenced the AIDS epidemic in Rio. As reviewed by Telles et al. (1997), HIV seroprevalence among IDUs in Rio are high when compared internationally (ca. 25%), but have never reached the catastrophic level observed in Santos. Over the years, the proportion of AIDS cases attributed to IDU has reached 7% at most. Currently, this proportion seems to be decreasing. Although Rio is geographically close to Santos, as well as close culturally (both cities share a large port, a role in the trans-shipment of cocaine, and a flourishing tourist industry), the city is characterized by different drug scene and an AIDS epidemic among IDUs distinct from that in Santos.

A recent and auspicious finding of an apparent decline of new HIV infections among IDUs in the City of Rio de Janeiro is highlighted (Guimarães et al., 2001). Using a sensitive/less sensitive HIV testing algorithm ('detuned assays'), Guimarães et al. did not find a single new infection in blood samples collected from IDUs between 1994 and 1996. Hypotheses to explain this result are now being investigated. Similar findings have been reported in Salvador, Bahia, showing a substantial decrease in infection rates for both HIV and HTLV, in a setting where the latter is endemic in the general population and hyper-endemic among IDUs and other vulnerable populations (Andrade et al., 2001b).

In Rio de Janeiro and Santos, data about HTLV infection (not endemic in either city) are yet to be analyzed. Comparisons of results from former to recent cross-sectional studies show significant declines for viral hepatitis, especially for hepatitis C. The observed decrease for hepatitis C—basically transmitted as a blood-borne infection—roughly parallels the decrease in the frequency of injection and the sharing of injection equipment in the two observation times (Bastos, Telles & Hacker, 2001a; Mesquita et al., 2001).

Our provisional conclusion is that the AIDS epidemic among IDUs seems to be experiencing a substantial decrease in the Brazilian cities that harbor a mature epidemic and where preventive programs have been fully

implemented; characteristics which are common to Santos, Rio de Janeiro and Salvador.

The 'second wave': the South

A process of continuous spread of HIV/AIDS towards mid-size cities located far from the coastal line is now taking place in different areas of the country (Szwarcwald et al., 2000b). In this sense, the decline in HIV/AIDS among IDUs in Rio de Janeiro, Santos, and Salvador represents a major achievement, but cannot be understood as an effective reversal of the whole country's epidemic, since these cities are located on the coastal line. Besides, Rio and Salvador are the capital cities of their respective states, and Santos is located in the metropolitan belt of the city of São Paulo, capital of the state of São Paulo. On the other hand, in the central and western regions of São Paulo, there are many mid-size and small municipalities (less than 50 000 population) where the AIDS epidemic is still progressing (Szwarcwald & Bastos, 1998).

What is unique in the epidemic in the South, both among IDUs and other population groups, is the geographic pattern of AIDS spread. The epidemic has been simultaneously progressing in the municipalities located along the coast and the middle and small municipalities located in the interior of the states of Paraná, Santa Catarina, and Rio Grande do Sul, the three states that compose the South macro-region.

The continuous spread of HIV/AIDS in the South is evidenced in the analysis of AIDS cases, reflecting, therefore, a much earlier prevailing epidemic dynamics. Further, analyses of empirical data from IDUs (Caiaffa et al., 2002) and pregnant women (unpublished data from the HPTN [HIV Prevention Trials Network] multicenter preparedness study) consistently emphasize the continuous spread of HIV in this Brazilian region, affecting more closely IDUs, but also the general population, for which pregnant women are a proxy.

Comparison of the South with the Southeast shows that while the AIDS epidemic tends to achieve a plateau in the Southeast, especially in the major metropolitan areas, it continues to spread in the South. By considering the two periods of time 1993–95 and 1996–98, the AIDS mean incidence rates increased 16% in Brazil, 51% in the South, while no increase was found in the Southeast from the first period of time to the most recent one (Table 1).

Over the last years, the epidemic has increasingly spread among women in all Brazilian regions. In the South, the expansion among women was intense. Not only the mean AIDS incidence among women doubled from 1993–1995 to 1996–1998 but also the number of reported AIDS cases due to vertical transmission has shown an important increase. From 1987 to 1996, the mean incidence rate among vertical transmission in-

Table 1
AIDS Mean Incidence Rates (per 100 000 inhabitants) by Geographic Macro-Region and Period of Time among Individuals aged 15–59 years, Brazil, 1990–1998

Region	1990–1992	1993–1995	1996–1998
North	2.6	5.0	7.0
North	2.6	5.0	7.0
North East	4.0	5.8	8.1
North East	4.0	5.8	8.1
South East	22.6	30.7	33.0
South East	22.6	30.7	33.0
South	8.6	16.4	24.7
South	8.6	16.4	24.7
Center West	9.4	15.8	18.4
Center West	9.4	15.8	18.4
Brazil	13.3	19.2	22.3

ected children showed an annual relative increase of 30%.

In relation to the epidemic among IDUs in the South, since 1989, a linear trend of continuous increase is observed (Fig. 3). Among heterosexual, bisexual, and homosexual men the epidemic is also continuously spreading in the South, although in a slower pace than among IDUs. In this region, for any exposure category, the epidemic is far from reaching a plateau.

In the South, the spread among women infected due to unprotected heterosexual intercourse follows approximately the same pattern found among IDUs. As has been shown by studies targeting this population (W. Caiaffa, personal communication, 2001), most IDUs

have non-IDUs as their sexual partners and use condoms inconsistently.

Analysis of the temporal trends of the AIDS epidemic by educational level in Brazil has evidenced that AIDS incidence rates are basically increasing among individuals with lower educational background, with a trend of stabilization among those with higher educational levels (Fonseca, Bastos, Derrico, Tavares de Andrade & Szwarcwald, 2000). In the South, however, the epidemic shows expansion in both groups, more intensely in the group of lower educational level but with no sign of stabilization in the other.

In addition to reported AIDS case analysis, temporal trends of AIDS deaths have also been examined, because the mortality decline has been pointed out as the hallmark of the Brazilian program of universal access to antiretrovirals (Bastos, Kerrigan Malta, Carneiro-da-Cunha & Strathdee, 2001b). Of particular concern is the fact that AIDS mortality in the South has decreased after the introduction of highly active antiretroviral therapy (HAART), but the reduction is not as substantial as that found in the other regions of the country (Table 2).

Discussion

From a pattern highly concentrated in the main metropolitan and industrial areas located in the Southeast, the AIDS epidemic has expanded towards a national phenomenon, although preserving specific

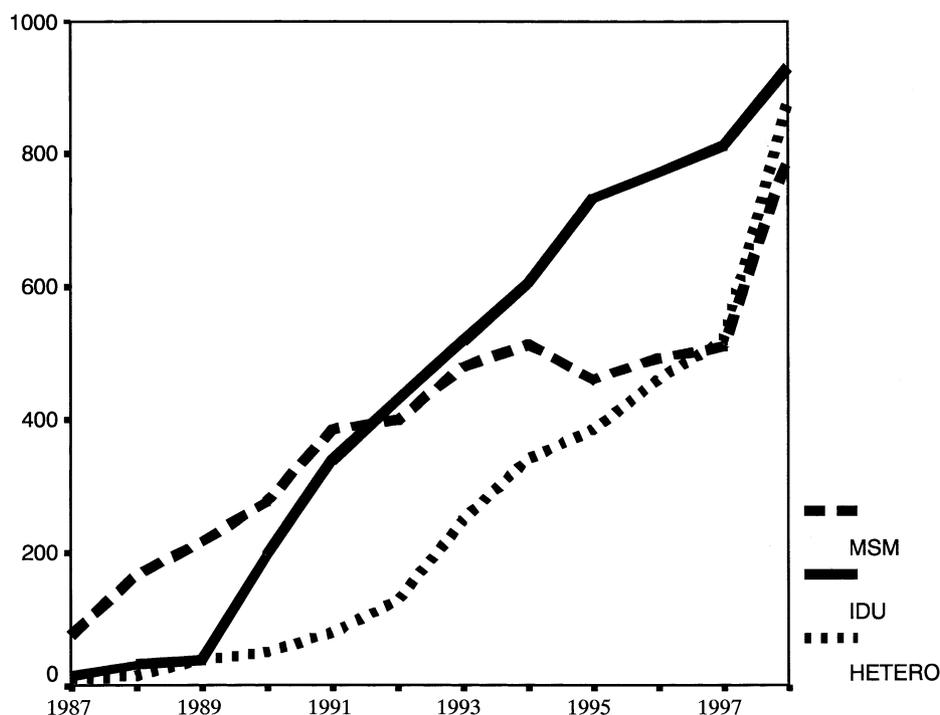


Fig. 3. Number of Cases by Category of Exposure among Males. Brazilian South Macro-Region, 1987–98.

Table 2
‘Ratio of Mortality’* by Geographic Macro-Region and Year of Death, Brazil, 1996–1998

Region	Year of Death		
	1996	1997	1998
North	2.6	5.0	7.0
North East	4.0	5.8	8.1
South East	22.6	30.7	33.0
South	8.6	16.4	24.7
Center West	9.4	15.8	18.4
Brazil	13.3	19.2	22.3

* Calculated as the ratio between the number of AIDS deaths in a given year and the number of reported AIDS cases diagnosed in the previous year.

regional features. While the epidemic in the Southeast seems to be reaching a plateau, the incidence rates in the South, especially among IDUs, are still increasing.

Due to its disproportionately large population vis-à-vis the rest of the country, the Southeast metropolitan areas still concentrates the largest number of cases, but this pattern is clearly changing. Among the municipalities with highest AIDS incidence rates, led for many years in the 1980s and early 1990s by the city of Santos, different mid-size southern cities such as Camboriú, Balneário de Camboriú, and Itajaí have emerged, all located in the coast of Santa Catarina (in the South). In these cities, over 50% of all AIDS reported cases are classified as IDUs.

It is not easy to demonstrate the influence of local drug scenes or cocaine trans-shipment routes on the dynamics of local epidemics taking place among IDUs. Many different factors can influence IDU vulnerability to HIV/AIDS spread once cocaine is made available in a given place at affordable prices, such as: absence of preventive programs, harsh drug policies and strictly drug law enforcement, social marginalization and stigmatization of drug users, among others. However, the spatial-temporal patterns observed in terms of the dynamics of major trafficking routes and extensive HIV/AIDS sub-epidemics are remarkable coincident in Brazil and other settings.

Some reports (Arbex & Tognoli, 1996) have shown that cocaine trafficking in Brazil is no longer an event observable in specific regions, states or cities, but is a nation-wide phenomenon, involving a complex network of cities, all over the country. The efforts to increase drug seizures in one setting—and the privileged target of police surveillance has been the traditional ‘export corridor’ linking the Center-west with southern main ports and airports—has just displaced the main trafficking routes to other routes, where surveillance is less intensive.

Although no systematic effort to map the changes in the drug trafficking routes in the South has been

accomplished in recent years, as has been carried out in the North (Machado, 1997), the ‘Southern Cone Free Market’ (Mercosul) has certainly intensified the movement of people, goods, and money across Brazilian borders with Argentina, Paraguay, and Uruguay. Prompted by the recent terrorist attacks against the USA, a thorough ongoing investigation of organized crime in Brazilian borders is uncovering a broad network of drug smuggling, corruption, and money laundering.

If no simple causal relationship can be established between drug availability at low prices and drug-using habits of individuals, it is well known that availability and affordability of a given drug constitute a necessary condition of a vigorous local drug scene. As shown by our previous study (Barcellos & Bastos, 1996) and an international report describing Asian heroin trafficking routes (Beyrer et al., 2000), blood-borne diseases quickly follow in regions where transition from non-injection to injection drug use has occurred.

Considering the deep geographic, social, and cultural heterogeneity of Brazil and knowing that the impact of interventions has not been uniform, it is essential to implement continuous surveillance and monitoring in various levels to ensure that interventions for prevention and treatment are delivered accordingly. Ecological studies, focusing the broad picture of regions, states or municipalities should be fully integrated with studies targeting individuals and small social networks.

As has been shown previously, IDUs frequently engage in high-risk sexual practices. Although a consistent decrease in risky injection practices in different Brazilian settings in recent years (Bastos et al., 2001a; Mesquita et al., 2001; Andrade et al., 2001a; Andrade et al., 2001b), the same trend has not been consistently observed for risky sexual behaviors. Persistence of high levels of unprotected sex between IDUs and their non-injecting sexual partners may explain why in different settings (e.g. São Paulo, in the early 1990s (Kalichman, 1993)), and more recently in the South, considerable expansion of AIDS among IDUs has been followed by a ‘wave’ of sexually acquired infections among their sexual partners, especially women.

The fact that the pace of the epidemics in the South has yet to slow down is of particular concern. However, the evidence that AIDS deaths have not decreased as much as in the other Brazilian regions, under the same perspective of antiretroviral universal access, deserves specific attention. Since any HIV-infected Brazilian is entitled to antiretroviral medicines for free provided that they meet clinical guidelines, the observed regional differences in mortality rates cannot be ascribed to substandard access to those medicines. In fact, the southern region has a good network of medical facilities, better socioeconomic standards than the other Brazilian regions, and a pattern of social inequalities that cannot

be considered worse than elsewhere in Brazil. In this sense, the smaller decrease of mortality in the South, vis-à-vis other Brazilian regions, seems to be much more related to the larger proportion of cases reported among IDUs in this region than to any particular deficiency in HAART access, a hypothesis to be further explored by multicenter studies assessing adherence to antiretroviral medicines.

Recent Brazilian literature corroborates this hypothesis. IDUs and their sexual partners, especially those that live in deprived and marginalized communities and have disorganized lifestyles, are being diagnosed at later stages of disease (Bastos, Malta & Carneiro-da-Cunha, 2002) and have low adherence to HAART regimens (Nemes, 2000; Teixeira, Paiva & Shimma, 2000).

The HIV/AIDS epidemic in the South is being the target of concerted efforts to prevent the harmful consequences of drug use. Actions are focused on specific programs for drug-users and surveillance of HIV-infection in order to gain control of the spread of HIV/AIDS and other blood-borne and sexually transmitted infections. Although the needle-exchange program implemented in Porto Alegre, Rio Grande do Sul, is considered one of the best Brazilian programs targeting drug users (Bastos, 2000), it has been implemented relatively late (after 1996), and still pales in view of the large extent of the local AIDS epidemic.

Much has to be done in relation to the efforts directed towards the control of the only regional epidemic that is still spreading in a vigorous way in Brazil. Establishment of actions and implementations of programs targeting drug users constitute a renewed challenge to the government, NGOs, and communities to curb the HIV/AIDS epidemic in the South and in the country as a whole.

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