

HIV and AIDS in India: Will the Next 20 Years Be Different?

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It was twenty years ago that the first few cases of HIV were detected in India.¹ There are now about 5.2 million HIV infected individuals living in India.² It was perhaps unimaginable in 1986 to think that HIV would generate such a burden of disease in the country; indeed, the prevailing response was one of denial about the presence of the infection in the country and its potential for spread. Today, however, HIV/AIDS has become one of the most important public health issues in India, attracting national and international priority for financial allocations towards prevention and control activities. Political will and government commitment to tackling HIV in India have increased dramatically in recent years. After two decades of HIV prevention and control efforts, we must consider whether the next twenty years will differ positively. This paper examines the context of the Indian HIV epidemic, describes the national response over the first twenty years of the epidemic and outlines challenges for the coming decades.

HIV/AIDS Prevalence from 1986 to 2005

Estimates of HIV/AIDS prevalence rates from 1986 to 2005 have become progressively more reliable. Although some estimates have been available since 1990, more robust ones have become available with the establishment of the national sentinel surveillance system in 1998. This surveillance system is the primary source of the country's prevalence data and contains unlinked anonymous HIV testing results from antenatal (ANC) and sexually transmitted disease (STD) clinics as well as from other intervention sites. In 2005 there were 391 antenatal sites (267 in urban and 124 in rural areas), 175 STD clinic sites, thirty injecting drug users (IDU) sites, eighteen men having sex with men (MSM) sites, eighty female sex worker (FSW) sites and four tuberculosis (TB) sites in the country. Every state and Union Territory in the country has at least one ANC clinic site and all states and Union Territories

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(except two) have at least one STD clinic site. IDU, MSM, FSW and TB sites were limited to certain key locations in the country.³

Table 1 provides the estimated number of HIV cases in India since 1998. These numbers are generated from estimates derived from sentinel surveys from sites of varying quality and quantity. Prevalence rates derived from antenatal data are generally lower than those obtained from community surveys, and several shortcomings have been identified for the antenatal data collected through sentinel surveys.^{4,5} However, in many African countries, household/community surveys have provided lower HIV prevalence levels primarily because of high rates of non-response. In high HIV prevalence settings, many individuals either know or suspect their status, and it is likely that such individuals may be over-represented among non-responders in household surveys. In Asian countries household level surveys to estimate HIV prevalence have not been undertaken on a large scale although such efforts are currently under way. Their reliability will

depend critically on completeness of coverage. STD clinic data also suffers from problems of non-generalizeable sampling because only a small proportion of those with sexually transmitted infections in the population are likely to attend STD clinics.⁶

Despite the methodological shortcomings of sentinel surveillance estimates, they are widely used by program managers, academics, media and advocacy groups. However, the general consensus among private conversations and sources is that the official reported number of affected people represents a gross underestimate. Indeed, there are reports that the number of HIV infected people could reach 30 million in India by 2010.⁷ Population or community level surveys to validate sentinel surveys will provide an indication of whether these unofficial views are well-founded. In particular, the current National Family Health Survey (NFHS-3) is likely to provide such validation for the country as a whole, as well as for south Indian states, as it includes HIV sero-testing and is based on a robust population sampling

Table 1. HIV prevalence, 1998-2005, India

Year	HIV cases	Increase from the previous year/s	Prevalence rate in adult population
1998	3.50	--	0.70
1999	3.70	+0.20	0.70
2000	3.86	+0.16	0.75
2001	3.97	+0.11	0.75
2002	4.58	+0.61	0.85
2003	5.10	+0.52	0.93
2004	5.13	+0.03	0.92
2005	5.21	+0.08	0.91

Source: Compiled from various reports of NACO

strategy. Over 100,000 men and women were tested for HIV in India during 2005-06 as part of the NFHS-3 Survey.

Prevalence of HIV in Various Risk Groups, 2003-2005

Trends in estimates of the prevalence of HIV infection among various risk groups between 2003 and 2005 are shown in Table 2. An important observation from the table is that the prevalence among women attending antenatal clinics (ANC) has remained below 1% and there has been no increase in infection rates in recent years. While ANC attendees typically represent socioeconomically better off households and thus are not a reliable proxy for the general population, these data provide an indication of the extent of the epidemic among pregnant women who have attended antenatal clinics. The low observed prevalence (below 1%) among ANC attendees seems to indicate a limited penetration of HIV among married monogamous women.

Nationally, the prevalence among those attending STD clinics has increased marginally over the last few years to 5.66%. In 2003, HIV prevalence rates among FSW, IDU and MSM risk groups rose beyond 10% but since then, there have been consistent declines in infection rates in FSW and IDU populations. Due to limited available data on these two groups it is

difficult to say whether or not there has been a real decline among these high risk groups and confirmatory studies are required. Data on MSM are very patchy and any interpretation of trends is likely to be misleading.

The National AIDS Control Program (NACP) conceptualizes that the major groups that can be identified as contributing to the spread of HIV in India are those with STDs, IDU, FSW and MSM. However, because of the relatively small population size of these risk groups, their contribution to the pool of infection is low. Instead, the general population, which the NACP has not identified as a risk group, has become the major contributor to the pool of infection. 2005 estimates suggest that about 3.36 million HIV infected individuals were from the “general population,” followed by 1.68 million reported as having STDs from STD clinics, 0.10 million FSW and 0.01 million IDU (Table 3). Given this, the future number of HIV infections in India will depend heavily on trends in HIV infection among both the general and the STD clinic population.

HIV among Antenatal Clinic Attendees

The pattern of infection in various states, as demarcated by the seroprevalence rates of ANC attendees, is shown in Table 4. In 2005 there

Table 2 HIV prevalence among major population groups, 2003-2005

Year	ANC	STD	FSW	IDU	MSM
2003	0.87	5.61	10.3	13.3	12.1
2004	0.89	5.55	9.43	11.2	7.5
2005	0.88	5.66	8.44	10.16	8.74

Source: NACO "HIV/AIDS epidemiological Surveillance & Estimation" report for the year 2005.

Table 3 HIV trend in various population groups, 2000-2005

Year	ANC	STD	FSW	IDU	CHILDREN
2000	1.75	1.44	--	0.04	--
2001	1.91	1.37	--	0.03	--
2002	2.36	1.44	--	0.03	--
2003	3.48	1.49	0.07	0.01	0.05
2004	3.60	1.33	0.14	0.01	0.06
2005	3.36	1.68	0.10	0.01	0.06

Source: NACO "HIV/AIDS epidemiological Surveillance & Estimation" report for the year 2005

were only five states, Andhra Pradesh, Karnataka, Maharashtra, Manipur and Nagaland, for which rates among ANC attendees were higher than 1%. However, it should be noted that nearly 23% of India's population live in these states. In Andhra Pradesh, Karnataka and Maharashtra (the more southern states), infections in pregnant women are thought to occur predominantly via heterosexual contact,⁸ due to husbands having unprotected sex with FSW. However, in Manipur and Nagaland (north eastern states), transmission predominantly occurs via heterosexual contact, but the link population in this case is husbands who are also IDUs.⁹ Thus, the two groups of states have similar HIV infection levels, but the pathway of transmission occurs through different routes.

In 2005, there were fifteen states and three Union Territories, mainly from north and central India, where HIV prevalence among ANC attendees was below 1%. These states contain about 55% of India's population, so changes in the prevalence rates in these states could have a very substantial influence on the overall number of infections. The major mode of transmission in these states is heterosexual contact.¹⁰ Various reports from this region show a pattern of men who are labor migrants returning from Delhi, Mumbai, Calcutta and infecting their

wives and other sexual partners who live in rural areas and small towns.¹¹ Given the existing scale of labor migration, it is appropriate to ask why HIV prevalence remains relatively low among women in these states. As yet no satisfactory answer can be given. It is important to note that the uptake of antenatal care in these states is still very low: a substantial proportion of rural women do not receive even a single antenatal visit. Thus, women who have been sampled in the sentinel survey could represent a highly selected group not representative of all pregnant women. In North India, poor socioeconomic status is indeed associated with poor uptake of antenatal care, which would translate to an under-representation of poor women in the sentinel surveys.¹²

In 2005, there were eight states and two Union Territories where prevalence of HIV infection among antenatal clinic attendees was not reported or was deemed insignificant. Nearly 22% of India's population lives in these states/Union Territories, which are Goa, Assam, Bihar, Uttar Pradesh, Uttranchal, Jammu and Kashmir, Meghalaya and Tripura. While some of these states have reported measurable prevalence levels in previous years (Goa, Tripura, Uttar Pradesh, Meghalaya), there are questions to be raised as to why infection is apparently almost absent from these states.

Overall, data from 2003-2005 sentinel surveys suggest that rates of infection among women attending ANC have not increased in most of the Indian states (except Nagaland, West Bengal, Arunachal Pradesh and Jharkhand) for the last three years. In Tamil Nadu and Mizoram, HIV infection rates actually declined to less than 1% in 2005.

While the state-wise picture of infection among ANC attendees provides better insight than single figures of national averages, local epidemics are difficult to capture from state level statistics. Available data indicate that even a low HIV prevalence state can harbor districts with high prevalence rates. For example, nine sites out of the ninety-five sites that had more than 1% HIV prevalence rates were located in otherwise “low prevalence” states. This indicates the possible presence of hidden localized epidemics.

HIV among Clients from STD Clinics

Table 4 also shows prevalence rates among STD clinic attendees in 2005. There are eight states with rates higher than 5%: Andhra Pradesh, Karnataka, Maharashtra, Manipur, Tamil Nadu, Goa, Rajasthan and Delhi. These states, predominantly southern states where rates of infection among other risk groups are also high, comprise about 35% of India's population. The case of Rajasthan requires further investigation because HIV rates among ANC attendees is, in contrast, purported to be only 0.13%. Manipur is the only north-eastern state in this group. Individuals from southern states shoulder a disproportionate burden of HIV infection among STD clinic clients, an observation supported by other studies.¹³

There are eighteen states where the preva-

lence rates among STI clinic attendees are less than 5%. These states are primarily located in the north and north eastern regions and contain nearly 52% of the total Indian population. Because of this huge population base, an increase in the number of cases among STD clinic attendees in these regions could significantly increase the total number of infections nationally.

There are six states and three Union Territories reporting no or negligible numbers of positive results in 2005. These are Bihar, Arunachal Pradesh, Jharkhand, Uttranchal, Jammu and Kashmir and Meghalaya. These states contain about 13% of India's population and are located in the northern belt region. Recent evidence from these areas suggests that rates of STD could be very high in certain population groups, particularly among migrant workers from Bihar.^{14,15}

Among a total of 175 STD clinic sites undertaking testing, thirty-four reported prevalence rates greater than 10% in 2005. About 87% of the Indian population lives in states where there are significant levels of HIV infection among the STD clinic population. Because this group primarily infects their wives and other female partners they represent an important focus group for control interventions, both to contain the problem in states where rates are currently high and to stem transmission dynamics in states where this group is not yet as prominent a driver of the epidemic.

HIV among Female Sex Workers

Female sex workers were sampled at eighty-three sites in twenty-two states during 2005. Six states, Andhra Pradesh, Karnataka, Maharashtra, Manipur, Mizoram and Nagaland,

reported prevalences higher than 10% in that year. This shows a pattern of high prevalence rates among FSW in both the southern and north eastern states. This becomes a matter of concern if these states also sustain a high number of sex workers, as they are likely to transmit HIV to the link population. Tamil Nadu, Gujarat and West Bengal had rates between 5% and 10% and the remaining thirteen states (mostly northern) reported less than 5% (Table 4).

HIV among Injecting Drug Users

In 2005 data on HIV prevalence among IDUs were collected from thirty sites in fourteen states. Out of the fourteen states, five states had HIV prevalence rates higher 10%. These are Manipur, Delhi, Maharashtra, Tamil Nadu and Tripura. There were an additional four states—Assam, Chandigarh, Kerala and West Bengal—with infection rates between 5% and 10%. In the remaining six states of Mizoram, Nagaland, Meghalaya, Jammu and Kashmir, the prevalence was below 5% (Table 4). While the number of IDUs may be high in north eastern states, the prevalence of HIV among IDUs is not particularly high in those states. Thus, prevalence of intravenous drug use and HIV infection rates among IDUs within each province contribute to the HIV epidemic in different ways.

HIV Prevalence among MSM

Homosexual intercourse is heavily stigmatized and remains illegal in India under Section 377 of the Indian Penal Code. Thus, data on MSM were collected from fewer than half

of the states and it is very difficult to provide detailed and reliable statistics on MSM. Studies about MSM have to date been mainly concentrated in Southern states.¹⁶ In Karnataka, Maharashtra, Manipur, Delhi and Gujarat provinces, HIV prevalence among MSM was higher than 10% in 2005. In Andhra Pradesh, Tamil Nadu and Pondicherry HIV prevalence among MSM was between 5% and 10% and in the remaining states of Bihar, Chandigarh, Kerala and West Bengal, it was below 5% (Table 4).

HIV Prevention and Control Program, 1986-2006

We shall now turn and consider the national response to the HIV epidemic. In 1986 following the detection of the first cases of HIV infection, the government of India constituted a National AIDS Committee, and in 1987 the committee formally launched its National AIDS Control Program (NACP). Up to 1989 much of NACP's work focused on the generation of public awareness materials, introduction of HIV screening in blood transfusion services and surveillance activities in high prevalence locations. In 1989 a medium term plan for HIV control was developed with support from the World Health Organization in five high-prevalence states, Maharashtra, Tamil Nadu, West Bengal, Manipur and Delhi.¹⁷

It was not until 1992 that HIV prevention activities gained momentum with the introduction of NACP-Phase 1. This was the first national public health program for HIV prevention and control aimed at slowing the spread of HIV and reducing future morbidity and mortality.

A second phase, NACP-2, started in 1999 as a scheme fully funded by the central govern-

Table 4 HIV prevalence among various HIV risk groups, 2005

States/Union Territory	ANC	STD	FSW	IDU	MSM
Andhra Pradesh	2.0	22.8	12.97	--	6.45
Nagaland	1.63	3.5	10.8	4.51	--
Maharashtra	1.25	10.4	23.62	12.8	10.4
Karnataka	1.25	13.6	18.39	--	11.61
Manipur	1.25	12.2	11.4	24.1	15.6
Mizoram	0.88	3.0	14	4.8	--
West Bengal	0.84	2.16	6.8	7.41	0.54
A&N Islands	0.58	0.4	0.4	--	--
Tamil Nadu	0.5	9.2	5.49	18	6.2
Arunachal Pradesh	0.43	0.0	--	--	--
D & N Haveli	0.3	0.0	--	--	--
Sikkim	0.3	0.86	--	0.48	--
Kerala	0.25	2.82	--	5.19	3.2
Gujarat	0.25	2.0	8.13	--	10.67
Delhi	0.25	9.15	3.15	22.8	21.6
Pondicherry	0.25	4.22	0.28	--	--
Madhya Pradesh	0.25	0.49	1.82	--	--
Orissa	0.25	4.0	2.6	--	--
Chattisgarh	0.25	2.83	--	--	--
Rajasthan	0.13	5.6	3.72	--	--
Jharkhand	0.13	0.0	0.8	--	--
Daman & Diu	0.13	0.0	--	--	--
Himachal Pradesh	0.13	0.4	0.0	--	--
Punjab	0.13	1.07	--	--	--
Haryana	0.13	1.3	2.0	--	--
Bihar	0.0	0.0	2.24	--	0.4
Goa	0.0	14.01	--	--	4.9
Assam	0.0	0.89	0.76	7.86	5.6
Uttar Pradesh	0.0	0.4	3.5	--	--
Chandigarh	0.0	1.0	0.67	9.2	1.60
Uttaranchal	0.0	0.0	--	--	--
Jammu and Kashmir	0.0	0.0	--	0.0	--
Meghalaya	0.0	0.0	--	0.0	--
Lakshdweep	0.0	0.0	--	--	--
Tripur	0.0	1.2	--	10.92	--

Source: NACO "HIV/AIDS epidemiological Surveillance & Estimation" report for the year 2005

ment. The two key objectives of the second phase were to reduce the rate of increase in new HIV infections and to strengthen India's capacity to respond to HIV/AIDS. NACP-2's

components were surveillance, prevention and care. Major activities included under NACP-2's surveillance objectives were an annual sentinel surveillance, improved AIDS case deten-

tion, mapping high risk groups and national behavioral surveillance. For prevention, specific activities were aimed at both high- and low-risk groups. Prevention activities for high-risk groups included targeted interventions, STD treatment, condom promotion, inter-sectoral collaboration between private and voluntary sectors and training of medical and paramedical partners. For low-risk populations prevention activities centered around “holistic” information, education and communication activities (IEC), social mobilization, blood safety, voluntary counseling and testing, an AIDS vaccine initiative and workplace interventions. Various activities under the domain of care included prevention of maternal to child transmission of HIV (PMTCT), management of HIV-TB co-infection, treatment of opportunistic infections, piloting ART, post-exposure prophylaxis and the establishment of community care centers. NACP-2 ended in March 2006, and a third phase, NACP-3 is currently underway.¹⁸ In parallel to these government programs, many local, state level and national agencies have also undertaken initiatives on prevention, treatment and care.

Will the Next 20 Years Be Different?

Currently, there are a number of technical innovations for HIV prevention that have the potential to significantly contain the spread of HIV at the population level in India. These are HIV vaccines, the female condom, prevention of herpes simplex infection, male circumcision and vaginal microbicides. So far progress on vaccine development has been disappointingly slow, and it is unlikely that an effective vaccine will be available within the medium term. Social marketing of female condoms has proved very

successful in Zimbabwe through a network of hair salons,¹⁹ and initial work in India suggests that the method is acceptable. However, social marketing of female condoms has yet to find a significant place in the national program. The presence of genital herpes increases the risk of sexual transmission of HIV, and the results of clinical trials of herpes virus suppression currently under way in Tanzania will provide a pointer as to whether this intervention will be useful. Male circumcision is now under active discussion in the African public health arena following positive research findings²⁰ but has not yet been seriously considered in India. Finally, vaginal microbicides, gels that inactivate the virus or prevent its attachment to vaginal tissues, offer a potential method that women can use prior to intercourse. The results from large scale randomized trials of two potential products will be available over the next two to three years.

Despite the potential for prevention using above new technologies, it is likely that the burden of HIV and AIDS in India will only continue to increase over the next twenty years unless the national program (implemented through government and non-government actors) addresses the following key issues in understanding and responding to the country's needs for prevention, care and treatment.

Firstly, reliable estimates on the number of HIV infections are necessary in order to plan for AIDS care and treatment and to track progress of prevention programs. The National AIDS Control Organization (NACO) admits that the statistics they produce do not represent a “head count” and are merely designed to aid program management.²¹ While it will be practically impossible to calculate with absolute certainty, the number of cases in the country, it is a realistic goal to provide estimates that more closely reflect reality. In particular, the

current methodology used to estimate prevalence rates for the general population is subject to much criticism and requires review. In particular, efforts should be made to include pregnant women in the sentinel survey who are not attending antenatal clinics. This is particularly important in states with poor antenatal uptake, where there is often significant association between uptake of antenatal care and certain socioeconomic characteristics. Innovative interventions such as home visits to pregnant women could be piloted with the aim of including them in the sentinel survey. The other group that needs to be included in the sentinel survey is sterilized women. Sterilization is an important family planning method in India. About 90% of the family planning acceptors are sterilization adopters. Although sterilized women are unlikely to become pregnant, they are highly likely to have unprotected sex both within and outside marriage. The average age at female sterilization in India is around twenty-five years and continues to decline. There are about 67 million women in the reproductive age group who are sterilized in India. Against this background it appears that increasing the number of sentinel sites is unlikely to improve the accuracy of estimates unless an effort is also made to include sterilized women in the survey population. We suggest that NACP-3 commission a research program to develop a statistically robust methodology relevant to the Indian context.

Due to the ethnic and cultural diversity within India, more nuanced and sophisticated analyses and intervention programs are needed in order to address differences in the determinants of HIV infection found in different areas, rendering HIV prevention and control in India a relatively complex task. NACO has a relatively weak infrastructure for outreach into rural areas, and hence there is very lim-

ited capacity to identify and deal with localized epidemics. The fact that there are multiple routes of HIV infection into and within rural areas necessitates a deeper understanding of local settings,²² which may lay beyond the scope of the current NACO structure. Recognizing that a macro level understanding of the epidemic is completely different from the dynamics of many varied micro level epidemics, NACP-3 should make efforts to bring in micro level understanding wherever feasible. Linkages with other recently established programs and mechanisms for health system devolution and local accountability such as the Rural Health Mission and “Panchayati Raj” institutions provide new opportunities that should be identified and made functional. Non-government organizations will likely play key roles in bringing these initiatives together in a productive manner. Initiatives of this type, we assert, must take precedence over further expansion of sites for sentinel surveys, which is likely to add little valuable information in tracking and understanding the epidemic.

The bridging population requires further consideration in shaping future policy directions. There is a significant correlation between HIV prevalence rates among ANC and STD clinic attendees. In states where there is a higher prevalence among ANC samples, there is also a higher prevalence among STD attendees. Since HIV transmission frequently occurs between men visiting STD clinics to their female partners, an increase in HIV infection rates among men in this group has the potential to increase infections among women. Men attending STD clinics have around eight to ten times greater risk of testing positive for HIV than the general male population.²³ These men are no doubt self-selecting, as they are aware that their patterns of sexual behavior render them at risk of STD and are hence more

inclined to seek medical attention. While early interventions focused on men who were more likely to solicit transactional sex, the cultural constraints on discussion of sexual relations still limit the scope of behavioral studies of commercial sex in India. There are indications that levels of condom use are now high in many brothels as a result of intensive social marketing campaigns, but the scale and dynamics of extramarital sexual exchange remain under-explored by researchers. Conversely, research indicates that many or even most Indian men do not seek extramarital or transactional sex, suggesting that promoting traditional norms of monogamy could serve as a possible means of primary STI prevention.²⁴

As the second phase of the NACP nears its end and preparations are made for NACP-3, final approval of funding through the World Bank and other partners is anticipated to be confirmed in Fall 2006. The anticipated financial outlay of \$2.5 billion over five years, excluding other programmatic supports, represents a huge increase in scale over NACP-1 and 2.²⁵ While anticipated funding levels are likely adequate in the short run to tackle the current threats posed by HIV in India, it is uncertain whether domestic policy and programming commitments in the long run will be sufficient to sustain NACP beyond the present period of international donor support.

HIV/AIDS will continue to be a public health problem in India for decades to come, even in the unlikely instance that a vaccine becomes available to prevent it. A vision for a long-term HIV strategy, therefore, is needed now rather than a program created ad-hoc to match international funds. The NACP will not be sustainable in its current form should the international support for HIV/AIDS programs fall over time as other international priorities emerge. The recent diminution of do-

nor support to international family planning activities should serve as a warning: once the HIV epidemic stabilizes and the threat of the epidemic to the wider international community is reduced, only limited international support for HIV/AIDS related activities should be anticipated.

As a sustainable way forward, the implication for health policy and programming is that local, district and state level responses to the epidemic need to be integrated into the public health system. In practical terms this means empowering public and private providers of health care in urban and rural areas with the tools to recognize and manage HIV with regards to both individuals and the wider community. In many parts of rural India, the public health infrastructure is shaky, with poorly staffed primary health centers and de-motivated staff; by contrast, in other areas the system works well. There is a patchwork of functionality, and the best way forward is likely to vary in different regions and even districts. In some areas, private practitioners are present and willing to get involved in HIV diagnosis and care but require clinical protocols, laboratory support and an effective referral pathway to support them. In other areas, there is a dearth of private doctors, and the state machinery is needed to assure provision of services to isolated communities. Policy initiatives aimed at decentralizing government budgets to local level, such as the "Panchayati Raj" initiative discussed above, have major scope to empower initiatives for care and support of HIV affected individuals and families, but again relevant tools and support resources will be required.

While the NACO and State AIDS Control Societies have contributed significantly in the initial twenty years of the epidemic, their relevance will disappear if the goal of "mainstreaming" HIV into the health system (pub-

lic and private) is attained. The availability of current funds to combat HIV/AIDS represents a major opportunity to strengthen the entire Indian health system as a whole so that it caters to the diverse and rapidly changing needs of modern India. Not to use the resources in this way would indeed be a lost opportunity.

What about sections of society that are marginalized and underserved? Reaching Indian tribal communities presents unique challenges even for the positive approaches discussed above. According to the 2001 census, there were about 84 million tribal people in India, who are characterized by distinctive cultures, geographic isolation and social customs related to sexuality. As a result of contact with “mainstream” society and migration to non-tribal areas, some of these characteristics have manifested in increased vulnerability to STDs and HIV. A high prevalence of STDs has been reported in polyandrous Toda tribes in the Nigiri Hills, polyandrous Jaunsaris of Chakrata, Dehradun, the Santals of Mayurbhanj district, Orissa and the Kondha tribe of Phulbani district, Orissa. The presence of sexually transmitted diseases was also reported from Andamanese and the tribal groups of Madhya Pradesh, Rajasthan, Mysore, Laccadive and the Minicoy islands.²⁶ It is likely that high STD prevalence will be mirrored by higher HIV prevalence, but so far this has not been investigated systematically. Most worryingly, research has shown that levels of knowledge about HIV/AIDS among indigenous populations are particularly low.^{27,28}

In Africa, knowledge of the HIV virus and its modes of transmission are very widespread and lack of knowledge no longer represents a significant barrier to prevention strategies. Accordingly, the emphasis in prevention has shifted towards behavior change. In India, large proportions of the population still lack basic knowledge about the virus and its modes


of transmission.²⁹ While urban and rural individuals with access to media, especially television, now report greatly increased levels of knowledge, recent HIV related postings from AIDS Yahoo group indicate that stigma and knowledge about HIV remain significant issues.³⁰ Those without access to television or other media have been characterized as a “media underclass” who remain especially vulnerable through their lack of knowledge for self-protection. Special efforts are needed to reach these individuals though social networks and interpersonal channels such as contacts with health workers. Access to electronic and print media is limited to a certain population profile and further investment in them will not increase their penetration into this “underclass.”³¹ NACP-3 should prominently feature innovative IEC approaches for “media dark” population sub-groups.

Among other prevention strategies, though condom use represents an important means of HIV prevention, consistent supply and demand of condoms remains problematic in India.³² Historically, condoms were never established as a method of marital contraception and, thus, they continue to be perceived as something only for use in extramarital encounters. Condom supplies are also not always available, though this is changing rapidly with the recent introduction of innovative social marketing mechanisms for male and female condoms. Current clinical trials of vaginal microbicides for HIV prevention, now under way in Africa and with some Indian sites, could present new and radically different opportunities for overcoming the overwhelming restrictions imposed by gender relations as the ability of Indian women to decline sexual relations³³ or to negotiate condom use has traditionally been very limited. However, if maximum benefit is to be gained from condoms and microbicides

their universal distribution and use based on social marketing will be critical. Other aspects of family and social relations³⁴ such as dowry and the influence of mothers-in-law have also been long standing foci for activism and social programming. General socioeconomic progress in the country has not necessarily led to greater autonomy for women. Rather, among some social groups, increased wealth has instead strengthened adherence to social norms³⁵ of female subordination in the pursuit of prestige. In this context, the availability of female-initiated methods of protection for use prior to intercourse would have a major impact. Should microbicide products prove successful in the clinical trials, increased behavioral research will be needed in order to plan social marketing activities.³⁶

In the coming years, with increasing economic development, large sections of the population are likely to continue migrating to urban areas seeking better employment and education opportunities. Because migrants are more likely to be young and single, their sexual behavior has great bearing on the future course of the HIV epidemic. With the current economic boom, an increase in the migration of sex workers to new locations within and outside their own districts is likely. The most practical way to reach migrants in order to offer prevention interventions is via employers or local organizations such as trade unions. NACP-3 should be prepared to take up such initiatives through local NGOs.

In conclusion, HIV/AIDS will continue to remain an important public health issue for India over the next twenty years, despite efforts to prevent new infections and increased investment in care and treatment. While the epidemic has to date been largely concentrated among risk groups, the future burden of HIV will largely be shouldered by married monoga-

mous women and unmarried men from the "general population." The main link population between low-risk and high-risk groups are individuals who have unprotected sex with male and female sex workers. The next twenty years will be positively different only if the national program can break the links between low- and high-risk groups by targeting this bridge population. Achieving current prevention goals will necessitate an understanding of the epidemic at local levels, dissemination of necessary knowledge about prevention to hard-to-reach groups, the effective dissemination of old and new barrier methods of protection and the development of responsive and flexible policies and programming systems that will cater to all dimensions of the epidemic. 

References

1. E.A. Simoes, P.G. Babu, T.J. John, S. Nirmala, S. Solomon and C.S. Lakshminarayana, "Evidence of HTLV-III infection in prostitutes in Tamil Nadu (India)," *Indian Journal of Medical Research* 85, (1987): 335-38.
2. National AIDS Control Organisation, "Annual Report 2002-2003 and 2003-2004," <http://www.nacoonline.org/annualreport/annulareport.pdf> (10 October 2006).
3. National AIDS Control Organisation, "HIV/AIDS epidemiological Surveillance & Estimation report for the year 2005," <http://www.nacoonline.org/fnlapil06rprt.pdf> (10 October 2006)
4. K. Thomas, S.P. Thyagarajan and L. Jayaseelan, J.C Varghese, P. Krishnamurthy, L. Bai, S. Hira, K. Sudhakar, A. Peedicayil, S. George, R. George, P. Rajendran, A.G. Joyee, D. Hari, Balakrishnan, N. Sethuraman, H. Gharpure, V. Srinivasan, "Community prevalence of sexually transmitted diseases and human immunodeficiency virus infection in Tamil Nadu, India: a probability proportional to size cluster survey," *The National Medical Journal of India* 15, (2005):135-40.
5. P. Chandrasekaran, G. Dallabetta, V. Loo, S. Rao, H. Gayle and A. Alexander, "Containing HIV/AIDS in India: the unfinished agenda," *The Lancet infectious diseases* 6, (2006):508-21.
6. National AIDS Control Organisation, "National Baseline General Population behavioural Surveillance Survey – 2001," <http://www.nacoonline.org/publication/31.pdf> (10 October 2006)
7. Public Affairs & Publications, "Leading HIV, AIDS Researcher Suniti Solomon to Deliver 2nd Annual Uka Solanki Foundation Lecture at CSULB," <http://karl.papubs.csulb.edu/press-release/story.cfm?hackid=88> (10 October 2006)
8. T. Sudha, V.D. Teja and V. Lakshmi, "HIV infection in women utilizing a major hospital in Andhra Pradesh, India, 1993–2004," *International Journal of Infectious Diseases*, (In

- Press).
9. S. Solomon, A. Chakraborty and R.D. Yepthomi, "A review of HIV epidemic in India," *AIDS Education and Prevention* 16, Supplement A (2004): 155-69.
 10. S. Pallikadavath and R.W. Stones, "Women's reproductive health security and HIV/AIDS in India," *Economic and Political Weekly* 38, (2003): 4173-4181.
 11. P. Chandrasekaran, G. Dallabetta, V. Loo, S. Rao, H. Gayle and A. Alexander, "Containing HIV/AIDS in India: the unfinished agenda," *The Lancet infectious diseases* 6, (2006):508-21.
 12. Pallikadavath S, Foss M and R. W. Stones, "Antenatal care: provision and inequality in rural north India," *Social Science and Medicine* 59, (2004): 1147-1158.
 13. K. Thomas, S.P. Thyagarajan and L. Jeyaseelan, J.C Varghese, P. Krishnamurthy, L. Bai, S. Hira, K. Sudhakar, A. Peedicayil, S. George, R. George, P. Rajendran, A.G. Joyce, D. Hari, Balakrishnan, N. Sethuraman, H. Gharpure, V. Srinivasan, "Community prevalence of sexually transmitted diseases and human immunodeficiency virus infection in Tamil Nadu, India: a probability proportional to size cluster survey," *The National Medical Journal of India* 15, (2005):135-40.
 14. T. Hussain, K.K. Kulshreshtha, S. Sinha, V.S. Yadav and V.M. Katoch, "HIV, HBV, HCV and syphilis co-infections among patients attending the STD clinics of district hospitals in Northern India," *International Journal of Infectious Diseases* 5, (2006):358-63.
 15. Yahoo AIDS India group, "High Prevalence Districts of Bihar," <http://groups.yahoo.com/group/AIDS-INDIA/> (10 October 2006).
 16. R.K. Verma and M. Collumbien, "Homosexual activity among rural Indian men: implications for HIV transmission," *AIDS* 18, (2004): 1845-47.
 17. National AIDS Control Organisation, "Annual Report 2002-2003 and 2003-2004," <http://www.nacoonline.org/annualreport/annulareport.pdf> (10 October 2006).
 18. Yahoo AIDS India group, <http://groups.yahoo.com/group/AIDS-INDIA/> (10 October 2006).
 19. Department for International Development, "How Zimbabwe's hairdressers are cutting HIV infection," <http://www.dfid.gov.uk/casestudies/files/africa/zim-hair.asp> (25 November 2006).
 20. B. Auvert, D.Taljaard, E.Lagarde, J.Sobngwi-Tambekou, R.Sitta, A.Puren. "Randomized, controlled intervention trial of male circumcision for reduction of HIV infections: the ANRS 1265 Trial." *PLoS Medicine* 2, (2005): e298.
 21. National AIDS Control Organisation, "National Consultation on HIV estimates India 2004," <http://www.nacoonline.org/nationalhiv.pdf> (10 October 2006).
 22. S. Pallikadavath, L. Garda, H. Apte, J. Freedman and R.W. Stones, "HIV in rural India: context and healthcare needs," *Journal of Biosocial Science* 37, (2005): 641-655.
 23. P. Chandrasekaran, G. Dallabetta, V. Loo, S. Rao, H. Gayle and A. Alexander, "Containing HIV/AIDS in India: the unfinished agenda," *The Lancet infectious diseases* 6, (2006):508-21.
 24. National AIDS Control Organisation, "National Baseline General Population behavioural Surveillance Survey – 200," <http://www.nacoonline.org/publication/31.pdf> (10 October 2006).
 25. Yahoo AIDS India group, "Tackling HIV/AIDS- More sense is needed, not money," <http://groups.yahoo.com/group/AIDS-INDIA/> (12 October 2006).
 26. S.K. Basu, "Health Status of Tribal Women in India," <http://www.hsph.harvard.edu/grhf-asia/forums/Tribals/Tribals/M002.HTM> (10 October 2006).
 27. S. Pallikadavath, A. Sanneh, J.M. McWhirter and R.W.Stones, "Rural women's knowledge of AIDS in the higher prevalence states of India: reproductive health and sociocultural correlates," *Health Promotion International* 20, (2005): 249-259.
 28. E. Naik, A. Karpur, R. Taylor, B. Ramaswami, S. Ramachandra, B. et al, "Rural Indian tribal communities: an emerging high-risk group for HIV/AIDS," *BMC International Health and Human Rights* 5, (2005), 5:1, <http://www.biomedcentral.com/1472-698X/5/1> (10 October 2006).
 29. S. Pallikadavath S, A.A Jayachandran and R.W. Stones, "Women's reproductive health, sociocultural context and AIDS knowledge in northern India," *Journal of Health Management* 7, (2005): 109-128.
 30. Yahoo AIDS India group, <http://groups.yahoo.com/group/AIDS-INDIA/> (10 October 2006).
 31. S. Pallikadavath, C. Sreedharan and R.W. Stones, "Sources of AIDS awareness among women in India," *AIDS Care* 18, (2006): 44-48
 32. S. Pallikadavath and R. W. Stones, "Disseminating knowledge about AIDS through the Indian family planning program: prospects and limitations," *AIDS* 17, (2003): 2008-9.
 33. L.K Waldner, L. Vaden-Goad and A. Sikka, "Sexual coercion in India: An exploratory analysis using demographic variables," *Archives of Sexual Behavior* 28, (1999): 523-538.
 34. S.J Jejeebhoy and Z.A Sathar, "Women's autonomy in India and Pakistan: The influence of religion and region," *Population and Development Review* 27 (2001): 687-712.
 35. X. Biao, "Gender, dowry and the migration system of Indian information technology professionals," *Indian Journal of Gender Studies* 12, (2005): 357-380.
 36. Indian Council of Medical Research, "Workshop on Socio-Behavioural Aspects of Microbicide Trials for HIV Prevention" <http://www.mdp.mrc.ac.uk/archive.html> (10 October 2006).